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INTERNATIONAL CENTRE FOR
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PREFACE

The Specialized Bibliography Series is a part of the larger effort to facilitate exchange of information and to establish an information network in the field of diarrhoeal diseases -- an effort being carried out by the International Diarrhoeal Disease Information Service and Documentation Centre (DISC) of the ICDDR,B. The present issue, the twelfth of the series, includes citations of 412 papers (223 abstracted) on water, sanitation and diarrhoeal diseases: roles and relationships. This is a subject of high current importance, and the reason for selecting the topic is explained in the Introduction.

This is a selective bibliography on the topic. The bibliography was compiled from the resources available at the ICDDR,B Library/DISC, and it is possible that inadvertent omissions may have occurred.

We hope the present bibliography will contribute towards generating greater interest and awareness in this field, and will facilitate user access to existing knowledge. Most of the published papers cited in this bibliography are available from the ICDDR,B Library/DISC to interested persons/organizations. We will consider this attempt successful if the bibliography helps diarrhoeal disease researchers and practitioners' interest.

M Shamsul Islam Khan

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CONTENTS

Introduction i

User's Guide iii

Bibliography 1

Subject Section 1

General 1

Community Participation 2

Disease Incidence and Prevalence 2

Environmental Factors, and Water Pollution and Contamination 13

Evaluation and Impact Studies 21

Health and Hygiene 26

Health Education 29

Interventions, Prevention and Control of Disease 30

Occurrence and Survival of Microorganisms in Environment 40

Sociocultural Aspects 44

Transmission of Microorganisms 46

Water-Health Relationships 52

Author Section 55

INTRODUCTION

Diarrhoeal diseases are a major health concern in most developing countries. In these countries, except China, recent WHO estimates show that diarrhoeal diseases cause nearly 5 million deaths annually in children under five years of age. In this age group, on an average, 2.2 episodes of diarrhoea occur per child per year. Diarrhoeal diseases are mostly seen to occur in places with an unsanitary environmental condition, unhygienic disposal of feces, use of contaminated open water source, overcrowding, malnutrition, and low-socioeconomic status, particularly that of women. In recognition of the health problems arising from such factors and the need for their solutions, the United Nations has declared "1981-1990" as "The International Drinking Water Supply and Sanitation Decade". Along with the appropriate allocation of resources to provide safe water and sanitation to millions of rural people in the developing countries, there is a need for effective motivational efforts at the household and community levels.

High diarrhoeal mortality and morbidity in low-income countries are related to the availability of safe water for personal and domestic purposes and environmental sanitation. The problems associated with the availability of safe water and disposal of feces in these countries remain grossly unattended. While addressing the issues of sanitation and safe water usage there must likewise be simultaneous efforts to motivate individuals to accept these interventions.

It is now recognized that some diarrhoeal diseases, such as cholera, have routes of transmission. The unhygienic disposal of feces may contaminate open water sources. The consumers of this contaminated water are consequently at risk of infection of cholera and other diarrhoeal diseases. The exact mechanism of the fecal-oral spread of diarrhoeal diseases may vary according to place, time and other variables.

It is widely believed that any attempt to prevent the outbreaks of diarrhoea may prove futile without the prior introduction of proper sewage disposal systems, food hygiene, health education and adequate water supplies. Developed communities throughout the world have achieved this goal to a great extent, and consequently the outbreaks of diarrhoeal diseases have effectively been checked. However, developing countries still need to take major steps to improve personal hygiene and provide appropriate means to contain fecal contamination, especially in rural populations, where the majority of their people live.

The hygienic use of water for washing hands and utensils before eating, preparing and serving of meals and following defecation reduces the possibility of ingesting fecal pathogens. The hygienic use of water can play a major role in preventing the transmission of enteric pathogens. In countries, like Bangladesh, where abundant water is available, people prefer to defecate near open water sources for the convenience of washing after defecation. It is not usually understood by individuals that in so doing he or she might infect the water source with enteric pathogens, and thus pose a health hazard to his or her family or their neighbors.

In developing countries, the safe use of water requires behavioral changes. Such changes are possible when safe water is available near the homes. It is possible to introduce major changes in sanitary habits and practices through participation of community women in planning and implementation of rural water and sanitation programs.

Health protection at the community level and its relationship with the environment and socioeconomic development lays stress on the need for broadening the concept of the effects of water use and sanitation practices. In the last two decades, there have been some advancements in the development of such concepts. In promoting the use of safe water and sanitation practices, a multidisciplinary approach seems to be essential to achieve desirable results in the shortest time. Such a multidisciplinary team could include public health experts, epidemiologists, social scientists, environmental microbiologists, and sanitary engineers.

One of the probable reasons for slow progress of research on water and sanitation in relation to the incidence of diarrhoeal diseases is the lack of an effective means to disseminate the results of research among the planners, faculties, and researchers. The seriousness of the threat of diarrhoeal diseases as well as the possible role of provision of safe water and sanitary disposal of human feces in reducing the number of episodes of diarrhoea has led to the preparation of this bibliography.

The papers cited in the bibliography are expected to help strengthen research efforts and provide an understanding of the incidence and prevalence of diarrhoeal diseases, the role of environmental contamination, transmission of microorganisms, and disease prevention and control. Attempts have been made to collate information from relevant literature and to present the findings of studies conducted in the fields of water and sanitation and their interrelationships with diarrhoeal diseases. It is hoped that this bibliography will provide the researchers, planners and policy-makers in this field with a ready reference source book so that a planned approach can be devised to address this important problem.

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USER'S GUIDE

The **Specialized Bibliography Series** includes abstracts and citations of currently available literature from sources worldwide.

The bibliography is divided into subject and author sections. In the Subject Section, citations are arranged alphabetically by the first author under specific headings. The citation sometimes is followed by a sign (**), indicating that an abstract of the cited paper appears in the Author Section.

The Author Section contains citations arranged alphabetically by the first author and then by the title of paper. Co-authors' names also appear in alphabetical order along with a cross-reference to the first author (e.g. Achananuparp S see Sakdisiwasdi O). This will facilitate a search by co-authors' names.

Efforts have been made to present abstracts with all available information regarding the study's nature and objective, method(s) used, and the major findings and conclusions.

The bibliography is in English. A title in parenthesis indicates that the paper is in another language.

ANNOTATED BIBLIOGRAPHY ON WATER, SANITATION AND DIARRHOEAL DISEASES: ROLES AND RELATIONSHIPS

SUBJECT SECTION

GENERAL

Barua D, Burrows W, eds. Cholera. Philadelphia: Saunders, 1974. xvii, 458 p.

Briscoe J. Public health in rural India: the case of excreta disposal. Cambridge: Center for Population Studies, Harvard University, 1976. xix, 414 p. PhD Thesis. (Research paper, 12)

Elliott K, Knight J, eds. Human rights in health. North-Holland: Elsevier, 1974. viii, 304 p. [Ciba Foundation symposium, 23 (new series)]

Feachem R, McGarry M, Mara D, eds. Water, wastes and health in hot climates. London: Wiley, 1977. xvi, 399 p.

Feachem RG, Burns E, Cairncross AM, Cronin A, Cross R, Curtis D, Khan MK, Lamb D, Southal H. Water, health and development: an interdisciplinary evaluation. London: Tri-Med Books, 1978. 267 p.

Jobin W. Report of the Scientific Advisory Group on the Blue Nile Health Project, 27-29 October 1979; first meeting. Alexandria: Regional Office for the Eastern Mediterranean, World Health Organization, 1980. 18 p. (EM/VBV/23; EM/MAL/173; EM/SCHIS./77; EM/SUD/VBC/00/RB)

Lee YK. Cholera in early Singapore - I (1819-1849). Singapore Med J 1973 Mar; 14:42-8

McJunkin FE. Water and sanitation. Washington, D.C.: National Demonstration Water Project, U S Agency for International Development, 1982. xi, 134 p.

MacNamara NC. Asiatic cholera: history up to July 15, 1982; causes and treatment. London: MacMillan, 1892. 71 p.

Pacey A, ed. Sanitation in developing countries. Chichester: Wiley, 1978. xiv, 237 p.

U S Agency for International Development. Interim report of the Task Force on Cholera. Washington, D.C., 1971. 149 p.

van Zijl WJ. Studies on diarrhoeal diseases in seven countries by the WHO Diarrhoeal Diseases Advisory Team. Bull WHO 1966;35(2):249-61 **

Wall JW, Keeve JP. Water supply, diarrheal disease, and nutrition: a survey of the literature and recommendations for research. Washington, D.C.: Public Utility Department, International Bank for Reconstruction and Development, 1974. 30 p.

**indicates an abstract appears with the citation in the author section.

COMMUNITY PARTICIPATION

Aziz KMA, Hasan KZ, Patwary Y, Aziz KMS, Rahaman MM. Acceptability of water-sealed latrines in Mirzapur: a rural area of Bangladesh. In: Islam AS, Haq MM, Ameen M, Ahmed N, Haque S, eds. Proceedings of the Regional Seminar on Protecting the Environment from Degradation, Dhaka, 13-16 May 1985. Dhaka: Science & Technology Division, Ministry of Education, Government of Bangladesh, 1985:166-71 **

Feachem RG. Rural water and sanitation; community participation in appropriate water supply and sanitation technologies: the mythology for the decade. Proc R Soc Lond (B) 1980 Jul;209(1174):15-29 **

Isely RB. A community organisation approach to clean water and waste disposal in Cameroonian villages. Prog Water Technol 1979;11(1-2):109-16 **

Mkumbwa ZM. Community response on control methods for diarrhoeal diseases. In: Khan A, Rowland MGM, Aziz KMS, eds. Proceedings of the First African Conference on Diarrhoeal Diseases, Arusha, 13-17 November 1984. Harare: International Steering Committee, 1986 **

Wagner EG, Lanoix JN. Excreta disposal for rural areas and small communities. Geneva: World Health Organization, 1958. 187 p. (WHO monograph series, 39)

Wagner EG, Lanoix JN. Water supply for rural areas and small communities. Geneva: World Health Organization, 1959. 337 p. (WHO monograph series, 42)

DISEASE INCIDENCE AND PREVALENCE

Abou-Gareeb AH. Measurement of seasonal variation in endemic cholera in West Bengal. Bull WHO 1961;25(1):93-102

Aggarwal P, Sarkar R, Gupta JP, Ahuja S, Ray K, Chowdhuri ANR. Current epidemiological aspects of cholera in Delhi. J Commun Dis 1983 Mar;15(1): 26-32 **

Arbab DM, Weidner BL. Infectious diseases and field water supply and sanitation among migrant farm workers. Am J Public Health 1986 Jun;76(6):694-5

Baine WB, Herron CA, Bridson K, Barker WH, Jr., Lindell S, Mallison GF, Wells JG, Martin WT, Kosuri MR, Carr F, Voelker E, Sr. Waterborne shigellosis at a public school. Am J Epidemiol 1975;101(4):323-32 **

Bhatnagar S, Dosajh U. Diarrhoeal disease morbidity in children below 5 years in urban slums of Delhi. Indian J Med Res 1986 Jul;86:53-8 **

Birzu I, Tieranu E, Zaharia C, et al. [An epidemic of bacillary dysentery caused by the water supply in a section of the town of Craiova]. Microbiologia (Bucur) 1970 Mar-Apr;15:113-20

Black RE, Craun GF, Blake PA. Epidemiology of common-source outbreaks of

shigellosis in the United States, 1961-1975. Am J Epidemiol 1978 Jul;108(1): 47-52 **

Black RE, Horwitz MA, Craun GF. Outbreaks of waterborne disease in the United States, 1975. J Infect Dis 1978 Mar;137(3):370-4 **

Boghitoiu G, Bogus L, Gusita C, et al. [Waterborne epidemic of bacillary dysentery in a hospital]. Microbiol Parazitol Epidemiol (Bucur) 1971 Jul-Aug;16:331-8

Borden HH, Harris RW, Mosher WE. A waterborne outbreak of gastroenteritis in western New York State. Am J Public Health 1970 Feb;60(2):283-9 **

Boyce JM, Hughes JM, Alim ARMA, Khan MU, Aziz KMA, Wells JG, Curlin GT. Patterns of Shigella infection in families in rural Bangladesh. Am J Trop Med Hyg 1982 Sep;31(5):1015-20 **

Bradley DJ. Infective disease and domestic water supplies. In: Tschannerl G, ed. Water supply; proceedings of the Conference on Rural Water Supply in East Africa, Dar es-Salaam, Tanzania, 5-8 April 1971. Dar es-Salaam: University of Dar es-Salaam, Bureau of Resource Assessment and Land-use Planning, 1971:115-30. (Research paper, 20)

Bradley DJ, Emurwon P. Predicting the epidemiological effects of changing water sources. I. A quantitative approach. East Afr Med J 1968 May;45(5):284-91 **

Bradley DJ, Feachem RG. Water supplies, sanitation and diarrhoeal diseases. Scientific Working Group on Environmental Health and Diarrhoeal Disease Prevention, Kuala Lumpur, 3-6 July 1979. Geneva: World Health Organization, 1979. 34 p.

Briscoe J, Feachem RG, Rahaman MM. Evaluating health impact: water supply, sanitation, and hygiene education. New York: UNICEF, 1986. 80 p.

Briscoe J, Feachem RG, Rahaman MM. Measuring the impact of water supply and sanitation facilities on diarrhoea morbidity: prospects for case-control methods. Geneva: World Health Organization, 1985. 71 p. (WHO/CWS/85.3; CDD/OPR/85.1) **

Chakraborty AK, Das JC. Comparative study of incidence of diarrhea among children in two different environmental situations in Calcutta. Indian Pediatr 1983 Dec;20(12):907-13 **

Chandler AC. A comparison of helminthic and protozoan infections in two Egyptian villages two years after the installation of sanitary improvements in one of them. Am J Trop Med Hyg 1954 Jan;3(1):59-73 **

Cheever FS. Dysentery outbreak aboard naval vessels in San Pedro Bay, Philippine Islands. U S Naval Med Bull 1946;46:479-94

Chernoschekov KA, Kaniuka GF. Role played by water factor in the seasonal morbidity elevations of acute intestinal infections. Zh Mikrobiol Epidemiol Immunobiol 1978 Apr;(4):137-9

Child mortality - nutrition - gastroenteritis - water contamination [editorial]. Lancet 1978 Sep 16;2(8090):616

Craun GF. Disease outbreaks caused by drinking water. J Water Pollut Control Fed 1979 Jun;51(6):1751-60 **

Craun GF. Disease outbreaks caused by drinking water. J Water Pollut Control Fed 1981 Jun;53(6):1134-8 **

Craun GF. Microbiology - waterborne outbreaks. J Water Pollut Control Fed 1972 Jun;44:1175-82

Craun GF. Outbreaks of waterborne disease in the United States: 1971-1978. J Am Water Works Assoc 1981 Jul:360-9 **

Craun GF, Gunn RA. Outbreaks of waterborne disease in the United States: 1975-1976. J Am Water Works Assoc 1979 Aug;71(8):422-8 **

Craun GF, McCabe LJ. Review of the causes of waterborne-disease outbreaks. J Am Water Works Assoc 1973 Jan;65(1):74-84 **

Craun GF. A summary of waterborne illness transmitted through contaminated groundwater. J Environ Health 1985 Nov-Dec;48(3):122-7 **

Craun GF. Waterborne disease - a status report emphasizing outbreaks in ground water systems. Ground Wat 1979;12:2

Craun GF, McCabe LJ, Hughes JM. Waterborne disease outbreaks in the US - 1971-1974. J Am Water Works Assoc 1976 Aug;68(8):4106-10 **

Craun GF. Waterborne disease outbreaks in the United States. J Environ Health 1979 Mar-Apr;41(5):259-65

Craun GF. Waterborne giardiasis in the United States 1965-85 [letter]. Lancet 1986 Aug 30;2(8505):513-4 **

Craun GF. Waterborne giardiasis in the United States: a review. Am J Public Health 1979 Aug;69(8):817-9 **

Djerassi L, Lutian M, Smilowitz M, Avital J, Porat V. [An epidemic of gastrointestinal infections in a high-rise building due to sewage contamination of drinking water]. Harefuah 1978 Dec;95(11):396-7

Drachman RH, Payne FJ, Jenkins AA, Mackel DC, Petersen NJ, Boring JR, 3d, Gareu FE, Fraser RS, Myers GG. An outbreak of water-borne Shigella gastroenteritis. Am J Hyg 1960 Nov;72:321-34

Dworkin D, Dworkin J. Water supply and diarrhea: Guatemala revisited. Washington, D.C.: U S Agency for International Development, 1980. 44 p. (AID evaluation special study, 2)

Dykes AC, Juranek DD, Lorenz RA, Sinclair S, Jakubowski W, Davies R. Municipal waterborne giardiasis: an epidemiologic investigation: beavers implicated as a possible reservoir. Ann Intern Med 1980 Feb;92(2,pt.1):165-70

Eden KV, Rosenberg ML, Stoopler M, Wood BT, Highsmith AK, Skaliy P, Wells JG, Feeley JC. Waterborne gastrointestinal illness at a ski resort - isolation of

Yersinia enterocolitica from drinking water. Public Health Rep 1977;92(3): 245-50

Eliassen R, Cummings RH. Analysis of waterborne outbreaks, 1938-45. J Am Water Works Assoc 1948;40:509. Abstract in: Bull Hyg 1948 Nov;23:703

Esrey SA, Habicht JP. Epidemiologic evidence for health benefits from improved water and sanitation in developing countries. Epidemiol Rev 1986;8:117-28

Eyler JM. William Farr on the cholera: the sanitarian's disease theory and the statistician's method. J Hist Med 1973 Apr;28:79-100

Feachem RG, Guy MW, Harrison S, Twugo KO, Marshall T, Mbere N, Muller R, Wright AM. Excreta disposal facilities and intestinal parasitism in urban Africa: preliminary studies in Botswana, Ghana and Zambia. Trans R Soc Trop Med Hyg 1983;77(4):515-21 **

Frankwell RJ. Incidence of enteric diseases and their relationship to water use and water quality in rural communities of Thailand. Bangkok: Southeast Asia Technology, 1974. v.p.

Gawronowa H, Horoch C, Kozlowska T, Sikorska J, Szmuness W. [An epidemic of water-borne dysentery and diarrhea]. Przegl Epidemiol 1962;16:473-8

Gawronowa H, Cechowicz L, Marynczak R, et al. [Waterborne epidemic at Chelm Lubelski]. Przegl Epidemiol 1971;25:409-16

Georgi ME, Carlisle MS, Smiley LE. Giardiasis in a great blue heron (Ardea herodias) in New York State: another potential source of waterborne giardiasis. Am J Epidemiol 1986 May;123(5):916-7

Ghannoum MA, Moore KE, Al-Dulaimi M, Nasr M. The incidence of water-related diseases in the Brak area, Libya from 1977 to 1979, before and after the installation of water treatment plants. Zentralbl Bakteriol Hyg [B] 1981;173 (6):501-8 **

Giardiasis and water [editorial]. Lancet 1980 May 31;1(8179):1176

Gorbatow O. [Water, milk and fly hygiene and their relation to summer diarrhea in a rural community]. Nord Hyg Tidskr 1951:225-39

Gordon RC, Pogan GJ. Water-borne outbreak of shigellosis at an Indian Bible School. J Okla State Med Assoc 1970 Aug;63:376-7

Green DM, Scott SS, Mowat DA, Shearer EJ, Thompson JM. Water-borne outbreak of viral gastroenteritis and Sonny dysentery. J Hyg (Camb) 1968 Sep;66:383-92

Greenberg JH, Schmidt EA, Bell FS, Jr. A common source epidemic of shigellosis. Public Health Rep 1966 Nov;81(11):1019-24

Haley CE, Gunn RA, Hughes JM, Lippy EC, Craun GF. Outbreaks of waterborne disease in the United States, 1978. J Infect Dis 1980 Jun;141(6):794-7 **

Han AM, Oo KN, Aye T, Hlaing T. Personal toilet after defaecation and the degree of hand contamination according to different methods used. J Trop Med Hyg 1986 Oct;89(5):237-41 **

Harter L, Frost F, Vogt R, Little AA, Hopkins R, Gaspard B, Lippy EC. A three-state study of waterborne disease surveillance techniques. Am J Public Health 1985 Nov;75(11):1327-8 **

Hollister AC, Jr., Beck MD, Gittlesohn AM, Hemphill EC. Influence of water availability on Shigella prevalence in children of farm labor families. Am J Public Health 1955 Mar;45(3):354-62 **

Hooper RR, Husted SR. A shipboard outbreak of gastroenteritis: toxin in the drinking water. Milit Med 1979 Dec;144(12):804-7

Hopkins RS, Gaspard GB, Williams FP, Jr., Karlin RJ, Cukor G, Blacklow NR. A community waterborne gastroenteritis outbreak: evidence for rotavirus as the agent. Am J Public Health 1984 Mar;74(3):263-5 **

Hopkins RS, Shillam P, Gaspard B, Eisnach L, Karlin RJ. Waterborne disease in Colorado: three years' surveillance and 18 outbreaks. Am J Public Health 1985 Mar;75(3):254-7 **

Horwitz MA, Hughes JM, Craun GF. Outbreaks of waterborne disease in the United States, 1974. J Infect Dis 1976 May;133(5):588-93 **

Hughes JM. Epidemiological studies of water supply and sanitation and health. In: Lindstrom JD, ed. The impact of interventions in water supply and sanitation in developing countries; proceedings of a seminar held at the Pan American Health Organization, 25-26 March 1980. Prepared by Logical Technical Services, Corp. Washington, D.C.: U S Agency for International Development, 1981:33-45

Hughes JM, Merson MH, Craun GF, McCabe LJ. Outbreaks of waterborne disease in the United States, 1973. J Infect Dis 1975 Sep;132(3):336-9 **

Hung T, Chen G, Wang C, Yao H, Fang Z, Chao T, Chou Z, Ye W, Chang X, Den S, Liong X, Chang W. Waterborne outbreak of rotavirus diarrhoea in adults in China caused by a novel rotavirus. Lancet 1984 May 26;1(8387):1139-42 **

Hussain AMZ. A study on cholera epidemic in Bogra, 1981. J Preven Soc Med 1982;1(1):49-57 **

Ismail M. Environmental health hazards in ecologically disturbed Bangladesh wetlands. In: Islam AS, Haque MM, Ameen M, Ahmed N, Haque S, eds. Proceedings of the Regional Seminar on Protecting the Environment from Degradation, South Asian Association of Regional Cooperation, 13-16 May 1985. Dhaka: Science & Technology Division, Ministry of Education, Government of Bangladesh, 1985:158-65 **

Jakubowski W, Hoff JC, eds. Waterborne transmission of giardiasis; proceedings of a symposium, 18-20 September 1978. Cincinnati: U S Environmental Protection Agency, 1979. xiv, 306 p.

Juranek D. Waterborne giardiasis (summary of recent epidemiologic investigations and assessment of methodology). In: Jakubowski W, Hoff JC, eds. Waterborne transmission of giardiasis; proceedings of a symposium, 18-20 September 1978. Cincinnati: U S Environmental Protection Agency, 1979:150-63

Kaplan JE, Goodman RA, Schonberger LB, Lippy EC, Gary GW. Gastroenteritis due

to Norwalk virus: an outbreak associated with a municipal water system. J Infect Dis 1982 Aug;146(2):190-7 **

Khan M, Rahaman MM, Aziz KMS, Islam S. Epidemiologic investigation of an outbreak of Shiga bacillus dysentery in an island population. Southeast Asian J Trop Med Public Health 1975 Jun;6(2):251-6 **

Khan MU, Shahidullah M. Epidemiologic pattern of diarrhoea caused by non-agglutinating vibrios (NAG) and EF-6 organisms in Dhaka. Trop Geogr Med 1982 Mar;34(2):19-27 **

Khan MU, Mosley WH, Chakraborty J, Sarder AM, Khan MR. The relationship of cholera to water source and use in rural Bangladesh. Int J Epidemiol 1981 Mar;10(1):23-5 **

Khan MU, Shahidullah M. Role of water and sanitation in the incidence of cholera in refugee camps. Trans R Soc Trop Med Hyg 1982;76(3):373-7 **

Khan MU, Roy NC, Huq MI, Stoll B, Islam MR. Shigellosis, an increasing pediatric problem in Dhaka: a fourteen years' epidemiological analysis. Bangladesh J Microbiol 1985;2(1-2):44-5 **

Khan MU, Curlin GT. Urban cholera study, 1974 and 1975, Dacca. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1977. 21 p. (Scientific report, 7) **

Khan MU, Chakraborty J, Sarder AM, Khan MR. Water source and the incidence of cholera in rural Bangladesh. In: Proceedings of the Third Bangladesh Science Conference, Chittagong, 8-12 January 1978:148 **

Khan MU, Mosley WH, Chakraborty J, Sarder AM, Khan MR. Water sources and the incidence of cholera in rural Bangladesh. Dhaka: Cholera Research Laboratory, 1978. 15 p. (Scientific report, 16)

Kirner JC, Little JD, Angelo IA. A waterborne outbreak of giardiasis in Camas, Washington. J Am Water Works Assoc 1978;70:35-40

Koomen J, Jr., Zacha EA, Stevenson WJ, Chesson AS, Jr. An outbreak of unusual waterborne illness in Wayne County - epidemiology aspects. North Carolina Med J 1960 Dec;21:540-4

Korns RF. An unusual waterborne outbreak of gastroenteritis. J Bacteriol 1944;47:582

Krishnaswamy M. Household water supply, hygiene and diarrhoeal diseases in central Thai villages. Bangkok: Asian Institute of Technology, 1973. (Master's thesis)

Kukolevskala MI, Lazarev OP, Ipatova II, et al. The role of water in dysentery. Gig Sanit 1967 Apr;32:9-12

Kumar P, Sehgal BS, Singh R. Bore-hole disposal of excreta of children and diarrhoeal morbidity in a rural community. Environ Health 1970;12:155-9

Lanyi B, Szita J, Ringelhann B, Kovach K. A water borne outbreak of enteritis

associated with Escherichia coli serotype 124:72:32. Acta Microbiol Acad Sci Hung 1959;6:77-84

Lawrence DN, Blake PA, Yashuk JC, Wells JG, Creech WB, Hughes JM. Vibrio parahaemolyticus gastroenteritis outbreaks aboard two cruise ships. Am J Epidemiol 1979 Jan;109(1):71-80 **

Lee YK. Cholera in early Singapore - I (1819-1849). Singapore Med J 1973 Mar;14:42-8

Levine RJ, Nalin DR. Cholera is primarily waterborne in Bangladesh [letter]. Lancet 1976 Dec 11;2(7998):1305

Levine RJ, D'Souza S, Khan MR, Nalin DR. Failure of sanitary wells to protect against cholera and other diarrhoeas in Bangladesh. Lancet 1976 Jul 10;2(7976):86-9 **

Lewis JN, Loewenstein MS, Guthrie LC, Sugi M. Shigella sonnei outbreak on the island of Maui. Am J Epidemiol 1972 Jul;96(1):50-8

Lippy EC. Water supply problems associated with a waterborne outbreak of giardiasis. In: Jakubowski W, Hoff JC, eds. Waterborne transmission of giardiasis; proceedings of a symposium, 18-20 September 1978. Cincinnati: U S Environmental Protection Agency, 1979:164-73

Lipschutz DE. The water question in London, 1827-1831. Bull Hist Med 1968 Nov-Dec;42:510-26

Lobel HO, Bisno AL, Goldfield M, Prier JE. A waterborne epidemic of gastroenteritis with secondary person-to-person spread. Am J Epidemiol 1969 Apr;89(4):384-92 **

Lopez CE, Dykes AC, Juranek DD, Sinclair SP, Conn JM, Christie RW, Lippy EC, Schultz MG, Mires MH. Waterborne giardiasis: a communitywide outbreak of disease and a high rate of asymptomatic infection. Am J Epidemiol 1980 Oct;112(4):495-507 **

Mackie TT, Mackie JW, Vaughn CM, Gleason NN, Greenberg BG, Nenninger ES, Lunde MN, Moore LLA, Kluttz JA, Taliafero MO. Intestinal parasitic infections in Forsyth County, North Carolina. IV. Domestic environmental sanitation and the prevalence of Entamoeba histolytica. Am J Trop Med Hyg 1956 Jan;5(1):29-39

Mahoney LE, Friedmann CTH, Murray RA, Schulenburg EL, Heidbreder GA. A waterborne gastroenteritis epidemic in Pico Rivera, California. Am J Public Health 1974 Oct;64(10):963-8 **

Martin AR, Mosley WH, Sau BB, Ahmed S, Huq I. Epidemiologic analysis of endemic cholera in urban East Pakistan, 1964-66. Am J Epidemiol 1969 May;89(5):572-82 **

Mason PR, Patterson BA, Loewenson R. Piped water supply and intestinal parasitism in Zimbabwean school children. Trans R Soc Trop Med Hyg 1986;80(1):88-93 **

Mentzing LO. Waterborne outbreaks of Campylobacter enteritis in central Sweden. Lancet 1981 Aug 15;2(8242):352-4 **

Merson MH, Goldmann DA, Boyer KM, Peterson NJ, Patton C, Everett LG, Downs H, Steckler A, Barker WH, Jr. An outbreak of Shigella sonnei gastroenteritis on Colorado River raft trips. Am J Epidemiol 1974 Sep;100(3):186-96 **

Merson MH, Tenney JH, Meyers JD, Wood BT, Wells JG, Rymzo W, Cline B, DeWitt WE, Skaliy P, Mallison GF. Shigellosis at sea: an outbreak aboard a passenger cruise ship. Am J Epidemiol 1975 Feb;101(2):165-75 **

Mhalu FS, Moshi WK, Mbaga I. A bacillary dysentery epidemic in Dar es Salaam, Tanzania. In: Khan A, Rowland MGM, Aziz KMS, eds. Proceedings of the First African Conference on Diarrhoeal Diseases, Arusha, 13-17 November 1984. Harare: International Steering Committee, 1986 **

Moore HA, de la Cruz E, Vargas-Mendez O. Diarrheal disease studies in Costa Rica. I. Plan and methods of investigation. Am J Public Health 1966 Feb;56(2):276-86

Morens DM, Zweighaff RM, Vernon TM, Gary GW, Eslien JJ, Wood BT, Holman RC, Dolin R. A waterborne outbreak of gastroenteritis with secondary person-to-person spread; association with a viral agent. Lancet 1979 May 5;1(8123):964-6 **

Mosley WH, Khan MU. Cholera epidemiology - some environmental aspects. Prog Water Technol 1979;11(1-2):309-16 **

Mosley WH, Bart KJ, Sommer A. An epidemiological assessment of cholera control programs in rural East Pakistan. Int J Epidemiol 1972 Spring;1(1):5-11

Mount RA, Rloyd TM. A dysentery outbreak aboard a cruiser in Apra Harbor, Guam, Marianas Islands. U S Naval Med Bull 1948;48:240-9

Muttamara S, Krishnaswamy M. Diarrhoeal diseases related to sanitation and water supply. Southeast Asian J Trop Med Public Health 1982 Sep;13(3):348-51 **

Nesterova VB. [Causes of waterborne dysentery outbreaks]. Gig Sanit 1971 Apr;36:13-6

O'Neil AE, Richen D, Lundrie P. A waterborne epidemic of acute infectious non-bacterial gastroenteritis in Alberta, Canada. Can J Public Health 1985 May-Jun;76(3):199-203 **

Outbreak of diarrheal illness associated with a natural disaster - Utah. MMWR 1983 Dec;32(50):662-4

Parekh P, Kethar M, Arora R, Sharma S, Chaparwal BC, Singh SD, Arora MM. An epidemiological survey during an outbreak of cholera in Indore city. Indian Pediatr 1981 Sep;18(9):637-41 **

Petersen NJ, Hines VD. The relation of summertime gastrointestinal illness to the sanitary quality of the water supplies in six Rocky Mountain communities. Am J Hyg 1960 May;71:314-20 **

Poley JR. Causes of chronic diarrhea in infants and children. Postgrad Med 1970 Dec;48(6):143-7 **

Rahaman MM, Khan M, Aziz KMS, Islam MS, Kibriya AKMG. An outbreak of dysentery

caused by Shigella dysenteriae type 1 on a coral island in the Bay of Bengal. J Infect Dis 1975 Jul;132(1):15-9

Rahaman MM, Aziz KMS, Rahman MM. Relationship between water consumption and dysentery in Teknaf: a rural Bangladesh village. In: Proceedings of the 11th Meeting of the Scientific Review and Technical Advisory Committee of the Cholera Research Laboratory. Dhaka: Cholera Research Laboratory, 1977:94-101

Rahaman MM, Mia MAL, Khan AR, Khan AK, Rahman M, Haq M, Khan AQ, Zoha MS. A survey of basic health information of rural Bangladesh. Bangladesh Med Res Counc Bull 1977 Jun;3(1):70-6 **

Rahaman MM, Aziz KMS. Teknaf Dysentery Project. In: Proceedings of the 9th Meeting of the Scientific Review and Technical Advisory Committee of the Cholera Research Laboratory and reports of the collaborative studies between International Center for Medical Research and Cholera Research Laboratory. Dhaka: Cholera Research Laboratory, 1975:148-56

Rajasekaran P, Dutt PR, Pisharoti KA. Impact of water supply on the incidence of diarrhoea and shigellosis among children in rural communities in Madurai. Indian J Med Res 1977 Aug;66(2):189-99 **

Rao SS. National water supply and sanitation programme with special reference to cholera endemic areas. Indian J Public Health 1975 Jan-Mar;19(1):44-9

Renteln HA, Himman AR. A waterborne epidemic of gastroenteritis in Madera, California. Am J Epidemiol 1967 Jul;86(1):1-10 **

Rosenberg ML, Koplan JP, Wachsmuth IK, Wells JG, Gangarosa EJ, Guerrant RL, Sack DA. Epidemic diarrhea at Crater Lake from enterotoxigenic Escherichia coli. Ann Intern Med 1977 Jun;86(6):714-8 **

Rosenberg ML, Weissman JB, Gangarosa EJ, Reller LB, Beasley RP. Shigellosis in the United States: ten-year review of nationwide surveillance, 1964-1973. Am J Epidemiol 1976 Nov;104(5):543-51 **

Saxena SN. Intestinal parasites prevalent in Kasauli (Himachal Pradesh) area. Indian J Public Health 1982 Apr-Jun;26(2):100-5 **

Schiavone EL. [Influence of water on communicable diseases: some of its solutions]. Red Samid Milit Argent 1963 Jul-Sep;62:189-206

Schliessmann DJ. Diarrhoeal disease and the environment. Bull WHO 1959;21:381-6 **

Schliessmann DJ, Atchley FO, Wilcomb MJ, Jr., Welch SF. Relation of environmental factor for the occurrence of enteric diseases in areas of eastern Kentucky. Public Health Monogr 1958;54:1-33

Schroeder SA, Caldwell JR, Vernon TM, White PC, Granger SI, Bennett JV. A waterborne outbreak of gastroenteritis in adults associated with Escherichia coli. Lancet 1968 Apr 6;1(7545):737-40 **

Shahid NS, Samadi AR, Khan MU, Huq MI. Classical vs El Tor cholera: a prospective family study of a concurrent outbreak. J Diarrhoeal Dis Res 1984 Jun;2(2):73-8 **

Shaw PK, Brodsky RE, Lyman DO, Wood BT, Hibler CP, Healy GR, MacLeod KIE, Stahl W, Schultz MG. A communitywide outbreak of giardiasis with evidence of transmission by a municipal water supply. Ann Intern Med 1977 Oct;87(4): 426-32 **

Shiffman MA, Schneider R, Turner AG, et al. Seasonality in water related to intestinal disease in Guatemala. Int J Biometeorol 1976 Oct;20(3):223-9

Shum H, Sum CY, Chan-Teo CH. Water-borne dysentery due to Shigella sonnei in Hong Kong. Southeast Asian J Trop Med Public Health 1971 Jun;2:180-5

Shura-Bura BL, Slavin NI, Verkholomov EE, et al. [The occurrence of dysentery of water origin, caused by Shigella boydii-10]. Voennomed Zh 1967 Nov;11:54-7

Skoda JD, Mendis JB, Chia M. A survey in rural Bangladesh on diarrhoeal morbidity, water usage and related factors; first report. Dhaka: United Nations Children's Fund, 1977. 47 p.

Sokolovski B, Arsic B, Dordevic D, et al. [Our experience with water-induced epidemics of bacillary dysentery]. Vojnosanit Pregl 1977 Mar-Apr;34(2):83-8

Sommer A, Woodward WE. The influence of protected water supplies on the spread of classical/Inaba and El Tor/Ogawa cholera in rural East Bengal. Lancet 1972 Nov 11;2(7785):985-7 **

Sorvina LE. Water-borne epidemic of dysentery. Vrach Delo 1946;26(10):743-6

Spira WM, Khan MU, Saeed YA, Sattar A. Environmental epidemiology. I. Environmental and prospective epidemiological investigation of cholera outbreaks. In: Proceedings of the 11th Meeting of the Scientific Review and Technical Advisory Committee of the Cholera Research Laboratory, 1976:148-59 **

Stewart WH, McCabe LJ, Jr., Hemphill EC, DeCapito T. Diarrheal disease control studies: the relationship of certain environmental factors to the prevalence of Shigella infection. Am J Trop Med Hyg 1955 Jul;4(4):718-24 **

Sultanov GV, Solodovnikov IuP. [Role of the aqueous factor in the epidemiology of dysentery]. Zh Mikrobiol Epidemiol Immunobiol 1977 Jun;(6):99-101

Sunoto. Diarrhoeal problems in Southeast Asia. Southeast Asian J Trop Med Public Health 1982 Sep;13(3):306-18 **

Sutoto, Mochtar MA, Karyadi, Wasisto B. Morbidity and mortality study on diarrhoeal diseases in North Jakarta — an urban area. Southeast Asian J Trop Med Public Health 1982 Sep;13(3):405-11 **

Taylor A, Jr., Craun GF, Faich GA, McCabe LJ, Gangarosa EJ. Outbreaks of waterborne disease in the United States, 1961-1970. J Infect Dis 1972 Mar;125(3):329-31 **

Tiehan W, Vogt RL. Waterborne Campylobacter gastroenteritis - Vermont. MMWR 1978;27:207

Trivedi BK, Gandhi HS, Shukla NK. Bacteriological water quality and incidence of waterborne diseases in a rural population. Indian J Med Sci 1971 Nov;25:795-801

Veldee MV. An epidemiological study of suspected water-borne gastroenteritis. Am J Public Health 1931;21:1227-35

Verkholomov EE, Siroko IA. [Microbiological substantiation of the role of the water factor in the epidemiology of dysentery]. Voennomed Zh 1967;5:39-42

Wagner EG, Lanoix JN. Excreta disposal for rural areas and small communities. Geneva: World Health Organization, 1958. 187 p. (WHO monograph series, 39)

Wagner EG, Lanoix JN. Water supply for rural areas and small communities. Geneva: World Health Organization, 1959. 337 p. (WHO monograph series, 42)

Watanabe Y. Epidemiology of water-borne diseases. Geneva: World Health Organization, 1973. (WHO/DANIDA/L19/1-15, 1973)

Waterborne disease outbreaks in the United States - 1978. MMWR 1980 Feb 1;29(4):46-8

Waterborne giardiasis. Wkly Epidemiol Rec 1980 Sep 5;55(36):275-7

Waterborne giardiasis - California, Colorado, Oregon, Pennsylvania. MMWR 1980 Mar 21;29(11):121-3

Water-related disease outbreaks in the United States - 1980. MMWR 1982 Jan 1;30(50-51):623-34 **

Watt J, Hollister AC, Jr., Beck MD, Hemphill EC. Diarrheal diseases in Fresno County, California. Am J Public Health 1953 Jun;43(6):728-41

Webber RH. Cholera on Lake Tanganyika (south). In: Khan A, Rowland MGM, Aziz KMS, eds. Proceedings of the First African Conference on Diarrhoeal Diseases, Arusha, 13-17 November 1984. Harare: International Steering Committee, 1986 **

Weibel SR, Dixon FR, Weidner RB, et al. Water borne disease outbreaks 1946-1960. J Am Water Works Assoc 1964 Aug;56:947-58

Weissman JB, Craun GF, Lawrence DN, Pollard RA, Saslaw MS, Gangarosa EJ. An epidemic of gastroenteritis traced to a contaminated public water supply. Am J Epidemiol 1976 Apr;103(4):391-8 **

Werner SB, Jones PH, McCormack WM, Ager EA, Holm PT. Gastroenteritis following ingestion of sewage-polluted water: an outbreak at a logging camp on the Olympic Peninsula. Am J Epidemiol 1960;89(3):277-85 **

Wilson R, Anderson LJ, Holman RC, Gary GW, Greenberg HB. Waterborne gastroenteritis due to Norwalk agent: clinical and epidemiologic investigation. Am J Public Health 1982 Jan;72(1):72-4 **

Wolff HL, van Zijl WJ, Roy M. Houseflies, the availability of water, and diarrhoeal diseases. Bull WHO 1969;41(6):952-9 **

World Health Organization. Diarrhoeal Diseases Control Programme. Environmental health and diarrhoeal disease prevention; report of a Scientific Working Group, Kuala Lumpur, 3-6 Jul 1979. Geneva, 1980. 33 p. (WHO/CDD/80.5)

Yap KL, Sabil D, Muthu PA. Human rotavirus infection in Malaysia. II. A study on the influence of living standard on the prevalence of rotavirus-associated gastroenteritis in children hospitalized with diarrhoea. J Trop Pediatr 1984 Oct;30(5):269-71 **

Zhang DL. [A water-borne outbreak of diarrhea]. Chung Hua Liu Hsing Ping Hseueh Tsa Chih 1984 Aug;5(4):209-11

ENVIRONMENTAL FACTORS, AND WATER POLLUTION AND CONTAMINATION

Abou-Gareeb AH. Measurement of seasonal variation in endemic cholera in West Bengal. Bull WHO 1961;25(1):93-102

Agarwal DK, Kasana SK, Tripathi AM, Agarwal KN. Environmental factors in childhood diarrhea in rural areas. Indian Pediatr 1986 Feb;23(2):89-95

Ahmad S. Role of water quality on diarrhoeal diseases in some villages of central Thailand. Bangkok: Asian Institute of Technology, 1974. (Master's thesis)

Barrell RAE, Rowland MGM. The relationship between rainfall and well water pollution in a West African (Gambian) village. J Hyg (Camb) 1979 Aug;83(1):143-50 **

Bashford DJ, Donovan TJ, Furniss AL, Lee JV. Vibrio cholerae in Kent [letter]. Lancet 1979 Feb 24;1(8113):436-7 **

Berg G. Viral pollution of the environment. Florida: CRC Press, 1983. 241 p.

Bhatia BD, Agarwal DK, Singla PN, Sanyal SC. Environmental factors and microbial flora in hospitalized children with diarrhoea. Indian Pediatr 1980 Apr;17:354-60 **

Black RE, Craun GF, Blake PA. Epidemiology of common-source outbreaks of shigellosis in the United States, 1961-1975. Am J Epidemiol 1978 Jul;108(1):47-52 **

Bradley DJ. Health problems of water management. J Trop Med Hyg 1970 Nov;73:286-94

Bradley DJ, Emurwon P. Predicting the epidemiological effects of changing water sources. I. A quantitative approach. East Afr Med J 1968 May;45(5):284-91 **

Brady PG, Wolfe JC. Waterborne giardiasis. Ann Intern Med 1974 Oct;81(4):498-9 **

Briscoe J. Public health in rural India: the case of excreta disposal. Cambridge: Center for Population Studies, Harvard University, 1976. xix, 414 p. PhD Thesis. (Research paper, 12)

Brisou J. An environmental sanitation plan for the Mediterranean seaboard:

pollution and human health. Geneva: World Health Organization, 1976. 96 p. (Public health papers, 62)

Britt B, Kourany M, Millar JW. A pilot search for environmental factors influencing diarrheal disease in young children in Panama. J Trop Pediatr Environ Child Health 1973 Sep;19:282-7 **

Bruch HA, Ascoli W, Scrimshaw NS, Gordon JE. Studies of diarrheal disease in Central America. V. Environmental factors in the origin and transmission of acute diarrheal disease in four Guatemalan villages. Am J Trop Med Hyg 1963 Jul;12(4):567-79 **

Chakraborty AK, Das JC. Comparative study of incidence of diarrhea among children in two different environmental situations in Calcutta. Indian Pediatr 1983 Dec;20(12):907-13 **

Chernoschekov KA, Kaniuka GF. Role played by water factor in the seasonal morbidity elevations of acute intestinal infections. Zh Mikrobiol Epidemiol Immunobiol 1978 Apr;(4):137-9

Child mortality - nutrition - gastroenteritis - water contamination [editorial]. Lancet 1978 Sep 16;2(8090):616

Chowdhury MAR, Aziz KMS, Rahim Z, Kay BA. Vibrio mimicus as a component of pollution of urban water body. In: Islam AS, Haque MM, Ameen M, Ahmed N, Haque MS, eds. Proceedings of the Regional Seminar on Protecting the Environment from Degradation, Dhaka, 13-16 May 1985. Dhaka: Science & Technology Division, Ministry of Education, Government of Bangladesh, 1985:108-13 **

Craun GF. Disease outbreaks caused by drinking water. J Water Pollut Control Fed 1979 Jun;51(6):1751-60 **

Craun GF. Disease outbreaks caused by drinking water. J Water Pollut Control Fed 1981 Jun;53(6):1134-8 **

Craun GF. Microbiology - waterborne outbreaks. J Water Pollut Control Fed 1972 Jun;44:1175-82

Craun GF. Outbreaks of waterborne disease in the United States: 1971-1978. J Am Water Works Assoc 1981 Jul:360-9 **

Craun GF, Gunn RA. Outbreaks of waterborne disease in the United States: 1975-1976. J Am Water Works Assoc 1979 Aug;71(8):422-8 **

Craun GF, McCabe LJ. Review of the causes of waterborne-disease outbreaks. J Am Water Works Assoc 1973 Jan;65(1):74-84 **

Craun GF. A summary of waterborne illness transmitted through contaminated groundwater. J Environ Health 1985 Nov-Dec;48(3):122-7 **

Craun GF. Waterborne disease - a status report emphasizing outbreaks in ground water systems. Ground Wat 1979;12:2

Craun GF, McCabe LJ, Hughes JM. Waterborne disease outbreaks in the US - 1971-1974. J Am Water Works Assoc 1976 Aug;68(8):4106-10 **

Craun GF. Waterborne disease outbreaks in the United States. J Environ Health 1979 Mar-Apr;41(5):259-65

Craun GF. Waterborne giardiasis in the United States 1965-85 [letter]. Lancet 1986 Aug 30;2(8505):513-4 **

Craun GF. Waterborne giardiasis in the United States: a review. Am J Public Health 1979 Aug;69(8):817-9 **

Dewailly E, Poirier C, Meyer FM. Health hazards associated with windsurfing on polluted water. Am J Public Health 1986 Jun;76(6):690-1

Djerassi L, Lutian M, Smilowitz M, Avital J, Porat V. [An epidemic of gastrointestinal infections in a high-rise building due to sewage contamination of drinking water]. Harefuah 1978 Dec;95(11):396-7

Dworkin D, Dworkin J. Water supply and diarrhea: Guatemala revisited. Washington, D.C.: U S Agency for International Development, 1980. 44 p. (AID evaluation special study, 2)

Dykes AC, Juranek DD, Lorenz RA, Sinclair S, Jakubowski W, Davies R. Municipal waterborne giardiasis: an epidemiologic investigation: beavers implicated as a possible reservoir. Ann Intern Med 1980 Feb;92(2,pt.1):165-70 **

Eliassen R, Cummings RH. Analysis of waterborne outbreaks, 1938-45. J Am Water Works Assoc 1948;40:509. Abstract in: Bull Hyg 1948 Nov;23:703

Eyler JM. William Farr on the cholera: the sanitarian's disease theory and the statistician's method. J Hist Med 1973 Apr;28:79-100

Feachem R, Miller C, Drasar B. Environmental aspects of cholera epidemiology. II. Occurrence and survival of Vibrio cholerae in the environment. Trop Dis Bull 1981 Oct;78(10):865-80 **

Feachem R. Is cholera primarily water-borne? [letter]. Lancet 1976 Oct 30;2 (7992):957-8 **

Feachem RG. Environmental aspects of cholera epidemiology. III. Transmission and control. Trop Dis Bull 1982 Jan;79(1):1-47 **

Feachem RG, Guy MW, Harrison S, Twugo KO, Marshall T, Mbere N, Muller R, Wright AM. Excreta disposal facilities and intestinal parasitism in urban Africa: preliminary studies in Botswana, Ghana and Zambia. Trans R Soc Trop Med Hyg 1983;77(4):515-21 **

Feachem RG. Infections related to water and excreta: the health dimension of the decade. In: Water supply and sanitation in developing countries. London: Institute of Water Engineers and Scientists, 1983:25-46

Feachem RG. Infectious disease related to water supply and excreta disposal facilities. AMBIO 1977;6(1):55-8

Feachem RG, Bradley DJ, Garelick H, Mara DD. Sanitation and disease: health aspects of excreta and wastewater management. New York: Wiley, 1983. 501 p. [World Bank studies in water supply and sanitation, 3]

Frankwell RJ. Incidence of enteric diseases and their relationship to water use and water quality in rural communities of Thailand. Bangkok: Southeast Asia Technology, 1974. v.p.

Georgi ME, Carlisle MS, Smiley LE. Giardiasis in a great blue heron (Ardea herodias) in New York State: another potential source of waterborne giardiasis. Am J Epidemiol 1986 May;123(5):916-7

Ghosh G, Rao AV. Water supply in Calcutta in relation to cholera. Indian J Med Res 1965 Jul;53(7):659-68 **

Giardiasis and water [editorial]. Lancet 1980 May 31;1(8179):1176

Goodman RA, Buehler JW, Greenberg HB, McKinley TW. Norwalk gastroenteritis associated with a water system in a rural Georgia community. Arch Environ Health 1982 Nov/Dec;37(6):358-60 **

Gorbatow O. [Water, milk and fly hygiene and their relation to summer diarrhea in a rural community]. Nord Hyg Tidskr 1951:225-39

Gracey M, Stone DE, Sutoto, Sutejo. Environmental pollution and diarrhoeal disease in Jakarta, Indonesia. J Trop Pediatr Environ Child Health 1976 Feb;22(1):18-23 **

Gracey M, Ostergaard P, Adnan SW, Iveson JB. Faecal pollution of surface waters in Jakarta. Trans R Soc Trop Med Hyg 1979;73(3):306-8 **

Gracey M. Polluted water and childhood diarrhoea in Jakarta, Indonesia. Prog Water Technol 1979;11(1-2):57-64 **

Haley CE, Gunn RA, Hughes JM, Lippy EC, Craun GF. Outbreaks of waterborne disease in the United States, 1978. J Infect Dis 1980 Jun;141(6):794-7 **

Hooper RR, Husted SR. A shipboard outbreak of gastroenteritis: toxin in the drinking water. Milit Med 1979 Dec;144(12):804-7

Horwitz MA, Hughes JM, Craun GF. Outbreaks of waterborne disease in the United States, 1974. J Infect Dis 1976 May;133(5):588-93 **

Howard J, Lloyd B. Sanitation and disease in Bangladesh urban slums and refugee camps. Prog Water Technol 1979;11(1-2):191-200 **

Hughes JM, Merson MH, Craun GF, McCabe LJ. Outbreaks of waterborne disease in the United States, 1973. J Infect Dis 1975 Sep;132(3):336-9 **

Ismail M. Environmental health hazards in ecologically disturbed Bangladesh wetlands. In: Islam AS, Haque MM, Ameen M, Ahmed N, Haque S, eds. Proceedings of the Regional Seminar on Protecting the Environment from Degradation, South Asian Association of Regional Cooperation, 13-16 May 1985. Dhaka: Science & Technology Division, Ministry of Education, Government of Bangladesh, 1985:158-65 **

Jakubowski W, Hoff JC, eds. Waterborne transmission of giardiasis; proceedings of a symposium, 18-20 September 1978. Cincinnati: U S Environmental Protection Agency, 1979. xiv, 306 p.

Jephcott AE, Begg NT, Baker IA. Outbreak of giardiasis associated with mains water in the United Kingdom. Lancet 1986 Mar 29;1(8483):730-2 **

Kale VV, Iyer L. Bacteriological study of neonatal diarrhoea. J Postgrad Med 1983 Jan;29(1):25-8 **

Kaplan JE, Goodman RA, Schonberger LB, Lippy EC, Gary GW. Gastroenteritis due to Norwalk virus: an outbreak associated with a municipal water system. J Infect Dis 1982 Aug;146(2):190-7 **

Khairy AEM, El Sebaie O, Gawad AA, El Attar L. The sanitary condition of rural drinking water in a Nile Delta village. I. Parasitological assessment of 'zir' stored and direct tap water. J Hyg (Camb) 1982 Feb;88(1):57-61 **

Khin-Maung-U, Tin-Aye, Myo-Khin, Nyunt-Nyunt-Wai, Thane-Toe. Composition and contamination of oral rehydration solutions prepared with well water by village mothers in Burma. Trans R Soc Trop Med Hyg 1986;80(2):329-32 **

Kirner JC, Little JD, Angelo IA. A waterborne outbreak of giardiasis in Camas, Washington. J Am Water Works Assoc 1978;70:35-40

Krishnaswamy M. Household water supply, hygiene and diarrhoeal diseases in central Thai villages. Bangkok: Asian Institute of Technology, 1973. (Master's thesis)

Kukolevskala MI, Lazarev OP, Ipatova II, et al. The role of water in dysentery. Gig Sanit 1967 Apr;32:9-12

Kumar P, Sehgal BS, Singh R. Bore-hole disposal of excreta of children and diarrhoeal morbidity in a rural community. Environ Health 1970;12:155-9

Lam S, Goh KT. A clinical study of Vibrio cholerae 01 in Singapore related to environmental factors. J Diarrhoeal Dis Res 1984 Dec;2(4):249-52 **

Levine RJ, Nalin DR. Cholera is primarily waterborne in Bangladesh [letter]. Lancet 1976 Dec 11;2(7998):1305

Levine RJ, Khan MR, D'Souza S, Nalin DR. Cholera transmission near a cholera hospital. Lancet 1976 Jul 10;2(7967):84-6 **

Levine RJ, D'Souza S, Khan MR, Nalin DR. Failure of sanitary wells to protect against cholera and other diarrhoeas in Bangladesh. Lancet 1976 Jul 10;2(7976):86-9 **

Lewis M. Sanitation, intestinal infections, and infant mortality in late Victorian Sydney. Med Hist 1979 Jul;23(3):325-38 **

Lipschutz DE. The water question in London, 1827-1831. Bull Hist Med 1968 Nov-Dec;42:510-26

Lloyd-Evans N, Pickering HA, Goh SGJ, Rowland MGM. Food and water hygiene and diarrhoea in young Gambian children: a limited case control study. Trans R Soc Trop Med Hyg 1984;78(2):209-11 **

Mathur R, Reddy V. Bacterial contamination of oral rehydration solution prepared from well water. Indian J Med Res 1983 Dec;78:814-8 **

Matulessy PF, Rachmad, Sulaiman Z, Husaini Y, Darwin K, Rachmat A. The influences of environmental factors and nutritional status of the underfives to diarrhoeal diseases in Bogor, West Java, Indonesia. Southeast Asian J Trop Med Public Health 1982 Sep;13(3):401-4 **

Melnick JL, Gerba CP. Is the water safe to drink? [letter]. J Infect Dis 1979 Jun;139(6):736-8

Mntenga WM, Mtango FD, Mhalu FS. Seasonality of cholera in Tanzania; possible role of rainfall in disease transmission. In: Khan A, Rowland MGM, Aziz KMS, eds. Proceedings of the First African Coference on Diarrhoeal Diseases, Arusha, 13-17 November 1984. Harare: International Steering Committee, 1986 **

Moore B. The risk of infection through bathing in sewage-polluted water. In: Pearson EA, ed. Proceedings of the First International Conference on Waste Disposal in the Marine Environment, 1959. Oxford: Pergamon Press, 1960:29-38

Moore HA, de la Cruz E, Vargas-Mendez O. Diarrheal disease studies in Costa Rica. IV. The influence of sanitation upon the prevalence of intestinal infection and diarrheal disease. Am J Epidemiol 1965 Sep;82(2):162-84 **

Mosley WH, Khan MU. Cholera epidemiology - some environmental aspects. Prog Water Technol 1979;11(1-2):309-16 **

Muttamara S, Krishnaswamy M. Diarrhoeal diseases related to sanitation and water supply. Southeast Asian J Trop Med Public Health 1982 Sep;13(3):348-51 **

Petersen NJ, Hines VD. The relation of summertime gastrointestinal illness to the sanitary quality of the water supplies in six Rocky Mountain communities. Am J Hyg 1960 May;71:314-20 **

Philipp R, Evans EJ, Hughes AO, Grisdale SK, Enticott RG, Jephcott AE. Health risks of Snorkel swimming in untreated water. Int J Epidemiol 1985 Dec;14(4):624-7 **

Pineo CS, Subrahmanyam DV. Community water supply and excreta disposal situation in the developing countries: a commentary. Geneva: World Health Organization, 1975. 41 p. (WHO offset publication, 15)

Poley JR. Causes of chronic diarrhea in infants and children. Postgrad Med 1970 Dec;48(6):143-7 **

Professor Koch on the bacteriological diagnosis of cholera, water filtration and cholera, and the cholera in Germany during the winter of 1892-93. Translated by G Duncan. Edinburgh: Douglas, 1894.

Rahaman MM, Aziz KMS, Rahman MM. Relationship between water consumption and dysentery in Teknaf: a rural Bangladesh village. In: Proceedings of the 11th Meeting of the Scientific Review and Technical Advisory Committee of the Cholera Research Laboratory. Dhaka: Cholera Research Laboratory, 1977:94-101

Rahaman MM, Aziz KMS. Teknaf Dysentery Project. In: Proceedigns of the 9th

Meeting of the Scientific Review and Technical Advisory Committee of the Cholera Research Laboratory and reports of the collaborative studies between International Center for Medical Research and Cholera Research Laboratory. Dhaka: Cholera Research Laboratory, 1975:148-56

Raman V, Parhad NM, Deshpande AW, Pathak SK. Assessment and control of water quality in a town distribution system with reference to the incidence of gastrointestinal diseases. Prog Water Technol 1979;11(1-2):65-71 **

Rao SS. National water supply and sanitation programme with special reference to cholera endemic areas. Indian J Public Health 1975 Jan-Mar;19(1):44-9

Rosenberg ML, Hazlet KK, Schaefer J, Wells JG, Pruneda RC. Shigellosis from swimming. JAMA 1976 Oct 18;236(16):1849-52

Ross JD. Contaminated hospital water supplies [letter]. Br Med J 1979 Jul 7;2(6181):53

Rowland MGM, Barrell RAE. Ecological factors in gastroenteritis. In: Clegg EJ, Garlick JP, eds. Disease and urbanization. London: Taylor and Francis, 1980:21-35. (Symposia of the Society for the Study of Human Biology, v. 20) **

Sabwa DM, Githeko AK. Faecal contamination of urban community water supplies and its public health implications. East Afr Med J 1985 Nov;62(11):794-801 **

Sakdisiwasdi O, Achananuparp S, Limsuwan A, Nanna P, Barnyen L. Salmonella and Shigella carrier rates and environmental sanitation in a rural district, central Thailand. Southeast Asian J Trop Med Public Health 1982;13(3):380-4 **

Schiavone EL. [Influence of water on communicable diseases: some of its solutions]. Red Samid Milit Argent 1963 Jul-Sep;62:189-206

Schliessmann DJ. Diarrhoeal disease and the environment. Bull WHO 1959;21:381-6 **

Schliessmann DJ, Atchley FO, Wilcomb MJ, Jr., Welch SF. Relation of environmental factor for the occurrence of enteric diseases in areas of eastern Kentucky. Public Health Monogr 1958;54:1-33

Schneider RE, Shiffman M, Faigenblum J. The potential effect of water on gastrointestinal infections prevalent in developing countries. Am J Clin Nutr 1978 Nov;31(11):2089-99 **

Shields DS, Nations-Shields M, Hook EW, Araujo JG, de Souza MA, Guerrant RL. Electrolyte/glucose concentration and bacterial contamination in home-prepared oral rehydration solution: a field experience in northeastern Brazil. J Pediatr 1981 May;98(5):839-41 **

Shiffman MA, Schneider R, Turner AG, et al. Seasonality in water related to intestinal disease in Guatemala. Int J Biometeorol 1976 Oct;20(3):223-9

Skoda JD, Mendis JB, Chia M. A survey in rural Bangladesh on diarrhoeal morbidity, water usage and related factors; first report. Dhaka: United Nations Children's Fund, 1977. 47 p.

Songonuga OO. Sanitary quality and health implications of well waters in Ile-Ife, Nigeria. Niger Med J 1979 Apr;9(4):493-7

Spira WM, Aziz KMS, Verwey WF. Environmental epidemiology. II. Ecological studies on Vibrio sp. in canal and tank environments. In: Proceedings of the 10th Meeting of the Scientific Review and Technical Advisory Committee of the Cholera Research Laboratory, 1976:160-84 **

Spira WM, Khan MU, Saeed YA, Sattar A. Environmental epidemiology. I. Environmental and prospective epidemiological investigation of cholera outbreaks. In: Proceedings of the 11th Meeting of the Scientific Review and Technical Advisory Committee of the Cholera Research Laboratory, 1976:148-59 **

Spira WM, Khan MU, Saeed YA, Sattar MA. Microbiological surveillance of intra-neighbourhood El Tor cholera transmission in rural Bangladesh. Bull WHO 1980;58(5):731-40 **

Spira WM, Huq A, Ahmed QS, Saeed YA. Uptake of Vibrio cholerae biotype eltor from contaminated water by water hyacinth (Eichornia crassipes). Appl Environ Microbiol 1981 Sep;42(3):550-3 **

Stewart WH, McCabe LJ, Jr., Hemphill EC, DeCapito T. Diarrheal disease control studies: the relationship of certain environmental factors to the prevalence of Shigella infection. Am J Trop Med Hyg 1955 Jul;4(4):718-24 **

Sultanov GV, Solodovnikov IuP. [Role of the aqueous factor in the epidemiology of dysentery]. Zh Mikrobiol Epidemiol Immunobiol 1977 Jun;(6):99-101

Taylor A, Jr., Craun GF, Faich GA, McCabe LJ, Gangarosa EJ. Outbreaks of waterborne disease in the United States, 1961-1970. J Infect Dis 1972 Mar;125(3):329-31 **

Taylor JW, Gary GW, Jr., Greenberg HB. Norwalk-related viral gastroenteritis due to contaminated drinking water. Am J Epidemiol 1981 Oct;114(4):584-92 **

Trivedi BK, Gandhi HS, Shukla NK. Bacteriological water quality and incidence of waterborne diseases in a rural population. Indian J Med Sci 1971 Nov;25: 795-801

Tsukidate S. Pollution of drinking water and parasitological infection of Japanese in tropical countries. Jpn J Trop Med Hyg 1985 Mar;13(1):42-3 **

van Damme JMG. The essential role of drinking water and sanitation in primary health care. Trop Geogr Med 1985 Sep;37(3):S21-30 **

Verkholomov EE, Siroko IA. [Microbiological substantiation of the role of the water factor in the epidemiology of dysentery]. Voennomed Zh 1967;5:39-42

Wagner EG, Lanoix JN. Excreta disposal for rural areas and small communities. Geneva: World Health Organization, 1958. 187 p. (WHO monograph series, 39)

Wagner EG, Lanoix JN. Water supply for rural areas and small communities. Geneva: World Health Organization, 1959. 337 p. (WHO monograph series, 42)

Wahed SANM. Water supply and sanitation. In: Islam AS, Haque MM, Ameen M, Ahmed N, Haque S, eds. Proceedings of the Regional Seminar on Protecting the

Environment from Degradation, South Asian Association for Regional Cooperation, Dhaka, 13-16 May 1985. Dhaka: Science & Technology Division, Ministry of Education, Government of Bangladesh, 1985:183-91 **

Watkinson M, Lloyd-Evans N, Watkinson AM. The use of oral glucose electrolyte solution prepared with untreated well water in acute non-specific childhood diarrhoea. Trans R Soc Trop Med Hyg 1980;74(5):657-62 **

Weibel SR, Dixon FR, Weidner RB, et al. Water borne disease outbreaks 1946-1960. J Am Water Works Assoc 1964 Aug;56:947-58

Weissman JB, Craun GF, Lawrence DN, Pollard RA, Saslaw MS, Gangarosa EJ. An epidemic of gastroenteritis traced to a contaminated public water supply. Am J Epidemiol 1976 Apr;103(4):391-8 **

Werner SB, Jones PH, McCormack WM, Ager EA, Holm PT. Gastroenteritis following ingestion of sewage-polluted water: an outbreak at a logging camp on the Olympic Peninsula. Am J Epidemiol 1960;89(3):277-85 **

Wolff HL, van Zijl WJ, Roy M. Houseflies, the availability of water, and diarrhoeal diseases. Bull WHO 1969;41(6):952-9 **

World Health Organization. International standards for drinking-water. 3d ed. Geneva, 1971. 70 p.

World Health Organization. Diarrhoeal Diseases Control Programme. Environmental health and diarrhoeal disease prevention; report of a Scientific Working Group, Kuala Lumpur, 3-6 Jul 1979. Geneva, 1980. 33 p. (WHO/CDD/80.5)

World Health Organization. Diarrhoeal Diseases Control Programme. Use of locally available drinking water for preparation of oral rehydration salt (ORS) solution. Geneva, 1981. 5 p. [CDD/SER/81.Rev.1 (1985)] **

Zaheer M, Prasad BG, Govil KK, Bhadury T. A note on urban water supply in Uttar Pradesh. J Indian Med Assoc 1962 Feb;38:177-82

EVALUATION AND IMPACT STUDIES

Anderson MN. Health and nutrition impact of potable water in rural Bolivia. J Trop Pediatr 1981 Feb;27(1):39-46

Aziz KMA, Hasan KZ, Aziz KMS, Rahaman MM. Behavioural changes in water use following health education in a rural area of Bangladesh. In: Proceedings of the Second Asian Conference on Diarrhoeal Diseases, Calcutta, 21-24 February 1983. Calcutta: National Institute of Cholera & Enteric Diseases, 1983:63 **

Azurin JC, Alvero M. Field evaluation of environmental sanitation measures against cholera. Bull WHO 1974;51(1):19-26 **

Bahl MR. Impact of piped water supply on the incidence of typhoid fever and diarrhoeal diseases in Lusaka. Med J Zambia 1976;10(4):98-9 **

Beyer MG. Water supply, sanitation and primary health care. In: Lindstrom JD, ed. The impact of interventions in water supply and sanitation in developing countries; proceedings of a seminar, held at the Pan American Health Organization, 25-26 March 1980. Prepared by Logical Technical Services, Corp. Washington, D.C.: U S Agency for International Development, 1981:47-68

Bradley DJ, Emurwon P. Predicting the epidemiological effects of changing water sources. I. A quantitative approach. East Afr Med J 1968 May;45(5):284-91 **

Bradley DJ. Water supplies: the consequence of change. In: Elliott K, Knight J, eds. Human rights in health. Amsterdam: Elsevier, 1974:81-98. (Ciba Foundation Symposium, 23 [new series])

Bradley DJ, Feachem RG. Water supplies, sanitation and diarrhoeal diseases. Scientific Working Group on Environmental Health and Diarrhoeal Disease Prevention, Kuala Lumpur, 3-6 July 1979. Geneva: World Health Organization, 1979. 34 p.

Briscoe J, Ahmed S, Chakraborty M. Domestic water use in a village in Bangladesh. I. A methodology and a preliminary analysis of use patterns during the "cholera season". Prog Water Technol 1979;11(1-2):131-42 **

Briscoe J, Feachem RG, Rahaman MM. Evaluating health impact: water supply, sanitation, and hygiene education. New York: UNICEF, 1986. 80 p.

Briscoe J, Feachem RG, Rahaman MM. Measuring the impact of water supply and sanitation facilities on diarrhoea morbidity: prospects for case-control methods. Geneva: World Health Organization, 1985. 71 p. (WHO/CWS/85.3; CDD/OPR/85.1) **

Briscoe J. The role of water supply in improving health in poor countries (with special reference to Bangladesh). Am J Clin Nutr 1978 Nov;31(11):2100-13 **

Cairncross S, Carruthers I, Curtis D, Feachem R, Bradley D, Baldwin G. Evaluation for village water supply planning. Chichester: Wiley, 1980. xviii, 179 p.

Chandler AC. A comparison of helminthic and protozoan infections in two Egyptian villages two years after the installation of sanitary improvements in one of them. Am J Trop Med Hyg 1954 Jan;3(1):59-73 **

Chandler AC. An evaluation of the effects, after two years of sanitary improvements in an Egyptian village. J Egypt Med Assoc 1953;36:357-67

Chen LC. Evaluating the health benefits of improved water supply through assessment of nutritional status in developing countries. In: Underwood BA, ed. Nutrition intervention strategies in national development. New York: Academic Press, 1983:227-39

Clark RL. Effects of a water supply system on local health attitudes in Nepal. Br Med J 1985 Jan 19;290(6461):225-7 **

Curlin G, Aziz KMA, Khan MR. Impact of the handpump tubewell on diarrheal disease rates in rural Bangladesh. In: Proceedings of the 10th Meeting of the

Scientific Review and Technical Advisory Committee of the Cholera Research Laboratory, 1975. Dhaka: Cholera Research Laboratory, 1975:107-9 **

Curlin GT, Aziz KMA, Khan MR. The influence of drinking tubewell water on diarrhoea rates in Matlab Thana, Bangladesh. Dhaka: Cholera Research Laboratory, 1977. 18 p. (Working paper no. 1). Also published in: Fukumi H, Zinnaka Y, eds. Symposium on Cholera; proceedings of the 12th joint conference, U S-Japan Cooperative Medical Science Program, Sapporo, 1976. Tokyo: National Institute of Health, 1977:48-54 **

Cvjetanovic B. Health effects and impact of water supply and sanitation. World Health Stat Q 1986;39(1):105-17 **

Cvjetanovic B, Chen L, Kronmal R, Rohde C, Suskind R. Measuring and evaluating diarrhea and malabsorption in association with village water supply and sanitation: a review of the Food Wastage/Sanitation Cost Benefit Methodology Project (Guatemala). Arlington, Virginia: Water and Sanitation for Health Project, 1981. 36 p. (WASH technical report, 12)

Cvjetanovic B. Sanitation versus immunization in control of enteric and diarrhoeal diseases. Prog Water Technol 1979;11(1-2):81-7 **

Esrey SA, Habicht JP. Epidemiologic evidence for health benefits from improved water and sanitation in developing countries. Epidemiol Rev 1986;8:117-28

Esrey SA, Habicht JP. The impact of improved water supplies and excreta disposal facilities on diarrheal morbidity, growth, and mortality among children. Ithaca: Division of Nutritional Sciences, Cornell University, 1985. (Cornell international nutrition monograph series)

Esrey SA, Feachem RG, Hughes JM. Interventions for the control of diarrhoeal diseases among young children: improving water supplies and excreta disposal facilities. Bull WHO 1985;63(4):757-72 **

Feachem RG. The role of water supply and sanitation in reducing mortality in China, Costa Rica, Kerala State (India) and Sri Lanka. In: Halstead SB, Walsh JA, Warren KS, eds. Good health at low cost; proceedings of a conference, held at the Bellagio Conference Center, Italy, 29 Apr-3 May 1985:191-8

Fenwich KWH. The short terms effects of a pilot environmental health project in rural Africa: the Zaina scheme re-assessed after four years. In: White GF, Bradley DJ, White AU. Drawers of water; domestic water use in East Africa. Chicago: University of Chicago Press, 1972:154-7

Handa BK, Panicker PVRC, Kulkarni SW, Gadkari AS, Raman V. The impact of sanitation in ten Indian villages. In: Pacey A, ed. Sanitation in developing countries. Chichester: Wiley, 1978:34-41

Hebert JR, Miller DR. Measuring the impact of water supply and sanitation on diarrhoeal diseases: problems of methodology [letter]. Int J Epidemiol 1984 Sep;13(3):374-6

Hebert JR, Miller R. Water supply and sanitation: effect on diarrhoeal diseases [letter]. Int J Epidemiol 1984 Dec;13(4):543-4

Henry FJ. Environmental sanitation infection and nutritional status of infants in rural St. Lucia, West Indies. Trans R Soc Trop Med Hyg 1981;75(4):507-13 **

Hughes JM. Potential impacts of improved water supply and excreta disposal on diarrhoeal disease morbidity: an assessment based on a review of published studies. Geneva: Diarrhoeal Disease Control Programme, World Health Organization, 1981. 36 p.

Kawata K. Of typhoid fever and telephone poles: deceptive data on the effect of water supply and privies on health in tropical countries. Prog Water Technol 1979;11(1-2):37-43 **

Levine RJ, D'Souza S, Khan MR, Nalin DR. Failure of sanitary wells to protect against cholera and other diarrhoeas in Bangladesh. Lancet 1976 Jul 10;2(7976):86-9 **

Lindstrom JD, ed. The impact of interventions in water supply and sanitation in developing countries; proceedings of a seminar held at the Pan American Health Organization, 25-26 March 1980. Prepared by Logical Technical Services, Corp. Washington, D.C.: U S Agency for International Development, 1981. 158 p.

McJunkin FE. Water and sanitation. Washington, D.C.: National Demonstration Water Project, U S Agency for International Development, 1982. xi, 134 p.

Matulessy PF, Rachmad, Sulaiman Z, Husaini Y, Darwin K, Rachmat A. The influences of environmental factors and nutritional status of the underfives to diarrhoeal diseases in Bogor, West Java, Indonesia. Southeast Asian J Trop Med Public Health 1982 Sep;13(3):401-4 **

Measurement of the health benefits of investments in water supply; report of an expert panel to the International Bank for Reconstruction and Development. Washington, D.C.: International Bank for Reconstruction and Development, 1976. 12 p. (Public Utilities Department report no. PUN 20)

Merrick T. The effect of piped water on early childhood mortality in urban Brazil, 1970-1976. Washington, D.C.: The World Bank, 1983. 46 p. (World Bank working paper, 594)

Moore HA, de la Cruz E, Vargas-Mendez O. Diarrheal disease studies in Costa Rica. IV. The influence of sanitation upon the prevalence of intestinal infection and diarrheal disease. Am J Epidemiol 1965 Sep;82(2):162-84 **

Moore HA, de la Cruz E, Vargas-Mendez O. Diarrheal disease studies in Costa Rica. I. Plan and methods of investigation. Am J Public Health 1966 Feb;56(2): 276-86

Murda A el-G. Evaluation of a health education programme in Tayba Qurashi Village, Central Sudan during 1983. J Trop Med Hyg 1985 Apr;88(2):111-3 **

Najera MP. [Role of health education in cholera control]. Rev Sanid Hig Publica (Madr) 1971 Dec;45:1135-47

Otto GF, Spindler LA. Effect of partial sanitation on infestation with intestinal parasites in southwest Virginia. South Med J 1930;23:566-60

Patel M. Effects of the health service and environmental factors on infant

mortality: the case of Sri Lanka. J Epidemiol Commun Health 1980 Jun;34(2):76-82

Pineo CS, Subrahmanyam DV. Community water supply and excreta disposal situation in the developing countries: a commentary. Geneva: World Health Organization, 1975. 41 p. (WHO offset publication, 15)

Pournadeali E, Tayback M. Potable water and village health: is primary prevention affordable? Prog Water Technol 1979;11(1-2):31-5

Pournadeali E, Tayback M. Potable water and village health: is primary prevention affordable? Public Health Rep 1980 May-Jun;95(3):291-4

Rahman M, Wojtyniak B, Rahaman MM, Aziz KMS. Impact of environmental sanitation and crowding on infant mortality in rural Bangladesh. Lancet 1985 Jul 6;2(8445):28-31 **

Rajasekaran P, Dutt PR, Pisharoti KA. Impact of water supply on the incidence of diarrhoea and shigellosis among children in rural communities in Madurai. Indian J Med Res 1977 Aug;66(2):189-99 **

Rubenstein A, Boyle J, Odoroff CL, Kunitz SJ. Effect of improved sanitary facilities on infant diarrhea in a Hopi village. Public Health Rep 1969;84:1093-7

Ryder RW, Reeves WC, Singh N, Hall CB, Kapikian AZ, Gomez B, Sack RB. The childhood health effects of an improved water supply system on a remote Panamanian island. Am J Trop Med Hyg 1985 Sep;34(5):921-4 **

Saunders RJ, Warford JJ. The goal of improved health; and improved water supply and sanitation: studies of its impact on health. In: Village water supply, economic and policy in the developing world. Baltimore: Johns Hopkins University Press, 1976:31-85, 205-21

Schneider RE, Shiffman M, Faigenblum J. The potential effect of water on gastrointestinal infections prevalent in developing countries. Am J Clin Nutr 1978 Nov;31(11):2089-99 **

Shaffer R, Najai D, Kabuleeta P. Environmental health among the Masai of southern Kenya: the effect of water supply changes. Prog Water Technol 1979;11(1-2):45-8 **

Shuval HI, Tilden RL, Perry BH, Grosse RN. Effect of investments in water supply and sanitation on health status: a threshold-saturation theory. Bull WHO 1981;59(2):243-8

Skoda JD, Mendis JB, Chia M. The impact of sanitation in Bangladesh. In: Pacey A, ed. Sanitation in developing countries. Chichester: Wiley, 1978:33-4

Sommer A, Woodward WE. The influence of protected water supplies on the spread of classical/Inaba and El Tor/Ogawa cholera in rural East Bengal. Lancet 1972 Nov 11;2(7785):985-7 **

Srivastava RN, Verma BL, Saran M. The study on the health benefits of water supply in a rural area of Uttar Pradesh; baseline survey report, 1981. Jhansi:

Department of Social and Preventive Medicine, M L B Medical College, 1982. 49+135 p. **

Strudwick RH. The Zaina Environmental Sanitation Project. East Afr Med J 1962 Jun;39(6):311-31 **

Tameim O, Jobin W. Impact of safe water supply and sanitation on diarrhoeal disease prevention. In: Khan A, Rowland MGM, Aziz KMS, eds. Proceedings of the First African Conference on Diarrhoeal Diseases, Arusha, 13-17 November 1984. Harare: International Steering Committee, 1986 **

van Damme JMG. The essential role of drinking water and sanitation in primary health care. Trop Geogr Med 1985 Sep;37(3):S21-30 **

Weir JM, Wasif IM, Hassan FR, Attia S-E-DM, Kader MA. An evaluation of health and sanitation in Egyptian villages. J Egyptian Public Health Assoc 1952;27:55-79 **

HEALTH AND HYGIENE

Arbab DM, Weidner BL. Infectious diseases and field water supply and sanitation among migrant farm workers. Am J Public Health 1986 Jun;76(6):694-5

Arrhenius E. Health aspects of multipurpose use of water. AMBIO 1977;6(1): 59-62

Aziz KMA, Hasan KZ, Aziz KMS, Rahaman MM. Behavioural changes in water use following health education in a rural area of Bangladesh. In: Proceedings of the Second Asian Conference on Diarrhoeal Diseases, Calcutta, 21-24 February 1983. Calcutta: National Institute of Cholera & Enteric Diseases, 1983:63 **

Aziz KMA, Hasan KZ, Hussain A, Patwary Y, Umra M, Aziz KMS, Rahaman MM. PARDA and some health practices in two conservative rural communities of Bangladesh. In: Rahaman MM, Aziz KMS, Rahman S, eds. Proceedings of the First Asian Conference on Diarrhoeal Disease, Dhaka, 16-20 February 1981. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1982:212-8 **

Aziz KMA, Curlin G. Role of learned behavior in the transmission of cholera. Paper presented at the post-plenary session of the 10th International Congress of Anthropological and Ethnological Sciences, Poona, 19-21 December 1978. (Unpublished) **

Aziz KMA, Hasan KZ, Patwary Y, Rahaman MM, Aziz KMS. A study of the interpersonal spread of human feces in rural Teknaf of Bangladesh. In: Rahaman MM, Greenough WB, III, Novak NR, Rahman S, eds. Shigellosis: a continuing global problem; proceedings of an international conference, Cox's Bazaar, 15-20 June 1981. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1983:238-48. (Special publication, 20) **

Beyer MG. Water supply, sanitation and primary health care. In: Lindstrom JD, ed. The impact of interventions in water supply and sanitation in developing countries; proceedings of a seminar, held at the Pan American Health

Organization, 25-26 March 1980. Prepared by Logical Technical Services, Corp. Washington, D.C.: U S Agency for International Development, 1981:47-68

Boot MT. "Making the links"; guidelines for hygiene education in community water supply and sanitation, with particular emphasis on public standpost water supplies. The Hague: IRC International Reference Centre for Community Water Supply and Sanitation, 1984. 82 p.

Briscoe J. Public health in rural India: the case of excreta disposal. Cambridge: Center for Population Studies, Harvard University, 1976. xix, 414 p. PhD Thesis. (Research paper, 12)

Feachem RG. Interventions for the control of diarrhoeal diseases among young children: promotion of personal and domestic hygiene. Bull WHO 1984;62(3):467-76 **

Feachem RG, Bradley DJ, Garelick H, Mara DD. Sanitation and disease: health aspects of excreta and wastewater management. New York: Wiley, 1983. 501 p. [World Bank studies in water supply and sanitation, 3]

Freij L, Sterky G, Wadstrom T, Wall S. Child health and diarrhoeal disease in relation to supply and use of water in African communities. Prog Water Technol 1979;11(1-2):49-55 **

Han AM, Oo KN, Aye T, Hlaing T. Personal toilet after defaecation and the degree of hand contamination according to different methods used. J Trop Med Hyg 1986 Oct;89(5):237-41 **

Kochar V. Sanitation and culture. I. Social aspects of sanitation and personal hygiene in a rural Bengal region. Indian J Prev Soc Med 1977 Sep;8:106-17 **

Koopman JS. Diarrhea and school toilet hygiene in Cali, Colombia. Am J Epidemiol 1978 May;107(5):412-20

Kourany M, Vasquez MA. Housing and certain socioenvironmental factors and prevalence of enteropathogenic bacteria among infants with diarrheal disease in Panama. Am J Trop Med Hyg 1969 Nov;18(6):936-41 **

Krishnaswamy M. Household water supply, hygiene and diarrhoeal diseases in central Thai villages. Bangkok: Asian Institute of Technology, 1973. (Master's thesis)

Kuo C. Measures to control diarrhoeal diseases -- environmental sanitation. Regional Meeting on Cholera and Diarrhoeal Diseases, Alexandria, 1-5 June 1978. Alexandria: Regional Office for the Eastern Mediterranean, World Health Organization, 1978. 6 p. **

Lewis W. The significance of water management in relation to public and environmental health. J Infect Dis 1986 Apr;153(4):802-3

McJunkin FE. Water supply and health: an overview. In: Lindstrom JD, ed. The impact of interventions in water supply and sanitation in developing countries; proceedings of a seminar held at the Pan American Health Organization, 25-26 March 1980. Prepared by Logical Technical Services, Corp. Washington, D.C.: U S Agency for International Development, 1981:1-31

Mackie TT, Mackie JW, Vaughn CM, Gleason NN, Greenberg BG, Nenninger ES, Lunde MN, Moore LIA, Kluttz JA, Taliafero MO. Intestinal parasitic infections in Forsyth County, North Carolina. IV. Domestic environmental sanitation and the prevalence of Entamoeba histolytica. Am J Trop Med Hyg 1956 Jan;5(1):29-39

Noche ML, Jr. Environmental factors in diarrhoeal diseases in the Philippines. Southeast Asian J Trop Med Public Health 1982 Sep;13(3):352-6 **

Old HN. Sanitation problems of the American Indians. Am J Public Health 1953 Feb;43(2):210-5 **

Patel M. Effects of the health service and environmental factors on infant mortality: the case of Sri Lanka. J Epidemiol Commun Health 1980 Jun;34(2):76-82

Pocchiari F. The public health's role in the prevention and control of cholera. In: Diffusion and treatment of cholera infection. Roma: Instituto Poligrafico dello Stato, 1975:5-8

Rahaman MM, Mia MAL, Khan AR, Khan AK, Rahman M, Haq M, Khan AQ, Zoha MS. A survey of basic health information of rural Bangladesh. Bangladesh Med Res Counc Bull 1977 Jun;3(1):70-6 **

Shaffer R, Najai D, Kabuleeta P. Environmental health among the Masai of southern Kenya: the effect of water supply changes. Prog Water Technol 1979;11(1-2):45-8 **

Skoda JD, Mendis JB, Chia M. A survey of sanitation in Bangladesh on diarrhoeal morbidity, water usage and related factors; first report. Dhaka: United Nations Children's Fund, 1977. 47 p.

Strudwick RH. The Zaina Environmental Sanitation Project. East Afr Med J 1962 Jun;39(6):311-31 **

Taylor I. Toilet paper and spread of infection [letter]. Br Med J 1978 Oct 7;2(6143):1024

Usenko EG. [D.K. Zabolotnyi on the sanitary and hygienic aspects of cholera]. Zh Mikrobiol Immunobiol 1978 Oct;(10):127-8

Velimirovic B, Subramanian M, Sadek F. Socio-economic and environmental factors and human health example of cholera El Tor in Manila. Zentralbl Bakteriol [Orig B] 1975;160(1):1-27

White GF, Bradley DJ, White AU. Drawers of water; domestic water use in East Africa. Chicago: University of Chicago Press, 1971. 306 p.

Wolman A. Environmental sanitation in urban and rural areas: its importance in the control of enteric infections. Bull Pan Am Health Organ 1975;9(2):157-9 **

Wolman A. [Importance of environmental sanitation in urban and rural areas of the control of intestinal infections]. Bol Of Sanit Panam 1975 Apr;78(4):343-5

Yap KL, Sabil D, Muthu PA. Human rotavirus infection in Malaysia. II. A study on the influence of living standard on the prevalence of rotavirus-associated

gastroenteritis in children hospitalized with diarrhoea. J Trop Pediatr 1984 Oct;30(5):269-71 **

HEALTH EDUCATION

Boot MT. "Making the links"; guidelines for hygiene education in community water supply and sanitation, with particular emphasis on public standpost water supplies. The Hague: IRC International Reference Centre for Community Water Supply and Sanitation, 1984. 82 p.

Briscoe J, Feachem RG, Rahaman MM. Evaluating health impact: water supply, sanitation, and hygiene education. New York: UNICEF, 1986. 80 p.

Cardenas M. Rural water supply and sanitation education in Paraguay. Assign Child 1979;(45/46):109-20

Derryberry M. Health education aspects of sanitation programmes in rural areas and small communities. Bull WHO 1954;10(2):145-54 **

Murda A el-G. Evaluation of a health education programme in Tayba Qurashi Village, Central Sudan during 1983. J Trop Med Hyg 1985 Apr;88(2):111-3 **

Najera MP. [Role of health education in cholera control]. Rev Sanid Hig Publica (Madr) 1971 Dec;45:1135-47

Nyerges N. [Plan for the control of enteric infections: environmental health, epidemiology, health education, and early diagnosis and treatment]. Bol Of Sanit Panam 1964 May;56:447-65

Nyerges N, Eng N. Plan for the control of gastrointestinal diseases. Environmental sanitation, epidemiology, health education, and early diagnosis and treatment. In: Control of gastrointestinal diseases. Washington, D.C.: Pan American Health Organization, 1963. (Technical discussions, science publication, 100)

Rahaman MM. A strategy for control of shigellosis (dysentery) in Teknaf - a rural Bangladesh village. Prog Water Technol 1979;11(1-2):303-8 **

Shiffman MA, Schneider R, Faigenblum JM, Helms R, Turner A. Field studies on water, sanitation and health education in relation to health status in Central America. Prog Water Technol 1979;11(1-2):143-50 **

Torun B. Environmental and educational interventions against diarrhea in Guatemala. In: Chen LC, Scrimshaw NS, eds. Diarrhea and malnutrition; interactions, mechanisms, and interventions. New York: Plenum, 1983:235-66 **

van Damme JMG. The essential role of drinking water and sanitation in primary health care. Trop Geogr Med 1985 Sep;37(3):S21-30 **

Zafir SA. Health education aspects in the control of diarrhoeal diseases. Regional Meeting on Cholera and Diarrhoeal Diseases, Alexandria, 1-5 June 1978. Alexandria: Regional Office for the Eastern Mediterranean, World Health Organization, 1978. 7 p. (EM/MTG.CHL.DHL.DIS./9.2)

INTERVENTIONS, PREVENTION AND CONTROL OF DISEASE

Ahmad K, Jahan K, Huq I. Decontamination of drinking water by alum for the preparation of oral rehydration solution. Food Nutr Bull 1984 Jun;6(2):54-7 **

Arbab DM, Weidner BL. Infectious diseases and field water supply and sanitation among migrant farm workers. Am J Public Health 1986 Jun;76(6):694-5

Aziz KMA, Hasan KZ, Patwary Y, Aziz KMS, Rahaman MM. Acceptability of water-sealed latrines in Mirzapur: a rural area of Bangladesh. In: Islam AS, Haq MM, Ameen M, Ahmed N, Haque S, eds. Proceedings of the Regional Seminar on Protecting the Environment from Degradation, Dhaka, 13-16 May 1985. Dhaka: Science & Technology Division, Ministry of Education, Government of Bangladesh, 1985:166-71 **

Azurin JC, Alvero M. Field evaluation of environmental sanitation measures against cholera. Bull WHO 1974;51(1):19-26 **

Bahl MR. Impact of piped water supply on the incidence of typhoid fever and diarrhoeal diseases in Lusaka. Med J Zambia 1976;10(4):98-9 **

Beliaev II. [Sanitary and health measures in the prevention of dysentery]. Gig Sanit 1972 Jun;37:23-5

Beyer MG. Water supply, sanitation and primary health care. In: Lindstrom JD, ed. The impact of interventions in water supply and sanitation in developing countries; proceedings of a seminar, held at the Pan American Health Organization, 25-26 March 1980. Prepared by Logical Technical Services, Corp. Washington, D.C.: U S Agency for International Development, 1981:47-68

Bhaskaran TR, Das CR, De S, Radhakrishnan I. Chlorination of unfiltered water supply as an interim measure for control of cholera in Calcutta. In: Proceedings of the Symposium on Problems in Water Treatment, 29-30 October 1984. Nagpur: CPHER, 1965:322-36

Black RE, Dykes AC, Anderson KE, Wells JG, Sinclair SP, Gary GW, Jr., Hatch MH, Gangarosa EJ. Handwashing to prevent diarrhea in day-care centers. Am J Epidemiol 1981 Apr;113(4):445-51 **

Black RH. Invited discussion of Dr R M Glasse's paper. In: Proceedings of the Cholera Research Symposium, Honolulu, Hawaii, 24-29 January 1965. Washington, D.C.: U S Department of Health, Education, and Welfare, 1965:340 **

Blaser MJ. Environmental interventions for the prevention of travelers' diarrhea. Rev Infect Dis 1986 May-Jun;8(Suppl 2):S142-50 **

Blum D, Feachem RG. Measuring the impact of water supply and sanitation investments on diarrhoeal diseases: problems of methodology. Int J Epidemiol 1983;12(3):357-65 **

Bradley DJ, Emurwon P. Predicting the epidemiological effects of changing water sources. I. A quantitative approach. East Afr Med J 1968 May;45(5):284-91 **

Bradley DJ. Water supplies: the consequence of change. In: Elliott K, Knight J, eds. Human rights in health. Amsterdam: Elsevier, 1974:81-98. (Ciba Foundation symposium, 23 [new series])

Bradley DJ, Feachem RG. Water supplies, sanitation and diarrhoeal diseases. Scientific Working Group on Environmental Health and Diarrhoeal Disease Prevention, Kuala Lumpur, 3-6 July 1979. Geneva: World Health Organization, 1979. 34 p.

Bradley RM. Basic sanitation in developing countries: survey of water use in a low income urban area in the Middle East. R Soc Health J 1980;100(2):67-71 **

Briscoe J, Ahmed S, Chakraborty M. Domestic water use in a village in Bangladesh. I. A methodology and a preliminary analysis of use patterns during the "cholera season". Prog Water Technol 1979;11(1-2):131-41 **

Briscoe J, Feachem RG, Rahaman MM. Evaluating health impact: water supply, sanitation, and hygiene education. New York: UNICEF, 1986. 80 p.

Briscoe J. Intervention studies and the definition of dominant transmission routes. Am J Epidemiol 1984;120(3):449-55 **

Briscoe J, Feachem RG, Rahaman MM. Measuring the impact of water supply and sanitation facilities on diarrhoea morbidity: prospects for case-control methods. Geneva: World Health Organization, 1985. 71 p. (WHO/CWS/85.3; CDD/OPR/85.1) **

Briscoe J. The role of water supply in improving health in poor countries (with special reference to Bangladesh). Am J Clin Nutr 1978 Nov;31(11):2100-13 **

Briscoe J. Water supply and health in developing countries: selective primary health care revisited. Am J Public Health 1984;74(9):1009-13

Briscoe J. Water supply and health in developing countries: selective primary health care revisited. In: Proceedings of the International Conference on Oral Rehydration Therapy, Washington, D.C.: 7-10 June 1983:141-50

Brisou J. An environmental sanitation plan for the Mediterranean seaboard: pollution and human health. Geneva: World Health Organization, 1976. 96 p. (Public health papers, 62)

Britt B, Kourany M, Millar JW. A pilot search for environmental factors influencing diarrheal disease in young children in Panama. J Trop Pediatr Environ Child Health 1973 Sep;19:282-7 **

Cairncross S, Carruthers I, Curtis D, Feachem R, Bradley D, Baldwin G. Evaluation for village water supply planning. Chichester: Wiley, 1980. xviii, 179 p.

Cardenas M. Rural water supply and sanitation education in Paraguay. Assign Child 1979;(45/46):109-20

Chandler AC. A comparison of helminthic and protozoan infections in two Egyptian villages two years after the installation of sanitary improvements in one of them. Am J Trop Med Hyg 1954 Jan;3(1):59-73 **

Chandler AC. An evaluation of the effects, after two years of sanitary improvements in an Egyptian village. J Egypt Med Assoc 1953;36:357-67

Chen LC. Evaluating the health benefits of improved water supply through assessment of nutritional status in developing countries. In: Underwood BA, ed. Nutrition intervention strategies in national development. New York: Academic Press, 1983:227-39

Clark RL. Effects of a water supply system on local health attitudes in Nepal. Br Med J 1985 Jan 19;290(6461):225-7 **

Curlin G, Aziz KMA, Khan MR. Impact of the handpump tubewell on diarrheal disease rates in rural Bangladesh. In: Proceedings of the 10th Meeting of the Scientific Review and Technical Advisory Committee of the Cholera Research Laboratory, 1975. Dhaka: Cholera Research Laboratory, 1975:107-9 **

Curlin GT, Aziz KMA, Khan MR. The influence of drinking tubewell water on diarrhoea rates in Matlab Thana, Bangladesh. Dhaka: Cholera Research Laboratory, 1977. 18 p. (Working paper no. 1). Also published in: Fukumi H, Zinnaka Y, eds. Symposium on Cholera; proceedings of the 12th joint conference, U S-Japan Cooperative Medical Science Program, Sapporo, 1976. Tokyo: National Institute of Health, 1977:48-54 **

Cutting WAM, Hawkins P. The role of water in relation to diarrhoeal disease. J Trop Med Hyg 1982 Feb;85(1):31-9 **

Cvjetanovic B. Health effects and impact of water supply and sanitation. World Health Stat Q 1986;39(1):105-17 **

Cvjetanovic B, Chen L, Kronmal R, Rohde C, Suskind R. Measuring and evaluating diarrhea and malabsorption in association with village water supply and sanitation: a review of the Food Wastage/Sanitation Cost Benefit Methodology Project (Guatemala). Arlington, Virginia: Water and Sanitation for Health Project, 1981. 36 p. (WASH technical report, 12)

Cvjetanovic B. Sanitation versus immunization in control of enteric and diarrhoeal diseases. Prog Water Technol 1979;11(1-2):81-7 **

de Araoz J, Subrahmanyam DV. Environmental health measures in cholera control. In: Principles and practice of cholera control. Geneva: World Health Organization, 1970:95-109. (Public health papers, 40)

Deb BC, Sircar BK, Sengupta PG, De SP, Mondal SK, Gupta DN, Saha NC, Ghosh S, Mitra U, Pal SC. Studies on interventions to prevent eltor cholera transmission in urban slums. Bull WHO 1986;64(1):127-31 **

Diamant BZ. The role of environmental engineering in the preventive control of water-borne diseases in developing countries. R Soc Health J 1979 Jun;99(3): 120-6

Dosunmu-Ogunbi O, Coker AO, Blum D, Grange AD. Strategies for control of diarrhoeal diseases. In: Khan A, Rowland MGM, Aziz KMS, eds. Proceedings of the First African Conference on Diarrhoeal Diseases, Arusha, 13-17 November 1984. Harare: International Steering Committee, 1986 **

Dworkin D, Dworkin J. Water supply and diarrhea: Guatemala revisited. Washington, D.C.: U S Agency for International Development, 1980. 44 p. (AID evaluation special study, 2)

El Gaddal AA. The Blue Nile Health Project: a comprehensive approach to the prevention and control of water-associated diseases in irrigated schemes of the Sudan. J Trop Med Hyg 1985 Apr;88(2):47-56 **

Esrey SA, Habicht JP. Epidemiologic evidence for health benefits from improved water and sanitation in developing countries. Epidemiol Rev 1986;8:117-28

Esrey SA, Habicht JP. The impact of improved water supplies and excreta disposal facilities on diarrheal morbidity, growth, and mortality among children. Ithaca: Division of Nutritional Sciences, Cornell University, 1985. (Cornell international nutrition monograph series)

Esrey SA, Feachem RG, Hughes JM. Interventions for the control of diarrhoeal diseases among young children: improving water supplies and excreta disposal facilities. Bull WHO 1985;63(4):757-72 **

Feachem R. Priorities for diarrhoeal disease control: water, excreta, behaviour and diarrhoea. Diarrhoea Dial 1981;4:4-5

Feachem RG, Hogan RC, Merson MH. Diarrhoeal disease control: reviews of potential interventions. Bull WHO 1983;61(4):637-40

Feachem RG. Interventions for the control of diarrhoeal diseases among young children: promotion of personal and domestic hygiene. Bull WHO 1984;62(3):467-76 **

Feachem RG. Preventing diarrhoea: what are the policy options? Health Policy Plan 1986 Jun;1(2):109-17

Feachem RG. The role of water supply and sanitation in reducing mortality in China, Costa Rica, Kerala State (India) and Sri Lanka. In: Halstead SB, Walsh JA, Warren KS, eds. Good health at low cost; proceedings of a conference, held at the Bellagio Conference Center, Italy, 29 Apr-3 May 1985:191-8

Feachem RG. Rural water and sanitation; community participation in appropriate water supply and sanitation technologies: the mythology for the decade. Proc R Soc Lond (B) 1980 Jul;209(1174):15-29 **

Fenwich KWH. The short terms effects of a pilot environmental health project in rural Africa: the Zaina scheme re-assessed after four years. In: White GF, Bradley DJ, White AU. Drawers of water; domestic water use in East Africa. Chicago: University of Chicago Press, 1972:154-7

Geldreich EE, Nash HD, Reasoner DJ, Taylor RH. The necessity of controlling bacterial populations in potable waters - bottled water and emergency water supplies. J Am Water Works Assoc 1975 Mar;67(3):117-24

Ghannoum MA, Moore KE, Al-Dulaimi M, Nasr M. The incidence of water-related diseases in the Brak area, Libya from 1977 to 1979, before and after the installation of water treatment plants. Zentralbl Bakteriol Hyg [B] 1981;173(6):501-8 **

Gibbs KR. There is no safe water in rural Bangladesh: so what about the kids? Shishu Diganta (Dhaka) 1980 Dec;(9):25-7 **

Han AM, Oo KN, Aye T, Hlaing T. Personal toilet after defaecation and the degree of hand contamination according to different methods used. J Trop Med Hyg 1986 Oct;89(5):237-41 **

Handa BK, Panicker PVRC, Kulkarni SW, Gadkari AS, Raman V. The impact of sanitation in ten Indian villages. In: Pacey A, ed. Sanitation in developing countries. Chichester: Wiley, 1978:34-41

Hebert JR, Miller DR. Measuring the impact of water supply and sanitation on diarrhoeal diseases: problems of methodology [letter]. Int J Epidemiol 1984 Sep;13(3):374-6

Hebert JR, Miller R. Water supply and sanitation: effect on diarrhoeal diseases [letter]. Int J Epidemiol 1984 Dec;13(4):543-4

Henry FJ. Environmental sanitation infection and nutritional status of infants in rural St. Lucia, West Indies. Trans R Soc Trop Med Hyg 1981;75(4):507-13 **

Hollister AC, Jr., Beck MD, Gittlesohn AM, Hemphill EC. Influence of water availability on Shigella prevalence in children of farm labor families. Am J Public Health 1955 Mar;45(3):354-62 **

Howard J, Lloyd B. Sanitation and disease in Bangladesh urban slums and refugee camps. Prog Water Technol 1979;11(1-2):191-200 **

Hughes JM. Epidemiological studies of water supply and sanitation and health. In: Lindstrom JD, ed. The impact of interventions in water supply and sanitation in developing countries; proceedings of a seminar held at the Pan American Health Organization, 25-26 March 1980. Prepared by Logical Technical Services, Corp. Washington, D.C.: U S Agency for International Development, 1981:33-45

Hughes JM. Potential impacts of improved water supply and excreta disposal on diarrhoeal disease morbidity: an assessment based on a review of published studies. Geneva: Diarrhoeal Diseases Control Programme, World Health Organization, 1981. 36 p.

Hunter JM, Rey L, Scott D. Disease prevention and control in water development schemes. Geneva: World Health Organization, 1980. 35 p.

Isely RB. A community organisation approach to clean water and waste disposal in Cameroonian villages. Prog Water Technol 1979;11(1-2):109-16 **

Ismail M. Environmental health hazards in ecologically disturbed Bangladesh wetlands. In: Islam AS, Haque MM, Ameen M, Ahmed N, Haque S, eds. Proceedings of the Regional Seminar on Protecting the Environment from Degradation, South Asian Association for Regional Cooperation, 13-16 May 1985. Dhaka: Science & Technology Division, Ministry of Education, Government of Bangladesh, 1985:158-65 **

Kawata K. Of typhoid fever and telephone poles: deceptive data on the effect of water supply and privies on health in tropical counties. Prog Water Technol 1979;11(1-2):37-43 **

Kawata K. Water and other environmental interventions - the minimum investment concept. Am J Clin Nutr 1978 Nov;31(11):2114-23 **

Keusch GT. Ecological control of the bacterial diarrheas: a scientific strategy. Am J Clin Nutr 1978 Dec;31(12):2208-18

Khan M. Intervention of shigellosis by hand washing. In: Rahaman MM, Greenough WB, III, Novak NR, Rahman S, eds. Shigellosis: a continuing global problem; proceedings of an international conference, Cox's Bazaar, 15-20 June 1981. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1983:227-37. (Special publication, 20) **

Khan MU, Khan MR, Hossain B, Ahmed QS. Alum potash in water to prevent cholera [letter]. Lancet 1984 Nov 3;2(8410):1032 **

Khan MU. Interruption of shigellosis by hand washing. Trans R Soc Trop Med Hyg 1982;76(2):164-8 **

Krishnaswamy M. Household water supply, hygiene and diarrhoeal diseases in central Thai villages. Bangkok: Institute of Technology, 1973. (Master's thesis)

Kuo C. Measures to control diarrhoeal diseases — environmental sanitation. Regional Meeting on Cholera and Diarrhoeal Diseases, Alexandria, 1-5 June 1978. Alexandria: WHO Regional Office for the Eastern Mediterranean, 1978. 6 p. **

Lee EW. Safe water supply and sanitation in diarrhoeal diseases control. Regional Planning Meeting on Diarrhoeal Diseases Control, Manila, 5-7 June 1979. Manila: Regional Office of the Western Pacific, World Health Organization, 1979. 5 p. (WPR/BVD/DDC/79.3) **

Levine RJ, D'Souza S, Khan MR, Nalin DR. Failure of sanitary wells to protect against cholera and other diarrhoeas in Bangladesh. Lancet 1976 Jul 10;2(7976):86-9 **

Lewis M. Sanitation, intestinal infections, and infant mortality in late Victorian Sydney. Med Hist 1979 Jul;23(3):325-38 **

Lewis W. The significance of water management in relation to public and environmental health. J Infect Dis 1986 Apr;153(4):802-3

Lindstrom JD, ed. The impact of interventions in water supply and sanitation in developing countries; proceedings of a seminar held at the Pan American Health Organization, 25-26 March 1980. Prepared by Logical Technical Services, Corp. Washington, D.C.: U S Agency for International Development, 1981. 158 p.

McCabe DB. Water and wastewater systems to combat cholera in East Pakistan. J Water Pollut Control Fed 1970 Nov;42:1968-81

MaCabe LJ, Haines TW. Diarrheal disease control by improved human excreta disposal. Public Health Rep 1957 Oct;72(10):921-8 **

McIntyre RC, Tira T, Flood T, Blake PA. Modes of transmission of cholera in a newly infected population on an atoll: implications for control measures. Lancet 1979 Feb 10;1(8111):311-4

McJunkin FE. Water supply and health: an overview. In: Lindstrom JD, ed. The impact of interventions in water supply and sanitation in developing countries; proceedings of a seminar held at the Pan American Health Organization, 25-26 March 1980. Prepared by Logical Technical Services, Corp. Washington, D.C.: U S Agency for International Development, 1981:1-31

Mason PR, Patterson BA, Loewenson R. Piped water supply and intestinal parasitism in Zimbabwean school children. Trans R Soc Trop Med Hyg 1986;80(1):88-93 **

Matulessy PF, Rachmad, Sulaiman Z, Husaini Y, Darwin K, Rachmat A. The influences of environmental factors and nutritional status of the underfives to diarrhoeal diseases in Bogor, West Java, Indonesia. Southeast Asian J Trop Med Public Health 1982 Sep;13(3):401-4 **

Merrick T. The effect of piped water on early childhood mortality in urban Brazil, 1970-1976. Washington, D.C.: The World Bank, 1983. 46 p. (World Bank working paper, 594)

Miller DeW. Boiling drinking water: a critical look. Waterlines 1986 Jul;5(1):2-5

Mkumbwa ZM. Community response on control methods for diarrhoeal diseases. In: Khan A, Rowland MGM, Aziz KMS, eds. Proceedings of the First African Conference on Diarrhoeal Diseases, Arusha, 13-17 November 1984. Harare: International Steering Committee, 1986 **

Moore HA, de la Cruz E, Vargas-Mendez O. Diarrheal disease studies in Costa Rica. IV. The influence of sanitation upon the prevalence of intestinal infection and diarrheal disease. Am J Epidemiol 1965 Sep;82(2):162-84 **

Moore HA, de la Cruz E, Vargas-Mendez O. Diarrheal disease studies in Costa Rica. I. Plan and methods of investigation. Am J Public Health 1966 Feb;56(2):276-86

Mosley WH, Bart KJ, Sommer A. An epidemiological assessment of cholera control programs in rural East Pakistan. Int J Epidemiol 1972 Spring;1(1):5-11

Najera MP. [Role of health education in cholera control]. Rev Sanid Hig Publica (Madr) 1971 Dec;45:1135-47

Noche ML, Jr. Environmental factors in diarrhoeal diseases in the Philippines. Southeast Asian J Trop Med Public Health 1982 Sep;13(3):352-6 **

Nyerges N. [Plan for the control of infections: environmental health, epidemiology, health education, and early diagnosis and treatment]. Bol Of Sanit Panam 1964 May;56:447-65

Nyerges N, Eng N. Plan for the control of gastrointestinal diseases. Environmental sanitation, epidemiology, health education, and early diagnosis and treatment. In; Control of gastrointestinal diseases. Washington, D.C.: Pan American Health Organization, 1963. (Technical discussions, Science publication, 100)

Otto GF, Spindler LA. Effect of partial sanitation on infestation with intestinal parasites in southwest Virginia. South Med J 1930;23:566-60

Patel M. Effects of the health service and environmental factors on infant mortality: the case of Sri Lanka. J Epidemiol Commun Health 1980 Jun;34(2):76-82

Pineo CS, Subrahmanyam DV. Community water supply and excreta disposal situation in the developing countries: a commentary. Geneva: World Health Organization, 1975. 41 p. (WHO offset publication, 15)

Pocchiari F. The public health's role in the prevention and control of cholera. In: Diffusion and treatment of cholera infection. Roma: Instituto Poligrafico dello Stato, 1975:5-8

Pournadeali E, Tayback M. Potable water and village health: is primary prevention affordable? Prog Water Technol 1979;11(1-2):31-5

Pournadeali E, Tayback M. Potable water and village health: is primary prevention affordable? Public Health Rep 1980 May-Jun;95(3):291-4

Professor Koch on the bacteriological diagnosis of cholera, water filtration and cholera, and the cholera in Germany during the winter of 1892-93. Translated by G Duncan. Edinburgh: Douglas, 1894.

Rahaman MM. A strategy for control of shigellosis (dysentery) in Teknaf - a rural Bangladesh village. Prog Water Technol 1979;11(1-2):303-8 **

Rahaman MM, Aziz KMS. Teknaf Dysentery Project. In: Proceedings of the 9th Meeting of the Scientific Review and Technical Advisory Committee of the Cholera Research Laboratory and reports of the collaborative studies between International Center for Medical Research and Cholera Research Laboratory. Dhaka: Cholera Research Laboratory, 1975:148-56

Rahman M, Wojtyniak B, Rahaman MM, Aziz KMS. Impact of environmental sanitation and crowding on infant mortality in rural Bangladesh. Lancet 1985 Jul 6;2(8445):28-31 **

Rajagopalan S, Shiffman MA. Guide to simple sanitary measures for the control of enteric diseases. Geneva: World Health Organization, 1974. 103 p.

Rajasekaran P, Dutt PR, Pisharoti KA. Impact of water supply on the incidence of diarrhoea and shigellosis among children in rural communities in Madurai. Indian J Med Res 1977 Aug;66(2):189-99 **

Rao SS. National water supply and sanitation programme with special reference to cholera endemic areas. Indian J Public Health 1975 Jan-Mar;19(1):44-9

Rubenstein A, Boyle J, Odoroff CL, Kunitz SJ. Effect of improved sanitary facilities on infant diarrhea in a Hopi village. Public Health Rep 1969;84: 1093-7

Ryder RW, Reeves WC, Singh N, Hall CB, Kapikian AZ, Gomez B, Sack RB. The childhood health effects of an improved water supply system on a remote Panamanian island. Am J Trop Med Hyg 1985 Sep;34(5):921-4 **

Saunders RJ, Warford JJ. The goal of improved health; and improved water supply and sanitation: studies of its impact on health. In: Village water

supply, economic and policy in the developing world. Baltimore: Johns Hopkins University Press, 1976:31-85, 205-21

Schiavone EL. [Influence of water on communicable diseases: some of its solutions]. Red Samid Milit Argent 1963 Jul-Sep;62:189-206

Schlesinger L, Weinberger J, Figueroa G, Segure MT, Gongalez N, Monckeberg F. Environmental sanitation: a nutrition intervention. In: Underwood BA, ed. Nutrition intervention strategies in national development. New York: Academic Press, 1983:241-53

Schneider RE, Shiffman M, Faigenblum J. The potential effect of water on gastrointestinal infections prevalent in developing countries. Am J Clin Nutr 1978 Nov;31(11):2089-99 **

Shaffer R, Najai D, Kabuleeta P. Environmental health among the Masai of southern Kenya: the effect of water supply changes. Prog Water Technol 1979;11(1-2):45-8 **

Shiffman MA, Schneider R, Faigenblum JM, Helms R, Turner A. Field studies on water, sanitation and health education in relation to health status in Central America. Prog Water Technol 1979;11(1-2):143-50 **

Shrivastav JB. Prevention and control of cholera. In: Barua D, Burrows W, eds. Cholera. Philadelphia: Saunders, 1974:405-26

Shuval HI, Tilden RL, Perry BH, Grosse RN. Effect of investments in water supply and sanitation on health status: a threshold-saturation theory. Bull WHO 1981;59(2):243-8

Skoda JD, Mendis JB, Chia M. The impact of sanitation in Bangladesh. In: Pacey A, ed. Sanitation in developing countries. Chichester: Wiley, 1978:33-4

Skoda JD, Mendis JB, Chia M. A survey in rural Bangladesh on diarrhoeal morbidity, water usage and related factors; first report. Dhaka: United Nations Children's Fund, 1977. 47 p.

Sommer A, Woodward WE. The influence of protected water supplies on the spread of classical/Inaba and El Tor/Ogawa cholera in rural East Bengal. Lancet 1972 Nov 11;2(7785):985-7 **

Srivastava RN, Verma BL, Saran M. The study on the health benefits of water supply in a rural area of Uttar Pradesh; baseline survey report 1981. Jhansi: Department of Social and Preventive Medicine, M L B Medical College, 1982. 49+135 p. **

Strudwick RH. The Zaina Environmental Sanitation Project. East Afr Med J 1962 Jun;39(6):311-31 **

Sundaresan TK, Grab B, Uemura K, Cvjetanovic B. Comparative epidemiological analysis of sanitation and immunization in the control of typhoid and cholera. Am J Public Health 1974 Sep;64(9):910-2

Tameim O, Jobin W. Impact of safe water supply and sanitation on diarrhoeal disease prevention. In: Khan A, Rowland MGM, Aziz KMS, eds. Proceedings of

the First African Conference on Diarrhoeal Diseases, Arusha, 13-17 November 1984. Harare: International Steering Committee, 1986 **

Torun B. Environmental and educational interventions against diarrhea in Guatemala. In: Chen LC, Scrimshaw NS, eds. Diarrhea and malnutrition; interactions, mechanisms, and interventions. New York: Plenum, 1983:235-66 **

Usenko EG. [D.K. Zabolotnyi on the sanitary and hygienic aspects of cholera]. Zh Mikrobiol Epidemiol Immunobiol 1978 Oct;(10):127-8

van Damme JMG. The essential role of drinking water and sanitation in primary health care. Trop Geogr Med 1985 Sep;37(3):S21-30 **

Voelcket J. [Improving sanitation and cholera prevention]. Med Trop (Mars) 1971 May;31:133-4

Wagner EG, Lanoix JN. Water supply for rural areas and small communities. Geneva: World Health Organization, 1959. 337 p. (WHO monograph series, 42)

Wahed SANM. Water supply and sanitation. In: Islam AS, Haque MM, Ameen M, Ahmed N, Haque S, eds. Proceedings of the Regional Seminar on Protecting the Environment from Degradation, South Asian Association for Regional Cooperation, Dhaka, 13-16 May 1985. Dhaka: Science & Technology Division, Ministry of Education, Government of Bangladesh, 1985:183-91 **

Wall JW, Keeve JP. Water supply, diarrheal disease, and nutrition: a survey of the literature and recommendations for research. Washington, D.C.: Public Utility Department, International Bank for Reconstruction and Development, 1974. 30 p.

Weir JM, Wasif IM, Hassan FR, Attia S-E-DM, Kader MA. An evaluation of health and sanitation in Egyptian villages. J Egyptian Public Health Assoc 1952;27:55-79 **

White GF, Bradley DJ, White AU. Drawers of water; domestic water use in East Africa. Chicago: University of Chicago Press, 1971. 306 p.

Wolman A. Environmental sanitation in urban and rural areas: its importance in the control of enteric infections. Bull Pan Am Health Organ 1975;9(2):157-9 **

Wolman A. [Importance of environmental sanitation in urban and rural areas of the control of intestinal infections]. Bol Of Sanit Panam 1975 Apr;78(4):343-5

World Health Organization. Diarrhoeal Diseases Control Programme. Environmental health and diarrhoeal disease prevention; report of a Scientific Working Group, Kuala Lumpur, 3-6 Jul 1979. Geneva, 1980. 33 p. (WHO/CDD/80.5)

World Health Organization. Diarrhoeal Diseases Control Programme. Guidelines for cholera control. Geneva, 1980. 14 p. (WHO/CDD/SER/80.4)

Zaheer M, Prasad BG, Govil KK, Bhadury T. A note on urban water supply in Uttar Pradesh. J Indian Med Assoc 1962 Feb;38:177-82

Zhang J, et al. Study on preventing bacillary dysentery with magnetized drinking water. Chin J Epidemiol 1985 Aug;6(4):203-5 **

OCCURRENCE AND SURVIVAL OF MICROORGANISMS IN ENVIRONMENT

Ahmed SZ. Water studies in connection with cholera epidemics. East Pak Med J 1963 Jan;7(1):13-5 **

Barrell RAE, Rowland MGM. Infant foods as a potential source of diarrhoeal illness in rural West Africa. Trans R Soc Trop Med Hyg 1979;73(1):85-90 **

Barrell RAE, Rowland MGM. The relationship between rainfall and well water pollution in a West African (Gambian) village. J Hyg (Camb) 1979 Aug;83(1): 143-50 **

Barua D. Survival of cholera vibrios in food, water and fomites. In: Principles and practice of cholera control. Geneva: World Health Organization, 1970:29-31. (Public health papers, 40)

Bashford DJ, Donovan TJ, Furniss AL, Lee JV. Vibrio cholerae in Kent [letter]. Lancet 1979 Feb 24;1(8113):436-7 **

Bhatia BD, Agarwal DK, Singla PN, Sanyal SC. Environmental factors and microbial flora in hospitalized children with diarrhoea. Indian Pediatr 1980 Apr;17:354-60 **

Bradley DJ. Infective disease and domestic water supplies. In: Tschannerl G, ed. Water supply; proceedings of the Conference on Rural Water Supply in East Africa, Dar es-Salaam, Tanzania, 5-8 April 1971. Dar es-Salaam: University of Dar es-Salaam, Bureau of Resource Assessment and Land-use Planning, 1971:115-30. (Research paper, 20)

Brady PG, Wolfe JC. Waterborne giardiasis. Ann Intern Med 1974 Oct;81(4): 498-9 **

Briscoe J. Public health in rural India: the case of excreta disposal. Cambridge: Center for Population Studies, Harvard University, 1976. xix, 414 p. PhD Thesis. (Research paper, 12)

Cheever FS. Dysentery outbreak aboard naval vessels in San Pedro Bay, Philippine Islands. U S Naval Med Bull 1946;46:479-94

Chowdhury MAR, Aziz KMS, Rahim Z, Kay B. Isolation of Vibrio mimicus from aquatic environment of Bangladesh. In: Committees, programme and abstracts of the Fourth Annual Conference of the Bangladesh Society of Microbiologists, Dhaka, 7-8 February 1985. Dhaka: Bangladesh Society of Microbiologists, 1985: 3 **

Chowdhury MAR, Aziz KMS, Rahim Z, Kay BA. Vibrio mimicus as a component of pollution of urban water body. In: Islam AS, Haque MM, Ameen M, Ahmed N, Haque MS, eds. Proceedings of the Regional Seminar on Protecting the Environment from Degradation, Dhaka, 13-16 May 1985. Dhaka: Science & Technology Division, Ministry of Education, Government of Bangladesh, 1985:108-13 **

Colwell RR, Seidler RJ, Kaper J, Joseph SW, Garges S, Lockman H, Maneval D, Bradford H, Roberts N, Remmers E, Huq I, Huq A. Occurrence of Vibrio cholerae serotype 01 in Maryland and Louisiana Estuaries. Appl Environ Microbiol 1981 Feb;41(2):555-8 **

Craun GF. Waterborne disease - a status report emphasizing outbreaks in ground water systems. Ground Wat 1979;12:2

Dykes AC, Juranek DD, Lorenz RA, Sinclair S, Jakubowski W, Davies R. Municipal waterborne giardiasis: an epidemiologic investigation: beavers implicated as a possible reservoir. Ann Intern Med 1980 Feb;92(2,pt.1):165-70 **

Eden KV, Rosenberg ML, Stoopler M, Wood BT, Highsmith AK, Skaliy P, Wells JG, Feeley JC. Waterborne gastrointestinal illness at a ski resort - isolation of Yersinia enterocolitica from drinking water. Public Health Rep 1977;92(3):245-50

Eliassen R, Cummings RH. Analysis of waterborne outbreaks, 1938-45. J Am Water Works Assoc 1948;40:509. Abstract in: Bull Hyg 1948 Nov;23:703

Farooki MA. The role of frogs and fish in the survival of Vibrio cholerae in water. Pak J Med Res 1965 Jul;4(3):281-309 **

Feachem R, Miller C, Drasar B. Environmental aspects of cholera epidemiology. II. Occurrence and survival of Vibrio cholerae in the environment. Trop Dis Bull 1981 Oct;78(10):865-80 **

Feachem RG, Guy MW, Harrison S, Iwugo KO, Marshall T, Mbere N, Muller R, Wright AM. Excreta disposal facilities and intestinal parasitism in urban Africa: preliminary studies in Botswana, Ghana and Zambia. Trans R Soc Trop Med Hyg 1983;77(4):515-21 **

Feachem RG. Infections related to water and excreta: the health dimension of the decade. In: Water supply and sanitation in developing countries. London: Institute of Water Engineers and Scientists, 1983:25-46

Feachem RG. Infectious disease related to water supply and excreta disposal facilities. AMBIO 1977;6(1):55-8

Feachem RG, Bradley DJ, Garelick H, Mara DD. Sanitation and disease: health aspects of excreta and wastewater management. New York: Wiley, 1983. 501 p. [World Bank studies in water supply and sanitation, 3]

Felsenfeld O. The survival of cholera vibrios. In: Barua D, Burrows W, eds. Cholera. Philadelphia: Saunders, 1974:359-66

Georgi ME, Carlisle MS, Smiley LE. Giardiasis in a great blue heron (Ardea herodias) in New York State: another potential source of waterborne giardiasis. Am J Epidemiol 1986 May;123(5):916-7

Ghannoum MA, Moore KE, Al-Dulaimi M, Nasr M. The incidence of water-related diseases in the Brak area, Libya from 1977 to 1979, before and after the installation of water treatment plants. Zentralbl Bakteriol Hyg [B] 1981;173(6):501-8 **

Ghosh G, Rao AV. Water supply in Calcutta in relation to cholera. Indian J Med Res 1965 Jul;53(7):659-68 **

Giardiasis and water [editorial]. Lancet 1980 May 31;1(8179):1176

Godbole SH, Wagle PM. Isolation of Vibrio cholerae from a well water during a small outbreak of cholera. Indian J Med Sci 1970 Aug;24:484-6

Goodman RA, Buehler JW, Greenberg HB, McKinley TW. Norwalk gastroenteritis associated with a water system in a rural Georgia community. Arch Environ Health 1982 Nov/Dec;37(6):358-60 **

Harada K, Shigehara S, Kameda M, et al. [Detection of Shigella sonnei from a water supply causing a disease outbreak]. Jpn J Bacteriol 1967 Aug;22:478-81

Hobson W. The spread and control of: (1) water and foodborne infections; and (2) worm infections. In: The theory and practice of public health. 2d ed. London: Oxford University Press, 1965:141-52, 201-6

Hood MA, Ness GE. Survival of Vibrio cholerae and Escherichia coli in estuarine waters and sediments. Appl Environ Microbiol 1982 Mar;43(3):578-84 **

Huq A, Small EB, West PA, Huq MI, Rahman R, Colwell RR. Ecological relationships between Vibrio cholerae and planktonic crustacean copepods. Appl Environ Microbiol 1983 Jan;45(1):275-83 **

Huq MI, Aziz KMS, Colwell RR. Enterotoxigenic properties of Vibrio fluvialis (Group F Vibrio) isolated from clinical and environmental sources. J Diarrhoeal Dis Res 1985 Jun;3(2):96-9 **

Isaacson M, Smit P. The survival and transmission of V. cholerae in an artificial tropical environment. Prog Water Technol 1979;11(1-2):89-96 **

Jakubowski W, Hoff JC, eds. Waterborne transmission of giardiasis; proceedings of a symposium, 18-20 September 1978. Cincinnati: U S Environmental Protection Agency, 1979. xiv, 306 p.

Jiwa SFH, Krovacek K, Wadstrom T. Enterotoxigenic bacteria in food and water from an Ethiopian community. Appl Environ Microbiol 1981 Apr;41(4):1010-9 **

Khairy AEM, El Sebaie O, Gawad AA, El Attar L. The sanitary condition of rural drinking water in a Nile Delta village. I. Parasitological assessment of 'zir' stored and direct tap water. J Hyg (Camb) 1982 Feb;88(1):57-61 **

Kumar P, Sehgal BS, Singh R. Bore-hole disposal of excreta of children and diarrhoeal morbidity in a rural community. Environ Health 1970;12:155-9

Lam S, Goh KT. A clinical study of Vibrio cholerae 01 in Singapore related to environmental factors. J Diarrhoeal Dis Res 1984 Dec;2(4):249-52 **

Lema O, Ogawa M, Mhalu FS. Survival of El tor cholera Vibrio in local water sources and beverages in Tanzania. East Afr Med J 1979 Oct;56(10):504-8

Lin SD. Giardia lamblia and water supply. J Am Water Works Assoc 1985;77:40-7

Lindell SS, Quinn P. Shigella sonnei isolated from well water. Appl Microbiol 1973 Sep;26(3):424-5

Lloyd-Evans N, Pickering HA, Goh SGJ, Rowland MGM. Food and water hygiene and diarrhoea in young Gambian children: a limited case control study. Trans R Soc Trop Med Hyg 1984;78(2):209-11 **

Mohadjer S, Mehrabian S. Studies on the survival of Shigella flexneri in river and tap water. Arch Roum Pathol Exp Microbiol 1975 Dec;34(4):307-12

Moore B. The risk of infection through bathing in sewage-polluted water. In: Pearson EA, ed. Proceedings of the First International Conference on Waste Disposal in the Marine Environment, 1959. Oxford: Pergamon Press, 1960:29-38

Nakamura M, Stone RL, Krubsack JE. Survival of Shigella in sea water. Nature 1964 Jul 11;203(4949):213-4

Nalin DR. Cholera, copepods and chitinase [letter]. Lancet 1976 Oct 30;2(7992):958 **

Neogy KN. Viability of V. cholerae and V. El Tor in food and water. Bull Calcutta Sch Trop Med 1965;13(1):10-1 **

Pandit CG, Pal SC, Murti SVS, Misra BS, Murty DK, Shrivastav JB. Survival of Vibrio cholerae biotype El Tor in well water. Bull WHO 1967;37(4):681-5

Pesigan TP. Studies on the viability of El tor vibrios in contaminated food-stuffs, fomites, and water. In: Bushnell OA, Brookhyser CS, eds. Proceedings of the Cholera Research Symposium, Honolulu, Hawaii, 24-29 January 1965. Washington, D.C.: U S Departement of Health, Education, and Welfare, 1965:317-21

Philipp R, Evans EJ, Hughes AO, Grisdale SK, Enticott RG, Jephcott AE. Health risks of Snorkel swimming in untreated water. Int J Epidemiol 1985 Dec;14(4):624-7 **

Pineo CS, Subrahmanyam DV. Community water supply and excreta disposal situation in the developing countries: a commentary. Geneva: World Health Organization, 1975. 41 p. (WHO offset publication, 15)

Pipes WO. Bacterial indicators of pollution. Florida: CRC Press, 1982. 174 p.

Professor Koch on the bacteriological diagnosis of cholera, water. filtration and cholera, and the cholera in Germany during the Winter of 1892-93. Translated by G Duncan. Edinburgh: Douglas, 1894.

Raman V, Parhad NM, Deshpande AW, Pathak SK. Assessment and control of water quality in a town distribution system with reference to the incidence of gastrointestinal diseases. Prog Water Technol 1979;11(1-2):65-71 **

Rosenberg ML, Hazlet KK, Schaefer J, Wells JG, Pruneda RC. Shigellosis from swimming. JAMA 1976 Oct 18;236(16):1849-52

Saha MR, Sen D, De SP, Sircar BK, Sengupta PG, Deb BC, Pal SC. Kanagawa phenomenon and serotypic pattern of Vibrio parahaemolyticus strains isolated from various sources in Calcutta. Trans R Soc Trop Med Hyg 1982;76(6):786-9 **

Saxena SN. Intestinal parasites prevalent in Kasauli (Himachal Pradesh) area. Indian J Public Health 1982 Apr-Jun;26(2):100-5 **

Spira WM, Aziz KMS, Verwey WF. Environmental epidemiology. II. Ecological studies on Vibrio sp. in canal and tank environments. In: Proceedings of the

10th Meeting of the Scientific Review and Technical Advisory Committee of the Cholera Research Laboratory, 1976:160-84 **

Spira WM, Huq A, Ahmed QS, Saeed YA. Uptake of Vibrio cholerae biotype eltor from contaminated water by water hyacinth (Eichornia crassipes). Appl Environ Microbiol 1981 Sep;42(3):550-3 **

Verkholomov EE, Siroko IA. [Microbiological substantiation of the role of the water factor in the epidemiology of dysentery]. Voennomed Zh 1967;5:39-42

Wagner EG, Lanoix JN. Excreta disposal for rural areas and small communities. Geneva: World Health Organization, 1958. 187 p. (WHO monograph series, 39)

Wagner EG, Lanoix JN. Water supply for rural areas and small communities. Geneva: World Health Organization, 1959. 337 p. (WHO monograph series, 42)

Watkinson M, Lloyd-Evans N, Watkinson AM. The use of oral glucose electrolyte solution prepared with untreated well water in acute non-specific childhood diarrhoea. Trans R Soc Trop Med Hyg 1980;74(5):657-62 **

World Health Organization. Diarrhoeal Diseases Control Programme. Use of locally available drinking water for preparation of oral rehydration salt (ORS) solution. Geneva, 1981. 5 p. [CDD/SER/81.Rev.1 (1985)] **

SOCIOCULTURAL ASPECTS

Agarwal DK, Kasana SK, Tripathi AM, Agarwal KN. Environmental factors in childhood diarrhea in rural areas. Indian Pediatr 1986 Feb;23(2):89-95

Aziz KMA, Hasan KZ, Patwary Y, Aziz KMS, Rahaman MM. Acceptability of water-sealed latrines in Mirzapur: a rural area of Bangladesh. In: Islam AS, Haq MM, Ameen M, Ahmed N, Haque S, eds. Protecting of the Regional Seminar on Protecting the Environment from Degradation, Dhaka, 13-16 May 1985. Dhaka: Science & Technology Division, Ministry of Education, Government of Bangladesh, 1985:166-71 **

Aziz KMA, Hasan KZ, Aziz KMS, Rahaman MM. Behavioural changes in water use following health education in a rural area of Bangladesh. In: Proceedings of the Second Asian Conference on Diarrhoeal Diseases, Calcutta, 21-24 February 1983. Calcutta: National Institute of Cholera & Enteric Diseases, 1983:63 **

Aziz KMA, Hasan KZ, Hussain A, Patwary Y, Umra M, Aziz KMS, Rahaman MM. PARDA and some health practices in two conservative rural communities of Bangladesh. In: Rahaman MM, Aziz KMS, Rahman S, eds. Proceedings of the First Asian Conference on Diarrhoeal Disease, Dhaka, 16-20 February 1981. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1982:212-8 **

Aziz KMA, Curlin G. Role of learned behavior in the transmission of cholera. Paper presented at the post-plenary session of the 10th International Congress of Anthropological and Ethnological Sciences, Poona, 19-21 December 1978. (Unpublished) **

Beck MD, Munoz JA, Scrimshaw NS. Studies on diarrheal diseases in Central

America. I. Preliminary findings on cultural surveys of normal population groups in Guatemala. Am J Trop Med Hyg 1957 Jan;6(1):62-71 **

Bertrand WE, Walmus BF. Maternal knowledge, attitudes and practice as predictors of diarrhoeal disease in young children. Int J Epidemiol 1983 Jun;12(2):205-10 **

Bhatnagar S, Dosajh U. Diarrhoeal disease morbidity in children below 5 years in urban slums of Delhi. Indian J Med Res 1986 Jul;84:53-8 **

Black RH. Invited discussion of Dr R M Glasse's paper. In: Proceedings of the Cholera Research Symposium, Honolulu, Hawaii, 24-29 January 1965. Washington, D.C.: U S Department of Health, Education, and Welfare, 1965:340 **

Chakraborty AK, Das JC. Comparative study of incidence of diarrhea among children in two different environmental situations in Calcutta. Indian Pediatr 1983 Dec;20(12):907-13 **

Chen PCY. Socio-cultural aspects of a cholera epidemic in Trengganu, Malaysia. Trop Geogr Med 1971 Sep;23(3):296-303 **

Cutting WAM, Hawkins P. The role of water in relation to diarrhoeal disease. J Trop Med Hyg 1982 Feb;85(1):31-9 **

Glasse RM. Cultural aspects of the transmission of cholera. In: Proceedings of the Cholera Research Symposium, Honolulu, Hawaii, 24-29 January 1965. Washington, D.C.: U S Government Printing Office, 1965:337-9 **

Han AM, Myint TM. Knowledge, attitudes and behaviour in relation to diarrhoea in a rural community in Burma. Southeast Asian J Trop Med Public Health 1986 Mar;17(1):59-62 **

Khan MU, Mosley WH, Chakraborty J, Sarder AM, Khan MR. The relationship of cholera to water source and use in rural Bangladesh. Int J Epidemiol 1981 Mar;10(1):23-5 **

Kochar V. Sanitation and culture. II. Behavioural aspects of disposal of excreta in a rural W. Bengal region. Indian J Prev Soc Med 1977 Dec;8:142-51 **

Kochar V. Sanitation and culture. I. Social aspects of sanitation and personal hygiene in a rural Bengal region. Indian J Prev Soc Med 1977 Sep;8:106-17 **

Kourany M, Vasquez MA. Housing and certain socioenvironmental factors and prevalence of enteropathogenic bacteria among infants with diarrheal disease in Panama. Am J Trop Med Hyg 1969 Nov;18(6):936-41 **

Lewis M. Sanitation, intestinal infections, and infant mortality in late Victorian Sydney. Med Hist 1979 Jul;23(3):325-38 **

Matulessy PF, Rachmad, Sulaiman Z, Husaini Y, Darwin K, Rachmat A. The influences of environmental factors and nutritional status of the underfives to diarrhoeal diseases in Bogor, West Java, Indonesia. Southeast Asian J Trop Med Public Health 1982 Sep;13(3):401-4 **

Mtera KNM. Cultural and behavioural antecedent diseases in Tanzania. In: Khan A, Rowland MGM, Aziz KMS, eds. Proceedings of the First African Conference on

Diarrhoeal Diseases, Arusha, 13-17 November 1984. Harare: International Steering Committee, 1986 **

Noche ML, Jr. Environmental factors in diarrhoeal diseases in the Philippines. Southeast Asian J Trop Med Public Health 1982 Sep;13(3):352-6 **

Old HN. Sanitation problems of the American Indians. Am J Public Health 1953 Feb;43(2):210-5 **

Pickering H. Social and environmental factors associated with diarrhoea and growth in young children: child health in urban Africa. Soc Sci Med 1985;21(2):121-7 **

Rahman M, Wojtyniak B, Rahaman MM, Aziz KMS. Impact of environmental sanitation and crowding on infant mortality in rural Bangladesh. Lancet 1985 Jul 6;2(8445):28-31 **

Vathanophas K, Indrasuksri T, Bunyarathapan P, Suthienkul O, Varavithya W. The study of socioeconomic environmental factors related to diarrhoeal disease in children under 5 years in congested areas of Bangkok metropolis. In: Programme, papers and abstracts of Third Asian Conference on Diarrhoeal Diseases, Bangkok, 10-14 June 1985:280 **

Velmimirovic B, Subramanian M, Sadek F. Socio-economic and environmental factors and human health example of cholera El Tor in Manila. Zentralbl Bakteriol [Orig B] 1975;160(1):1-27

Yap KL, Sabil D, Muthu PA. Human rotavirus infection in Malaysia. II. A study on the influence of living standard on the prevalence of rotavirus-associated gastroenteritis in children hospitalized with diarrhoea. J Trop Pediatr 1984 Oct;30(5):269-71 **

TRANSMISSION OF MICROORGANISMS

Aziz KMA, Curlin G. Role of learned behavior in the transmission of cholera. Paper presented at the post-plenary session of the 10th International Congress of Anthropological and Ethnological Sciences, Poona, 19-21 December 1978. (Unpublished document) **

Aziz KMA, Hasan KZ, Patwary Y, Rahaman MM, Aziz KMS. A study of the interpersonal spread of human feces in rural Teknaf of Bangladesh. In: Rahaman MM, Greenough WB, III, Novak NR, Rahman S, eds. Shigellosis: a continuing global problem; proceedings of an international conference, Cox's Bazaar, 15-20 June 1981. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1983:238-48. (Special publication, 20) **

Bashford DJ, Donovan TJ, Furniss AL, Lee JV. Vibrio cholerae in Kent [letter]. Lancet 1979 Feb 24;1(8113):436-7 **

Benenson AS, Ahmed SZ, Oseasohn RO. Person-to-person transmission of cholera. In: Proceedings of the Cholera Research Symposium, Honolulu, Hawaii, 24-29 Jan 1965. Washington, D.C.: U S Department of Health, Education, and Welfare, 1965:332-6 **

Black RE, Brown KH, Becker S, Alim ARMA, Merson MH. Contamination of weaning foods and transmission of enterotoxigenic Escherichia coli diarrhoea in children in rural Bangladesh. Trans R Soc Trop Med Hyg 1982;76(2):259-64 **

Black RE, Merson MH, Rowe B, Taylor PR, Alim ARMA, Gross RJ, Sack DA. Enterotoxigenic Escherichia coli diarrhoea: acquired immunity and transmission in an endemic area. Bull WHO 1981;59(2):263-8 **

Black RE, Dykes AC, Sinclair SP, Wells JG. Giardiasis in day-care centers: evidence of person-to-person transmission. Pediatrics 1977 Oct;60(4):486-91

Black RH. Invited discussion of Dr R M Glasse's paper. In: Proceedings of the Cholera Research Symposium, Honolulu, Hawaii, 24-29 January 1965. Washington, D.C.: U S Government Printing Office, 1965:340 **

Blake PA, Rosenberg ML, Costa JB, Ferreira PS, Guimaraes CL, Gangarosa EJ. Cholera in Portugal, 1974. I. Modes of transmission. Am J Epidemiol 1977 Apr;105(4):337-43 **

Blake PA, Rosenberg ML, Florencia J, Costa JB, Quintino LDP, Gangarosa EJ. Cholera in Portugal, 1974. II. Transmission by bottled mineral water. Am J Epidemiol 1977 Apr;105(4):344-8 **

Boyce JM, Hughes JM, Alim ARMA, Khan MU, Aziz KMA, Wells JG, Curlin GT. Patterns of Shigella infection in families in rural Bangladesh. Am J Trop Med Hyg 1982 Sep;31(5):1015-20 **

Bradley DJ. Infective disease and domestic water supplies. In: Tschannerl G, ed. Water supply; proceedings of the Conference on Rural Water Supply in East Africa, Dar es-Salaam, Tanzania, 5-8 April 1971. Dar es-Salaam: University of Dar es-Salaam, Bureau of Resource Assessment and Land-use Planning, 1971:115-30. (Research paper, 20)

Briscoe J. Intervention studies and the definition of dominant transmission routes. Am J Epidemiol 1984;120(3):449-55 **

Briscoe J. Public health in rural India: the case of excreta disposal. Cambridge: Center for Population Studies, Harvard University, 1976. xix, 414 p. PhD Thesis. (Research paper, 12)

Bruch HA, Ascoli W, Scrimshaw NS, Gordon JE. Studies of diarrheal disease in Central America. V. Environmental factors in the origin and transmission of acute diarrheal disease in four Guatemalan villages. Am J Trop Med Hyg 1963 Jul;12(4):567-79 **

Craun GF. A summary of waterborne illness transmitted through contaminated groundwater. J Environ Health 1985 Nov-Dec;48(3):122-7 **

Craun GF. Waterborne giardiasis in the United States: a review. Am J Public Health 1979 Aug;69(8):817-9 **

Deb BC, Sircar BK, Sengupta PG, De SP, Mondal SK, Gupta DN, Saha NC, Ghosh S, Mitra U, Pal SC. Studies on interventions to prevent eltor cholera transmission in urban slums. Bull WHO 1986;64(1):127-31 **

Eyler JM. William Farr on the cholera: the sanitarian's disease theory and the statistician's method. J Hist Med 1973 Apr;28:79-100

Feachem R. Is cholera primarily water-borne? [letter]. Lancet 1976 Oct 30;2(7992):957-8 **

Feachem RG. Environmental aspects of cholera epidemiology. III. Transmission and control. Trop Dis Bull 1982 Jan;79(1):1-47 **

Flynn M. Needs for research upon the role of water in transmission of cholera. In: Bushnell OA, Brookhyser CS, eds. Proceedings of the Cholera Research Symposium, Honolulu, 24-29 January 1965. Washington, D.C.: U S Department of Health, Education, and Welfare, 1965:314-6

Gehlbach SH, MacCormack JN, Drake BM, Thompson WV. Spread of disease by fecal-oral route in day nurseries. Health Serv Rep 1973 Apr;88(4):320-2 **

Georgi ME, Carlisle MS, Smiley LE. Giardiasis in a great blue heron (Ardea herodias) in New York State: another potential source of waterborne giardiasis. Am J Epidemiol 1986 May;123(5):916-7

Ghosh G, Rao AV. Water supply in Calcutta in relation to cholera. Indian J Med Res 1965 Jul;53(7):659-68 **

Giardiasis and water [editorial]. Lancet 1980 May 31;1(8179):1176

Glasse RM. Cultural aspects of the transmission of cholera. In: Proceedings of the Cholera Research Symposium, Honolulu, Hawaii, 24-29 January 1965. Washington, D.C.: U S Department of Health, Education, and Welfare, 1965: 337-9 **

Gorbatow O. [Water, milk and fly hygiene and their relation to summer diarrhea in a rural community]. Nordh Hyg Tidskr 1951:225-39

Han AM, Oo KN, Aye T, Hlaing T. Personal toilet after defaecation and the degree of hand contamination according to different methods used. J Trop Med Hyg 1986 Oct;89(5):237-41 **

Hobson W. The spread and control of: (1) water and foodborne infections; and (2) worm infections. In: The theory and practice of public health. 2d ed. London: Oxford University Press, 1965:141-52, 201-6

Hughes JM, Boyce JM, Levine RJ, Khan MU, Aziz KMA, Huq MI, Curlin GT. Epidemiology of eltor cholera in rural Bangladesh: importance of surface water in transmission. Bull WHO 1982;60(3):395-404 **

Hughes JM, Boyce JM, Levine RJ, Khan MU, Curlin GT. Water and the transmission of El Tor cholera in rural Bangladesh. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1977. 24 p. (Working paper no. 2) **

Ioirish AN, Vilkovich VA. [The role of the water factor in the spread of dysentery on river vessels]. Zh Mikrobiol Epidemiol Immunobiol 1976 May;(5):104-6

Isaacson M, Smit P. The survival and transmission of V. cholerae in an artificial tropical environment. Prog Water Technol 1979;11(1-2):89-96 **

Jakubowski W, Hoff JC, eds. Waterborne transmission of giardiasis; proceedings of a symposium, 18-20 September 1978. Cincinnati: U S Environmental Protection Agency, 1979. xiv, 306 p.

Joint ICMR-GWB-WHO Cholera Study Group, Calcutta, India. Cholera carrier studies in Calcutta, 1968. Bull WHO 1970;43(3):379-87 **

Juranek D. Waterborne giardiasis (summary of recent epidemiologic investigations and assessment of methodology). In: Jakubowski W, Hoff JC, eds. Waterborne transmission of giardiasis; proceedings of a symposium, 18-20 September 1978. Cincinnati: U S Environmental Protection Agency, 1979:150-63

Khan M, Rahaman MM, Aziz KMS, Islam S. Epidemiologic investigation of an outbreak of Shiga bacillus dysentery in an island population. Southeast Asian J Trop Med Public Health 1975 Jun;6(2):251-6 **

Khan M, Mosley WH. The role of boatman in the transmission of cholera. East Pak Med J 1967 Apr;11(2):61-5 **

Khan MU, Shahidullah M. Epidemiologic pattern of diarrhoea caused by non-agglutinating vibrios (NAG) and EF-6 organisms in Dhaka. Trop Geogr Med 1982 Mar;34(2):19-27 **

Khan MU, Mosley WH, Chakraborty J, Sarder AM, Khan MR. The relationship of cholera to water source and use in rural Bangladesh. Int J Epidemiol 1981 Mar;10(1):23-5 **

Khan MU, Shahidullah M. Role of water and sanitation in the incidence of cholera in refugee camps. Trans R Soc Trop Med Hyg 1982;76(3):373-7 **

Khan MU, Roy NC, Huq MI, Stoll B, Islam MR. Shigellosis, an increasing pediatric problem in Dhaka: a fourteen years' epidemiological analysis. Bangladesh J Microbiol 1985;2(1-2):44-5 **

Khan MU, Curlin GT. Urban cholera study, 1974 and 1975, Dacca. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1977. 21 p. (Scientific report no. 7) **

Khan MU, Chakraborty J, Sarder AM, Khan MR. Water source and the incidence of cholera in rural Bangladesh. In: Proceedings of the Third Bangladesh Science Conference, Chittagong, 8-12 January 1978:148 **

Khan MU, Mosley WH, Chakraborty J, Sarder AM, Khan MR. Water sources and the incidence of cholera in rural Bangladesh. Dhaka: Cholera Research Laboratory, 1978. 15 p. (Scientific report, 16)

Krishnaswamy M. Household water supply, hygiene and diarrhoeal diseases in central Thai villages. Bangkok: Asian Institute of Technology, 1973. (Master's thesis)

Lanyi B, Szita J, Ringelhann B, Kovach K. A water borne outbreak of enteritis associated with Escherichia coli serotype 124:72:32. Acta Microbiol Acad Sci Hung 1959;6:77-84

Lawrence DN, Blake PA, Yashuk JC, Wells JG, Creech WB, Hughes JM. Vibrio

parahaemolyticus gastroenteritis outbreaks aboard two cruise ships. Am J Epidemiol 1979 Jan;109(1):71-80 **

Lee YK. Cholera in early Singapore - I (1819-1849). Singapore Med J 1973 Mar;14:42-8

Levine RJ, Nalin DR. Cholera is primarily waterborne in Bangladesh [letter]. Lancet 1976 Dec 11;2(7998):1305

Levine RJ, Khan MR, D'Souza S, Nalin DR. Cholera transmission near a cholera hospital. Lancet 1976 Jul 10;2(7967):84-6 **

Levine RJ, D'Souza S, Khan MR, Nalin DR. Failure of sanitary wells to protect against cholera and other diarrhoeas in Bangladesh. Lancet 1976 Jul 10;2(7976):86-9 **

Lin SD. Giardia lamblia and water supply. J Am Water Works Assoc 1985;77:40-7

Lippy EC. Water supply problems associated with a waterborne outbreak of giardiasis. In: Jakubowski W, Hoff JC, eds. Waterborne transmission of giardiasis; proceedings of a symposium, 18-20 September 1978. Cincinnati: U S Environmental Protection Agency, 1979:164-73

Lobel HO, Bisno AL, Goldfield M, Prier JE. A waterborne epidemic of gastroenteritis with secondary person-to-person spread. Am J Epidemiol 1969 Apr;89(4):384-92 **

McIntyre RC, Tira T, Flood T, Blake PA. Modes of transmission of cholera in a newly infected population on an atoll: implications for control measures. Lancet 1979 Feb 10;1(8111):311-4

Merson MH, Goldmann DA, Boyer KM, Peterson NJ, Patton C, Everett LG, Downs H, Steckler A, Barker WH, Jr. An outbreak of Shigella sonnei gastroenteritis on Colorado River raft trips. Am J Epidemiol 1974 Sep;100(3):186-96 **

Merson MH, Tenney JH, Meyers JD, Wood BT, Wells JG, Rymzo W, Cline B, DeWitt WE, Skaliy P, Mallison GF. Shigellosis at sea: an outbreak aboard a passenger cruise ship. Am J Epidemiol 1975 Feb;101(2):165-75 **

Mhalu FS. Studies on modes of transmission of cholera in Tanzania. In: Khan A, Rowland MGM, Aziz KMS, eds. Proceedings of the First African Conference on Diarrhoeal Diseases, Arusha, 13-17 November 1984. Harare: International Steering Committee, 1986 **

Mntenga WM, Mtango FD, Mhalu FS. Seasonality of cholera in Tanzania; possible role of rainfall in disease transmission. In: Khan A, Rowland MGM, Aziz KMS, eds. Proceedings of the First African Conference on Diarrhoeal Diseases, Arusha, 13-17 November 1984. Harare: International Steering Committee, 1986 **

Morens DM, Zweighaft RM, Vernon TM, Gary GW, Eslien JJ, Wood BT, Holman RC, Dolin R. A waterborne outbreak of gastroenteritis with secondary person-to-person spread; association with a viral agent. Lancet 1979 May 5;1(8123):964-6 **

Mosley WH, Khan MU. Cholera epidemiology - some environmental aspects. Prog Water Technol 1979;11(1-2):309-16 **

Mtera KNM. Cultural and behavioural antecedent diseases in Tanzania. In: Khan A, Rowland MGM, Aziz KMS, eds. Proceedings of the First African Conference on Diarrhoeal Diseases, Arusha, 13-17 November 1984. Harare: International Steering Committee, 1986 **

Niyogi SG, Deb BC, Sircar BK, Sengupta PG, De SP, Sen D, Ghosh BN. Studies on cholera carriers and their role in transmission of the infection: a preliminary report. Indian J Med Res 1979 Dec;70:892-7 **

O'Neil AE, Richen D, Lundrie P. A waterborne epidemic of acute infectious non-bacterial gastroenteritis in Alberta, Canada. Can J Public Health 1985 May-Jun;76(3):199-203 **

Pineo CS, Subrahmanyam DV. Community water supply and excreta disposal situation in the developing countries: a commentary. Geneva: World Health Organization, 1975. 41 p. (WHO offset publication, 15)

Professor Koch on the bacteriological diagnosis of cholera, water filtration and cholera, and the cholera in Germany during the Winter of 1892-93. Translated by G Duncan. Edinburgh: Douglas, 1894.

Rahaman MM, Khan M, Aziz KMS, Islam MS, Kibriya AKMG. An outbreak of dysentery caused by Shigella dysenteriae type 1 on a coral island in the Bay of Bengal. J Infect Dis 1975 Jul;132(1):15-9

Rahaman MM, Aziz KMS, Rahman MM. Relationship between water consumption and dysentery in Teknaf: a rural Bangladesh village. In: Proceedings of the 11th Meeting of the Scientific Review and Technical Advisory Committee of the Cholera Research Laboratory. Dhaka: Cholera Research Laboratory, 1977:94-101

Rajasekaran P, Dutt PR, Pisharoti KA. Impact of water supply on the incidence of diarrhoea and shigellosis among children in rural communities in Madurai. Indian J Med Res 1977 Aug;66(2):189-99 **

Rosenberg ML, Weissman JB, Gangarosa EJ, Reller LB, Beasley RP. Shigellosis in the United States: ten-year review of nationwide surveillance, 1964-1973. Am J Epidemiol 1976 Nov;104(5):543-51 **

Ross JD. Contaminated hospital water supplies [letter]. Br Med J 1979 Jul 7;2(6181):53

Sakdisiwasdi O, Achananuparp S, Limsuwan A, Nanna P, Barnyen L. Salmonella and Shigella carrier rates and environmental sanitation in a rural district, central Thailand. Southeast Asian J Trop Med Public Health 1982;13(3):380-4 **

Schliessmann DJ. Diarrhoeal disease and the environment. Bull WHO 1959;21:381-6 **

Shahid NS, Samadi AR, Khan MU, Huq MI. Classical vs El Tor cholera: a prospective family study of a concurrent outbreak. J Diarrhoeal Dis Res 1984 Jun;2(2):73-8 **

Shaw PK, Brodsky RE, Lyman DO, Wood BT, Hibler CP, Healy GR, MacLeod KIE, Stahl W, Schultz MG. A communitywide outbreak of giardiasis with evidence of transmission by a municipal water supply. Ann Intern Med 1977 Oct;87(4): 426-32 **

Solodovnikov IuP, Turchinskaia MV, Ioirish An, et al. [Study of food and other routes of transmission of dysentery on river ships]. Zh Mikrobiol Epidemiol Immunobiol 1974 Mar;51:90-3

Sommer A, Woodward WE. The influence of protected water supplies on the spread of classical/Inaba and El Tor/Ogawa cholera in rural East Bengal. Lancet 1972 Nov 11;2(7785):985-7 **

Spira WM, Khan MU, Saeed YA, Sattar A. Environmental epidemiology. I. Environmental and prospective epidemiological investigation of cholera outbreaks. In: Proceedings of the 11th Meeting of the Scientific Review and Technical Advisory Committee of the Cholera Research Laboratory, 1976:148-59 **

Spira WM, Khan MU, Saeed YA, Sattar MA. Microbiological surveillance of intra-neighbourhood El Tor cholera transmission in rural Bangladesh. Bull WHO 1980;58(5):731-40 **

Sultanov GV, Solodovnikov IuP. [Role of the aqueous factor in the epidemiology of dysentery]. Zh Mikrobiol Epidemiol Immunobiol 1977 Jun;(6):99-101

Taylor I. Toilet paper and spread of infection [letter]. Br Med J 1978 Oct 7;2(6143):1024

Teng PH. The role of foods in the transmission of cholera. In: Proceedings of the Cholera Research Symposium, Honolulu, Hawaii, 24-29 January 1965. Washington, D.C.: U S Department of Health, Education, and Welfare, 1965:328-32 **

U S Agency for International Development. Interim report of the Task Force on Cholera. Washington, D.C., 1971. 149 p.

Wagner EG, Lanoix JN. Excreta disposal for rural areas and small communities. Geneva: World Health Organization, 1958. 187 p. (WHO monograph series, 39)

Webber RH. Cholera on Lake Tanganyika (south). In: Khan A, Rowland MGM, Aziz KMS, eds. Proceedings of the First African Conference on Diarrhoeal Diseases, Arusha, 13-17 November 1984. Harare: International Steering Committee, 1986 **

Wilson R, Anderson LJ, Holman RC, Gary GW, Greenberg HB. Waterborne gastroenteritis due to Norwalk agent: clinical and epidemiologic investigation. Am J Public Health 1982 Jan;72(1):72-4 **

WATER-HEALTH RELATIONSHIPS

Arrhenius E. Health aspects of multipurpose use of water. AMBIO 1977;6(1): 59-62

Bannaga SEI, Pickfold J. Water-health relationships in Sudan. Effl Water Treat J 1978;18:560-9

Bantic Z, Dezelic N, Preka N, Zebec M. [Health aspects of village water supply]. Lijee Vjesn 1978 Nov;100(1):728-31

Beyer MG. 1,000 million children lack safe water. XVth International Congress of Pediatrics, New Delhi, 23-29 October 1977. 6 p.

Bradley DJ. Health problems of water management. J Trop Med Hyg 1970 Nov;73:286-94

Briscoe J. The role of water supply in improving health in poor countries (with special reference to Bangladesh). Am J Clin Nutr 1978 Nov;31(11):2100-13 **

Briscoe J. Water supply and health in developing countries: selective primary health care revisited. Am J Public Health 1984;74(9):1009-13

Briscoe J. Water supply and health in developing countries: selective primary health care revisited. In: Proceedings of the International Conference on Oral Rehydration Therapy, Washington, D.C., 7-10 June 1983:141-50

Burr ML, Davis AR, Zbijowski AG. Diarrhoea and the drought. Public Health (Lond) 1978 Mar;92(2):86-7

Dewailly E, Poirier C, Meyer FM. Health hazards associated with windsurfing on polluted water. Am J Public Health 1986 Jun;76(6):690-1

Elliott K, Knight J, eds. Human rights in health. North-Holland: Elsevier, 1974. viii, 304 p. [Ciba Foundation symposium, 23 (new series)]

Feachem R, McGarry M, Mara D, eds. Water, wastes and health in hot climates. London: Wiley, 1977. xvi, 399 p.

Feachem RG, Burns E, Cairncross AM, Cronin A, Cross R, Curtis D, Khan MK, Lamb D, Southal H. Water, health and development: an interdisciplinary evaluation. London: Tri-Med Books, 1978. 267 p.

Frankwell RJ. Incidence of enteric diseases and their relationship to water use and water quality in rural communities of Thailand. Bangkok: Southeast Asia Technology, 1974. v.p.

Freij L, Sterky G, Wadstrom T, Wall S. Child health and diarrhoeal disease in relation to supply and use of water in African communities. Prog Water Technol 1979;11(1-2):49-55 **

Hughes JM. Epidemiological studies of water supply and sanitation and health. In: Lindstrom JD, ed. The impact of interventions in water supply and sanitation in developing countries; proceedings of a seminar held at the Pan American Health Organization, 25-26 March 1980. Prepared by Logical Technical Services, Corp. Washington, D.C.: U S Agency for International Development, 1981:33-45

Hunter JM, Rey L, Scott D. Disease prevention and control in water development schemes. Geneva: World Health Organization, 1980. 35 p.

Ismail M. Environmental health hazards in ecologically disturbed Bangladesh wetlands. In: Islam AS, Haque MM, Ameen M, Ahmed N, Haque S, eds. Proceedings of the Regional Seminar on Protecting the Environment from Degradation, South Asian Association for Regional Cooperation, 13-16 May 1985. Dhaka: Science & Technology Division, Ministry of Education, Government of Bangladesh, 1985:158-65 **

Lewis W. The significance of water management in relation to public and environmental health. J Infect Dis 1986 Apr;153(4):802-3

McJunkin FE. Water and human health. Washington, D.C.: National Demonstration Water Project, U S Agency for International Development, 1982. 111 p.

McJunkin FE. Water supply and health: an overview. In: Lindstrom JD, ed. The impact of interventions in water supply and sanitation in developing countries; proceedings of a seminar held at the Pan American Health Organization, 25-26 March 1980. Prepared by Logical Technical Services, Corp. Washington, D.C.: U S Agency for International Development, 1981:1-31

Melnick JL, Gerba CP. Is the water safe to drink? [letter]. J Infect Dis 1979 Jun;139(6):736-8

Philipp R, Evans EJ, Hughes AO, Grisdale SK, Enticott RG, Jephcott AE. Health risks of Snorkel swimming in untreated water. Int J Epidemiol 1985 Dec;14(4):624-7 **

Sabwa DM, Githeko AK. Faecal contamination of urban community water supplies and its public health implications. East Afr Med J 1985 Nov;62(11):794-801 **

Skoda JD, Mendis JB, Chia M. A survey of sanitation in Bangladesh on diarrhoeal morbidity, water usage and related factors; first report. Dhaka: United Nations Children's Fund, 1977. 47 p.

Songonuga OO. Sanitary quality and health implications of well waters in Ile-Ife, Nigeria. Niger Med J 1979 Apr;9(4):493-7

Srivastava RN, Verma BL, Saran M. The study on the health benefits of water supply in a rural area of Uttar Pradesh; baseline survey report 1981. Jhansi: Department of Social and Preventive Medicine, M L B Medical College, 1982. 49+135 p. **

Thacker SB, Music SI, Pollard RA, Berggrren G, Boulos C, Nagy T, Brutus M, Pamphile M, Ferdinand RO, Joseph VR. Acute water shortage and health problems in Haiti. Lancet 1980 Mar 1;1(8166):471-3 **

Tisdale ES. The 1930-1931 drought and its effect upon public water supply. Am J Public Health 1931;21:1203-15

AUTHOR SECTION

Abou-Gareeb AH. Measurement of seasonal variation in endemic cholera in West Bengal. Bull WHO 1961;25(1):93-102

Achananuparp S see Sakdisiwasdi O

Adnan SW see Gracey M

Agarwal DK, Kasana SK, Tripathi AM, Agarwal KN. Environmental factors in childhood diarrhea in rural areas. Indian Pediatr 1986 Feb;23(2):89-95

Agarwal DK see Bhatia BD

Agarwal KN see Agarwal DK

Ager EA see Werner SB

Aggarwal P, Sarkar R, Gupta JP, Ahuja S, Ray K, Chowdhuri ANR. Current epidemiological aspects of cholera in Delhi. J Commun Dis 1983 Mar;15(1):26-32

The incidence of cholera amongst acute diarrhoea cases in Delhi, India was studied from 1976 to 1980, and the relationship with local climatic factors was analyzed statistically. All Vibrio cholerae 01 isolates belonged to the El Tor biotype, with the Ogawa serotype predominating. No classical Vibrio strain was identified. The highest incidence of cholera was seen in 1980 (22%). July and August were the peak period for the incidence of cholera. The increase in the number of cholera cases depended on the increase in rainfall, temperature, and relative humidity. The joint impact of climatic factors on the incidence of acute diarrhoea, including cholera, was higher than for any other factors.

Ahmad K, Jahan K, Huq I. Decontamination of drinking water by alum for the preparation of oral rehydration solution. Food Nutr Bull 1984 Jun;6(2):54-7

The authors claim that this is the first report on the use of chemical agents in decontaminating potable water for the preparation of oral rehydration solution (ORS). The study determines whether aluminium potassium sulphate (alum potash), used traditionally for purifying tank, reservoir and household drinking water, would have an antibacterial effect on the total bacterial count in ORS prepared with the piped-supply water and with pond water of high bacterial count. Vibrio cholerae at concentrations of 10^3 and 10^4 per ml were killed between 1 and 2 h in 500 µg/ml of alum potash. Alum potash at a concentration of 1 mg/ml killed V. cholerae in water in less than 1 h. Escherichia coli from stool (10^3 and 10^4 per ml) had the same survival time in presence of 500 µg/ml of alum potash. The pH of ORS fortified with 500 µg/ml alum remained at 6.4. ORS made from well water or pond water, with or without alum potash, did not vary markedly in ionic concentration. Changes in $NaHCO_3$ level were within allowable limits. There were sharp decreases in the total bacterial counts in ORS made with water collected from different sources and when fortified with 500 µg/ml of alum potash. Since diarrhoeal diseases are often caused by contaminated water, treating water before drinking or making ORS with alum potash during epidemics in rural or urban areas should decrease diarrhoeal morbidity and mortality.

Ahmad S. Role of water quality on diarrhoeal diseases in some villages of central Thailand. Bangkok: Asian Institute of Technology, 1974. (Master's thesis)

Ahmed QS see Khan MU

Ahmed QS see Spira WM

Ahmed S see Briscoe J

Ahmed S see Martin AR

Ahmed SZ. Water studies in connection with cholera epidemics. East Pak Med J 1963 Jan;7(1):13-5

The association of water use with outbreaks of cholera epidemics is reported. The Pakistan-SEATO Cholera Research Laboratory (now International Centre for Diarrhoeal Disease Research, Bangladesh) conducted the research. The water sources suspected to be closely associated with actual cholera cases were investigated. Surveillance studies on the chemical nature of the water samples revealed that some tanks, particularly in dry season, showed very high pH levels, favorable for the growth of classical Vibrio cholerae rather than other gastrointestinal organisms. Since recovery of cholera vibrios from such tanks during an epidemic period was not possible, the effect of pH on Vibrio cholerae was not established. Non-cholera vibrios were found throughout with varying frequency. Nearly 700 water samples from all sources were examined, and 300 vibrios were isolated, of which only 10 were true cholera vibrios. These comprised 3.3% of the vibrios isolated and 1.4% of the total number of water samples examined. Ten classical cholera vibrios were found, all of the Inaba strain; 4 were found in dug wells of affected households, and from a drying ditch and 5 from water stored in affected households. One cholera Vibrio was isolated from a pitcher of a non-affected household. Of the 300 vibrios isolated, 65% were from dug wells. Results showed that natural water reservoirs did not favor the multiplication of cholera vibrios, and that the survival period was less outside the water body under the atmospheric conditions than inside (maximum 3 and 12 days respectively). It was seen that the starch concentrate of cooked rice served as a good medium for V. cholerae either when neutralized to pH 7.0 or after addition of 0.1% NaCl.

Ahmed SZ see Benenson AS

Ahuja S see Aggarwal P

Al-Dulaimi M see Ghannoum MA

Alim ARMA see Black RE

Alim ARMA see Boyce JM

Alvero M see Azurin JC

Anderson KE see Black RE

Anderson LJ see Wilson R

Anderson MN. Health and nutrition impact of potable water in rural Bolivia. J Trop Pediatr 1981 Feb;27(1):39-46

Angelo LA see Kirner JC

Araujo JG see Shields DS

Arbab DM, Weidner BL. Infectious diseases and field water supply and sanitation among migrant farm workers. Am J Public Health 1986 Jun;76(6):694-5

Arora MM see Parekh P

Arora R see Parekh P

Arrhenius E. Health aspects of multipurpose use of water. Ambio 1977;6(1): 59-62

Arsic B see Sokolovski B

Ascoli W see Bruch HA

Atchley FO see Schliessmann DJ

Attia S-E-DM see Weir JM

Avital J see Djerassi L

Aye T see Han AM

Aziz KMA, Hasan KZ, Patwary MY, Aziz KMS, Rahaman MM. Acceptability of water-sealed latrines in Mirzapur: a rural area of Bangladesh. In: Islam AS, Haq MM, Ameen M, Ahmed N, Haque S, eds. Proceedings of the Regional Seminar on Protecting the Environment from Degradation, Dhaka, 13-16 May 1985. Dhaka: Science & Technology Division, Ministry of Education, Government of Bangladesh, 1985:166-71

Highlighted here are aspects related to the acceptability of water-sealed latrines by the people of Mirzapur, a rural area of Bangladesh. The study population, consisting of 798 mainly agricultural households, were selected by the International Centre for Diarrhoeal Disease Research, Bangladesh in 1985. These households are located in 2 villages covering 16 "paras" in Mirzapur Upazila. All the study households were offered latrines for installation and use. Motivational efforts were made at the household level in 80% of the cases for the acceptance of these latrines at a subsidized rate of payment. Demonstration latrines were installed to usher awareness and acceptance amongst the remaining households. Baseline data on the distribution of households revealed that 1.8% households had water-sealed latrines and 45.4% had "kutcha" latrines. Results showed that, within 2 months, 6.14% of the households had accepted latrines with full payment. The percentage of the acceptance of latrines with part payment was 3.88%. Commitment for acceptance of latrines was made by 13.6% of the households with target dates of payments of within the next 2 months. The acceptance was found to be significantly higher for literate groups compared to those illiterate. The overall acceptance of water-sealed latrines was higher in the business and cultivator groups compared to the day laborers. When compared with the business group, the difference in

acceptance was 15.65%, while with the cultivation group it was 8%. Similar difference was also found between the skilled and day-laborer groups. The primary reason for acceptance of water-sealed latrines was stated to be the rise in 'good name' of the household. The willingness to install water-sealed latrines arose from social and psychological considerations and were not health-related.

Aziz KMA, Hasan KZ, Aziz KMS, Rahaman MM. Behavioural changes in water use following health education in a rural area of Bangladesh. In: Proceedings of the Second Asian Conference on Diarrhoeal Diseases, Calcutta, 21-24 February 1983. Calcutta: National Institute of Cholera & Enteric Diseases, 1983:63

The usefulness of health education in bringing about changes in attitudes and behavior in the community regarding water use was studied. The health education messages were developed considering the prevalent perceptions, beliefs, practices, and sociocultural traditions of the population. These messages were verbally communicated at inter-personal and group levels and through demonstration in 320 households in a rural community of Teknaf, Bangladesh. The health education messages emphasized on the exclusive use of tubewell water for all personal and domestic purposes. Baseline knowledge, attitude and practice (KAP) data were obtained by interviewing and observing 20% randomly selected households. After communicating the health education messages for 6 months, the KAP survey was repeated to estimate the compliance level. The subjects were able to appreciate the advantages of tubewell water use through knowledge acquired from this exercise. This knowledge, however, had no significant reflection on the actual practice of water use. (Modified author's abstract)

Aziz KMA, Hasan KZ, Hussain A, Patwary Y, Umra M, Aziz KMS, Rahaman MM. PARDA and some health practices in two conservative rural communities of Bangladesh. In: Rahaman MM, Aziz KMS, Rahman S, eds. Proceedings of the First Asian Conference on Diarrhoeal Disease, Dhaka, 16-20 February 1981. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1982:212-8

This article, based on field observations and in depth interviews in two rural communities of Teknaf thana in the coastal Bangladesh, focuses on parda and some health practices with a special reference to habits of defecation and water use. Viewing defecation habits and water use pattern as an expression of social norms, both women and men were analyzed from the point of view of health practices. This analysis showed that the practice of parda was responsible for differential defecation habits and water use pattern among males and females. The study revealed that the males defecated after rising from the bed in the morning. The timing for such defecation may either be before sunrise or after; but, for the sake of the observance of parda, women, since their childhood, develop the habit of defecation following sunset or before sunrise. In depth interviewing revealed certain unconventional practices of hasty defecation and cleaning of bottom, when the need for defecation by women arose during daytime. It was found that, for the sake of observance of parda, women mainly carried water from the tubewell following sunset and sunrise. When there was need for water during the daytime, women had to frequently depend on their minor children for carrying water. Observation indicated that the children were much less careful than the women in maintaining cleanliness of water during collection and transport from the collection point to their homes.

Aziz KMA, Curlin G. Role of learned behavior in the transmission of cholera.

Paper presented at the post-plenary session of the 10th International Congress of Anthropological and Ethnological Sciences, Poona, 19-21 December 1978. (Unpublished)

In transmission of cholera and other diarrhoeal diseases, learned behavior of social and hygienic customs plays an important role. A study was undertaken in a fishing and an agricultural village to elucidate patterns of learned behavior with regard to personal hygiene, with reference to the spread of cholera and other diarrhoeal diseases. Retrospective data offer a framework for discussion and future plans. In the study villages, children of the age group 4-10 and their parents were interviewed to identify the learned behavior factors which may be responsible for the transmission of cholera vibrios among the group members during the incubation period and in the acute phase of an index case. Data on the learned behavior among children included toilet practices, feeding practices, and group or individual activities done in the learning period according to age and sex. Information on the social and hygienic customs of parents followed particularly in connection with the care of children have been analyzed. Retrospective data were collected according to age and sex on the cholera-positive cases, who came from 132 villages of the vaccine trial area to the Matlab cholera hospital during 1966-1977. The study showed that it might be possible to view learned behavior separately from strictly biological factors in the transmission of cholera. Ultimately, there is a need to quantify the learned behavior factors so that required intervention studies can be undertaken.

Aziz KMA, Hasan KZ, Patwary Y, Rahaman MM, Aziz KMS. A study of the interpersonal spread of human feces in rural Teknaf of Bangladesh. In: Rahaman MM, Greenough WB, III, Novak NR, Rahman S, eds. Shigellosis: a continuing global problem; proceedings of an international conference, Cox's Bazaar, 15-20 June 1981. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1983:238-48. (Special publication, 20)

To develop health messages for community members aiming at promotion of water use following the cleaning of anal region after defecation, this study identifies the ways of transmission of human feces through fingers of the mothers of under-5 children within the context of a household. Only willing mothers from 21 different households of Teknaf, Bangladesh were observed by two female field workers for more than 12 h beginning before sunrise. Observations were limited to those aspects of hand movement which were likely to play an important role in transmitting feces among human beings. The findings of this study identified that contamination of feces was transmissible in the following ways: (1) handling of utensils, (2) serving of food, (3) serving of fruits, (4) feeding infants and children and sharing food, (5) carrying and storing water, (6) disposal of the feces of children, (7) preparation of boiled food, (8) preparation of betel-leaf with betel-nut, and (9) certain personal habits of washing oneself and one's child. This study emphasizes the need of proper handwashing after contact with feces, so that contamination does not occur through soiled fingers.

Aziz KMA see Boyce JM

Aziz KMA see Curlin G

Aziz KMA see Curlin GT

Aziz KMA see Hughes JM

Aziz KMS see Aziz KMA

Aziz KMS see Chowdhury MAR

Aziz KMS see Huq MI

Aziz KMS see Khan M

Aziz KMS see Rahaman MM

Aziz KMS see Rahman M

Aziz KMS see Spira WM

Azurin JC, Alvero M. Field evaluation of environmental sanitation measures against cholera. Bull WHO 1974;51(1):19-26

Findings of a field evaluation of environmental sanitation measures against cholera at Bacolod city in the Philippines during 1968-1972 are reported. Four communities, similar in size, geographic characteristics and demographic composition, were studied. Appropriate sanitary improvements were undertaken by the staff of the cholera research project under the supervision of a sanitary engineer in the 4 chosen communities. All 4 communities are located along with sea coast on the western edge of Bacolod city. Most of the inhabitants are fishermen, farmers, or odd-job holders. The majority were "squatter" families belonging to the poorest socioeconomic class. In each of the 4 communities, an epidemiological aide - usually a midwife or a trained person - was assigned to conduct the surveillance. She worked under a nurse supervisor. The evaluation indicator for this study was the number of bacteriologically confirmed cholera infection. After 4 and a half years of surveillance, the data showed that improvement of either water supply or toilet facilities or both was effective in reducing the incidence of cholera during the study as compared with the controls. No cases were detected in 1972 in the community (Sibuco), where both toilet and water facilities were provided. The incidence of disease was highest among the very young and lowest among the adults in all the communities. The percentage reduction of cholera incidence in the community, where toilets were provided, was 46.9%, whereas in the community in which both toilets and water supplies were provided, a reduction of 78.4% was seen. Results showed that the provision of sanitary facilities or human waste disposal and the provision of a safe water supply system can reduce the incidence of cholera, more so in places where both the facilities are available. The findings confirm the usefulness of environmental sanitation measures against cholera.

Bahl MR. Impact of piped water supply on the incidence of typhoid fever and diarrhoeal diseases in Lusaka. Med J Zambia 1976;10(4):98-9

The impact of piped water supply on the incidence of typhoid fever and diarrhoeal diseases in Lusaka, Zambia is discussed. Stand pipes were provided in the city so that all the residents had an access to pure drinking water. The cases of typhoid fever between 1970 and 1975 were notified in this paper. The figures of incidence of diarrhoeal diseases were obtained from the urban health centers and clinics in the city from 1972 to 1975. In 1970, the population of the city was 278,000, and the number of cases of typhoid fever was 24; the incidence per 100,000 of population was 9. In 1975, the population

rose to 450,000 when the number and incidence of typhoid fever, respectively, were 4 and 0.8 per 100,000 of population. In 1972, the population was 363,000, and the number of cases of diarrhoeal diseases was 122,833 with incidence per 1,000 population being 338; in 1975, the population was 450,000, and the number of diarrhoeal cases was 95,244, the incidence per 1,000 of population standing at 212. The data for both typhoid fever and diarrhoeal disease from 1970 to 1975 were evaluated. The provision of piped water supply, though on a communal basis, to the residents of the self-help settlements in the urban and peri-urban areas of the city had reduced the incidence of diarrhoeal diseases in the city.

Baine WB, Herron CA, Bridson K, Barker WH, Jr., Lindell S, Mallison GF, Wells JG, Martin WT, Kosuri MR, Carr F, Voelker E, Sr. Waterborne shigellosis at a public school. Am J Epidemiol 1975;101(4):323-32

This paper describes an outbreak of waterborne shigellosis occurred in November 1972 at a public school in Iowa, USA. One hundred ninety-four (72%) of the 269 students and 14 (61%) of the 23 staff members were affected. A case of Shigella sonnei infection in a young woman in Stockport, Iowa is also reported. Later, 11 of the 12 school students, who shared the school's water supply, developed gastrointestinal illnesses within 4 days. Two of these 11 had S. sonnei. The families of the index case, students, and staff at the middle school were surveyed by questionnaire regarding daily consumption of school water and their gastrointestinal illnesses. In addition, symptomatic and asymptomatic students, faculty members and basketball players had submitted rectal swabs for examinations. Some 194 students and 14 staff members reported gastrointestinal illnesses showing attack rates of 72% and 61% respectively. Rectal swabs were positive for S. sonnei in 96 of the 123 symptomatic students and 3 of the 6 symptomatic staff members. Thirteen of the 23 asymptomatic students were positive for S. sonnei. All 8 isolates were resistant to ampicillin, streptomycin, sulfathiazole, and tetracycline. They were untypable by colicin production, but shared a common colicin sensitivity pattern. Cases of shigellosis were also reported. The attack rate for household contacts of staff was not significantly lower than the rates reported for the contacts of students. The relative high attack rates for young children reflected their inattention to hygiene and frequent physical contact with other children.

Baker IA see Jephcott AE

Baldwin G see Cairncross S

Bannaga SEI, Pickfold J. Water-health relationships in Sudan. Effl Wat Treat J 1978;18:560-9

Bantic Z, Dezelic N, Preka N, Zebec M. [Health aspects of village water supply]. Lijee Vjesn 1978 Nov;100(1):728-31

Barker WH, Jr. see Baine WB

Barker WH, Jr. see Merson MH

Barnyen L see Sakdisiwasdi O

Barrell RAE, Rowland MGM. Infant foods as a potential source of diarrhoeal illness in rural West Africa. Trans R Soc Trop Med Hyg 1979;73(1):85-90

The numbers and types of potential gut pathogens were determined in foods consumed by children during their first 18 months of life at Keneba, the Gambia. Two hundred ninety-four food samples were examined between March and December 1977. Samples were collected in the mornings, afternoons and in the evenings and tested from 0 to 8 h after preparation. Locust bean and soured milk contained Escherichia coli in samples of 0.1 g. Counts of Bacillus cereus were found in excess of 10^6/g in 2 samples. Salmonella was detected in one, while another contained $2x10^6$ Clostridium welchii. Isolation rates for E. coli were 34.9% in the wet season and 6.8% in the dry season for all foods sampled within 1 h of preparation. B. cereus was detected in 53.3% of the wet season 'fajiringo' samples and 29.2% of the dry season samples tested more than 8 h after preparation. One dry season 'fajiringo' contained 10^5 Staphylococcus aureus in a 1-g sample. Salmonella was detected in one dry season sample of 'fajiringo'. A higher proportion of wet season foods contained unacceptable levels of potential pathogens when compared with those of the dry season. A high count in a freshly cooked food was indicative of inadequate cooking and poor hygiene. The well water at Keneba was found to be heavily contaminated with fecal coliforms. It is suggested that the poor bacteriological quality of infant foods is a casual factor for weanling diarrhoea.

Barrell RAE, Rowland MGM. The relationship between rainfall and well water pollution in a West African (Gambian) village. J Hyg (Camb) 1979 Aug;83(1): 143-50

Water pollution was monitored in 6 Gambian village wells over a 8-month period spanning the 5-month monomodal rains and the pre- and post-rain dry periods. Fecal coliform and fecal streptococci counts were high throughout with a massive observed increase associated with the onset of the rains, maximum counts exceeding $5x10^5$/100 ml. This pattern was sustained throughout the rainy season. Some individual variations in patterns of pollution could be ascribed to well design, in particular the lining of the shaft, but no well was protected from the seasonal increase in fecal pollution. The source of the increased pollution appeared to be a flushing-in of fecal material of indeterminate or mixed human and animal origin, probably over considerable distances. Peaks of pollution not associated with rainfall episodes could have resulted from the practice of communal laundering in the near vicinity of the wells. The individual use of ropes and buckets to extract water is a continual potential source of introduced contaminants. Specific pathogens, including Salmonella spp., were isolated only intermittently. Attention is drawn to a problem complicating the standard method for assessing fecal streptococci counts.

Barrell RAE see Rowland MGM

Bart KJ see Mosley WH

Barua D, Burrows W, eds. Cholera. Philadelphia: Saunders, 1974. xvii, 458 p.

Barua D. Survival of cholera vibrios in food, water and fomites. In: Principles and practice of cholera control. Geneva: World Health Organization, 1970:29-31. (Public health papers, 40)

Bashford DJ, Donovan TJ, Furniss AL, Lee JV. Vibrio cholerae in Kent [letter]. Lancet 1979 Feb 24;1(8113):436-7

In a search for Vibrio cholerae in surface waters in Kent, UK, the organisms

were found in a number of sites. Their incidence appeared to be related to water temperature, isolation being more common in the summer months. Some isolates were from streams, where there was a possibility of sewage contamination. One site, extensively studied in the preliminary work, yielded strains of V. cholerae of several different serovars in large numbers. This site was an agricultural drainage ditch, where the possibility of sewage contamination was negligible. Amongst the V. cholerae isolated, there were some of the 01 serovars - typical cholera vibrios of the Ogawa subtype. The phage-typing pattern of these cholera vibrios was similar to that of some of the old classical strains and thus differed from that of the El Tor strains usually isolated from human cases in current studies. Tests, carried out on strains of V. cholerae isolated from the ditch, showed that, with one exception, all strains were completely non-toxigenic. No human cases of Vibrio infection were known in Kent at the time of this isolation, which made it difficult to explain their presence in the environment. It was clear from the study that the vibrios occurred there naturally in the environment.

Beasley RP see Rosenberg ML

Beck MD, Munoz JA, Scrimshaw NS. Studies on diarrheal diseases in Central America. I. Preliminary findings on cultural surveys of normal population groups in Guatemala. Am J Trop Med Hyg 1957 Jan;6(1):62-71

Findings of a preliminary epidemiological and laboratory survey on prevalence patterns of diarrhoeal disease in Guatemala are reported. With assistance from the mayor of each village, workers of the Nutrition Field Unit of the Guatemalan Public Health Department managed to gather mothers, teachers, pre-school children and school children for the study. In Guatemala city, the children in day-care centers and pediatric clinics were also included. The localities chosen varied from an elevation of less than 100 feet with a hot humid climate to an altitude of 8,399 feet with a cold dry climate. The major types of living conditions of persons included in the survey are described. Amititlan, a town with population 10,000 and Santa Maria Cauque, a small village with a population of 700 were surveyed. The prevalence rates for Shigella and Salmonella were ascertained. During October 1955-March 1956, 2,342 rectal swab cultures from children aged 0-10 years were examined. The prevalence rate of Shigella was 7.5%. Two isolations of S. dysenteriae 1 and 20 of S. dysenteriae 2 were made. Only 13 isolations of Salmonella from 2,342 specimens were reported. The overall rate of Salmonella isolation was 0.55%. Eight species were identified. A gradual decline in the prevalence rate of Shigella was noted from October to March. No conclusions regarding the seasonal pattern of Shigella infections could be drawn. The age distribution of Shigella infection varied from a low of 2.7% in the group under 1 year to a high of 11.8% in those aged 1 to 2 years. The prevalence rates were higher where the sanitary facilities were poor or lacking, where there were no closed sewage systems or where open unsewered defecation was common. Between 2 types of people of Guatemala, the Indian group had a higher prevalence rate than the Ladino group. Shigella was the major causative organism in the 12 study communities of Guatemala.

Beck MD see Hollister AC, Jr.

Beck MD see Watt J

Becker S see Black RE

Begg NT see Jephcott AE

Beliaev II. [Sanitary and health measures in the prevention of dysentery]. Gig Sanit 1972 Jun;37:23-5

Bell FS, Jr. see Greenberg JH

Benenson AS, Ahmed SZ, Oseasohn RO. Person-to-person transmission of cholera. In: Proceedings of the Cholera Research Symposium, Honolulu, Hawaii, 24-29 Jan 1965. Washington, D.C.: U S Department of Health, Education, and Welfare, 1965:332-6

Transmission of cholera by contact has been tested in several ways in the hospital ward of the Cholera Research Laboratory (now International Centre for Diarrhoeal Disease Research, Bangladesh), Dhaka, Bangladesh. The relationship between water use and intra-familial infection was studied. Families of hospitalized patients living in Dhaka were selected for study within 2 days of onset of illness in bacteriologically positive index cases. The study showed that the precise manner in which the fecal-oral spread of cholera occurs probably varied from place to place and from time to time. Person-to-person spread had not occurred in the hospital environment. Contaminated drinking water had not appeared to be a significant factor in the study population. Preliminary findings are consistent with the hypothesis that endemic cholera in Bangladesh is a variety of food infection in which water, fingers, or other factors may serve as vehicles to inoculate a widely consumed staple, such as rice. These findings point to the need for more studies of the culture and habit patterns of the populations affected by cholera.

Bennett JV see Schroeder SA

Berg G. Viral pollution of the environment. Florida: CRC Press, 1983. 241 p.

Berggren G see Thacker SB

Bertrand WE, Walmus BF. Maternal knowledge, attitudes and practice as predictors of diarrhoeal disease in young children. Int J Epidemiol 1983 Jun;12(2):205-10.

The authors assumed that a better description of the relationships between knowledge, attitude and practice, and socioeconomic and environmental factors would lead to an improved understanding of their relative importance in the transmission of diarrhoea. This paper presents findings describing the association for a number of these less documented variables to diarrhoea prevalence in under-5 children. Using data from an experimental outreach health delivery program in Cali, Colombia, this study examines 583 randomly selected women with children aged 0-4 years representing a total population of approximately 70,000. Mothers were questioned on 11 attitude indicators of maternal knowledge and practice about diarrhoeal diseases, 4 indicators of individual socioeconomic status, 3 of crowding, 3 of housing quality and 2 of family sanitary conditions. Results indicated significant elevated prevalence (X^2 analysis) with 11 variables, including knowledge of causes of diarrhoea, where and how to treat diarrhoea, housing quality, mother's age, education and civil status, type of water supply, and where parents were born. Logistic regression performed on variables with significant and near-significant prevalence findings indicated that the mother's perception of malnutrition in child, age of mother, house appearance, birthplace of mother, and the mother's

general knowledge of diarrhoea were the most important predictive variables in descending order.

Beyer MG. 1,000 million children lack safe water. XVth International Congress of Pediatrics, New Delhi, 23-29 October 1977. 6 p.

Beyer MG. Water supply, sanitation and primary health care. In: Lindstrom JD, ed. The impact of interventions in water supply and sanitation in developing countries; proceedings of a seminar, held at the Pan American Health Organization, 25-26 March 1980. Prepared by Logical Technical Services, Corp. Washington, D.C.: U S Agency for International Development, 1981:47-68

Bhadury T see Zaheer M

Bhaskaran TR, Das CR, De S, Radhakrishnan I. Chlorination of unfiltered water supply as an interim measure for control of cholera in Calcutta. In: Proceedings of the Symposium on Problems in Water Treatment, 29-30 October 1984. Nagpur: CPHER, 1965:322-36

Bhatia BD, Agarwal DK, Singla PN, Sanyal SC. Environmental factors and microbial flora in hospitalized children with diarrhoea. Indian Pediatr 1980 Apr;17:354-60

The epidemiological factors and the microbial flora of diarrhoea were studied in 120 patients, aged 3 months to 5 years hospitalized in Varanasi, India. Fifty age- and sex-matched hospitalized non-diarrhoeal children served as controls. Diarrhoea was most common in children aged under 2 (80.8%). Twelve children (12.4%) with diarrhoea and 10 (27.0%) controls were exclusively breast-fed, and supplementary milk feeds were given to 54 (54.7%) and 13 (35.1%) children in the diarrhoeal and control groups respectively. The differences were statistically significant ($p<0.05$). The storage of drinking water ($p<0.02$) and excreta disposal ($p<0.001$) were found to be significant variables. The source of water, the type of dwelling house and the presence of animals on the premises did not differ significantly in the two groups. Bacteria were isolated from 57 (47.5%) diarrhoeic patients and 7 (14.0%) controls, while parasites were found in 10 (8.8%) diarrhoeic patients and 21 (42.0%) controls. Enterotoxigenic Escherichia coli was the most common organism isolated, followed by Klebsiella pneumoniae and Pseudomonas aeruginosa in the diarrhoeal group. Mixed pathogens were isolated in significantly higher number of diarrhoeal children (20.8%) as against the control children (8.0%).

Bhatnagar S, Dosajh U. Diarrhoeal disease morbidity in children below 5 years in urban slums of Delhi. Indian J Med Res 1986 Jul;84:53-8

The incidence of diarrhoea was estimated to be 7.9 episodes per child per year, in 4 urban slums of Delhi. The highest incidence (11.9) was registered in the slums, which had the poorest sanitary conditions. As the survey was done during May and June, the estimated diarrhoeal incidence turned out to be unusually high. Morbidity due to diarrhoea was significantly related with the use of water, drawn from handpumps, uncovered drains as also habits of open defecation and the high female illiteracy rates. Knowledge and use of oral rehydration therapy by the mothers were not found to be related to their educational level. (Author's abstract)

Birzu I, Tieranu E, Zaharia C, et al. [An epidemic of bacillary dysentery

caused by the water supply in a section of the town of Craiova]. Microbiologia (Bucur) 1970 Mar-Apr;15:113-20

Bisno AL see Lobel HO

Black RE, Brown KH, Becker S, Alim ARMA, Merson MH. Contamination of weaning foods and transmission of enterotoxigenic Escherichia coli diarrhoea in children in rural Bangladesh. Trans R Soc Trop Med Hyg 1982;76(2):259-64

Through longitudinal studies of infectious diseases and nutrition in rural Bangladesh, the degree of bacterial contamination of traditional weaning was determined. The role of these foods in the transmission of diarrhoeal diseases was also ascertained. In the study households, much of the food and water given to weaning-age children had fecal contamination, as indicated by the frequent recovery of Escherichia coli in high counts from specimens. Consumption of such food and water is likely to increase the risk of acquisition of enteropathogens normally spread by the fecal-oral route. The number of E. coli in contaminated foods was generally 10 times higher than that in contaminated water. There are many possible social and cultural reasons for these higher levels of contamination. The proportion of a child's food samples that contained E. coli was significantly related to the child's annual incidence of diarrhoea associated with enterotoxigenic E. coli. This study stresses the importance of locally available foods that are hygienic as well as nutritious, as supplements to offering breast feeding children in developing countries.

Black RE, Merson MH, Rowe B, Taylor PR, Alim ARMA, Gross RJ, Sack DA. Enterotoxigenic Escherichia coli diarrhoea: acquired immunity and transmission in an endemic area. Bull WHO 1981;59(2):263-8

Household contacts of patients with diarrhoea associated with enterotoxigenic Escherichia coli (ETEC) producing heat-stable (ST) and heat-labile toxins or ST toxin only were studied in the Matlab field research area of the International Centre for Diarrhoeal Disease Research, Bangladesh. As ETEC are an important cause of diarrhoea in developing countries, attempts were made to learn more about the clinical spectrum, epidemiological characteristics and immunology of ETEC infection. This study particularly sought to find the proportion of infected persons who became ill and the variation in this proportion with age. It was found that 11% of contacts of the index cases were infected during the next 10 days, and that both the rates of infection and the proportion of infected persons with diarrhoea decreased with increasing age, suggesting the development of immunity. The proportion of persons infected was highest for children aged under 2. In the study, ETEC of the same serotype as that of the index patient were found frequently in water sources used by the index family, but not in those used by neighboring control families. It was also found in a small number of food and drinking water specimens from the index homes, and in feces from 3 healthy calves. The infection rate of household members was higher in houses where there was contaminated food or water. This suggests that important exposures leading to infection may take place in the home, when contaminated water is used for drinking or preparing food.

Black RE, Craun GF, Blake PA. Epidemiology of common-source outbreaks of shigellosis in the United States, 1961-1975. Am J Epidemiol 1978 Jul;108(1):47-52

Common-source outbreaks of shigellosis and other enteric infections have been reported to the Center for Disease Control (CDC), USA since 1961, when CDC assumed responsibility for surveillance of outbreaks of food- and waterborne illness. This report summarizes the epidemiology of food- and waterborne outbreaks of shigellosis reported to CDC in the first 15 years of the surveillance program. In 1961-1975, there were 72 foodborne and 38 waterborne outbreaks of shigellosis reported in the USA. Foodborne outbreaks were most often caused by salads with contamination attributed to poor hygiene of a food handler. Waterborne outbreaks most often involved semi-public water systems and were usually the result of inadequate chlorination of water contaminated by human feces. In 110 common-source outbreaks, 16,541 persons were ill. The attack rate for both food- and waterborne shigellosis was 47%, and the case-fatality ratio was 0.1% in foodborne outbreaks and 0.2% in waterborne outbreaks. The review of outbreaks of waterborne shigellosis suggests that proper hygiene by food handlers and refrigeration of food after it is prepared are important for the prevention of foodborne shigellosis. Disinfection and adequate protection of water from contamination are important to prevent waterborne shigellosis. Increased surveillance of swimming areas for evidence of contamination may help determine when swimming should be restricted. (Modified author's abstract)

Black RE, Dykes AC, Sinclair SP, Wells JG. Giardiasis in day-care Centers: evidence of person-to-person transmission. Pediatrics 1977 Oct;60(4):486-91

Black RE, Dykes AC, Anderson KE, Wells JG, Sinclair SP, Gary GW, Jr., Hatch MH, Gangarosa EJ. Handwashing to prevent diarrhea in day-care centers. Am J Epidemiol 1981 Apr;113(4):445-51

The positive effects of handwashing after toilet activities to prevent diarrhoea in day-care centers are reported. Four day-care centers were studied in suburban Atlanta, Georgia, USA. On 7 June 1976, the monitoring of diarrhoeal illnesses began at the 4 centers. Two of the 4 centers were considered as controls and 2 as experimental centers. After the handwashing program began in the 9th week of the study, the incidence of diarrhoea at the "handwashing centers" began to fall. The incidence of diarrhoea in the control centers was double than that in the handwashing centers during the 35-week study period. The incidence of diarrhoea among children, aged 6 months to 1½ years at the handwashing centers, was lower than that of the control centers ($\chi^2=9.2$, $p<0.001$). The newly enrolled children totalled 38 in the handwashing centers and 36 in the control centers. The incidence of diarrhoea peaked within 2 to 4 weeks after the children enrolled at the centers. During this period, diarrhoea rates were lower at the handwashing centers than those at the control centers. Stool specimens were obtained from 76 children at the handwashing centers and 92% of the children at the control centers. Giardia lamblia cysts and Yersinia enterocolitica were the only pathogens identified. Children at the handwashing centers were infected with Escherichia coli serogroup O:26. Stools from 4 of the 79 children had rotavirus particles, while one of the 33 control children had rotavirus. Adenoviruses were seen in 7 of the handwashing group and one in the control group. The results suggested that illness of the children in day-care centers followed after initial contact with other infected children. Thus a handwashing program will probably prevent at least some of these enteric infections.

Black RE, Horwitz MA, Craun GF. Outbreaks of waterborne disease in the United States, 1975. J Infect Dis 1978 Mar;137(3):370-4

Outbreaks of waterborne diseases that occurred in 1975 in the USA were compared with other such outbreaks reported during 1971-1974. In 1975 and in 1971-1974, the mean annual numbers of reported outbreaks were 24 and 25 respectively. Most outbreaks involved the semi-public water systems (67%) more than those involving the municipal (25%) or individual (8%) systems. A similar distribution of outbreaks was observed during 1971-1973. Untreated or inadequately treated water was responsible for most outbreaks. The largest outbreak in Sewickley, Philadelphia caused illnesses in 5,000 persons who were struck with diarrhoea, abdominal cramps, malaise, headache, and fever. No etiologic agent could be identified. Low levels of coliform bacteria were found in water from the distribution system along with a high bacterial population. The second largest outbreak occurred in Sellersburg, Indiana in 1975 affecting 1,400 persons. Coliform contamination (50/100 ml) of the water system has been assessed. Two outbreaks in 1975 resulted from malfunction of the disinfection equipment. Escherichia coli serotype 06:416 was isolated from stool samples of ill persons and from water samples collected from the Crater Lake National Park. An etiologic agent was found in 7 of the 24 outbreaks. Three outbreaks were caused by chemicals. Shigellosis, hepatitis and giardiasis resulted from drinking untreated ground or surface water. Two outbreaks of leptospirosis occurred from contaminated surface water. Unrecognized agents may be responsible for some outbreaks of waterborne acute gastrointestinal illness. Thorough epidemiologic and laboratory investigation of outbreaks can assist in confining and controlling outbreaks of waterborne diseases.

Black RH. Invited discussion of Dr R M Glasse's paper. In: Proceedings of the Cholera Research Symposium, Honolulu, Hawaii, 24-29 January 1965. Washington, D.C.: U S Department of Health, Education, and Welfare, 1965:340

In a discussion generated over R M Glasse's paper on "Cultural aspects of the transmission of cholera" (In: Proceedings of the Cholera Research Symposium, Honolulu, Hawaii, 24-29 Jan 1965:337-9), the author makes several comments on plausible reasons for the difference in the incidence of cholera among communities and among socioeconomic classes. The role of the epidemiologist and that of an anthropologist are clearly defined and demarcated. The author points out that if person-to-person contact in the spread of cholera is emphasized, then the low incidence of cholera at the height of the wet season might be explained by the relatively small amount of movement of people between the small but packed isolated communities. The author agrees with Glasse that, in any anthropological or epidemiological study, the features of family size and structure and their spatial distribution should be taken into account, and these factors need to be appropriately differentiated from Western family structures. It is stated that a number of observations in Glasse's paper may be relevant to differences in the incidence of cholera amongst members of different socioeconomic classes. These include the use of alum precipitation of water, the use of soap for hand cleansing, the possession of latrines, and the stricter observance of Muslim law by the rich regarding cleansing after defecation. These are rightly the items of possible significance put forward by the anthropologist for consideration by the epidemiologist. The casual defecatory behavior of children has been presented as a possible mechanism for the dissemination of the cholera Vibrio. If direct contact with the feces of young children is significant in the transmission of cholera, the anthropological findings suggest that there should be a higher incidence in women and girls, who are more exposed to such contact than males. The author, therefore, emphasizes the need of looking at the problem of transmission of

cholera from the point of view of the anthropologist, who is likely to have an assortment of field notes on the behavior of people in a cholera-stricken area. The author lays particular emphasis on the findings of the anthropologist - who studies people in a society. The epidemiologist, later, examines the findings of the anthropologist in an attempt to locate those factors which may be of significance in the transmission of disease - in this case cholera.

Blacklow NR see Hopkins RS

Blake PA, Rosenberg ML, Costa JB, Ferreira PS, Guimaraes CL, Gangarosa EJ. Cholera in Portugal, 1974. I. Modes of transmission. Am J Epidemiol 1977 Apr;105(4):337-43

For 7 months in 1974 (April-November), Portugal faced an epidemic of cholera, caused by Vibrio cholerae El Tor Inaba with 2,467 bacteriologically confirmed hospitalized cases and 48 deaths. Most of the country was affected, with 17 of the 18 districts reporting cholera cases. Studies were carried out in Tavira and Faro, 2 cities on the southern coast, and in Lisbon, to determine the important modes of transmission of cholera in Portugal. V. cholerae were isolated from 42% of the shellfish tested during the epidemic, and an epidemiologic study found that a history of consumption of raw or poorly cooked cockles was significantly more common among cholera patients than among paired controls (p=0.180). Water from a spring and a brand of commercially bottled water were associated with the transmission of cholera. Fruits and vegetables, contaminated by sewage or polluted water, were initially suspected to be the vehicles of cholera transmission, but no association was found between cholera and the consumption of these items. Probably there were other vehicles of transmission which could not be determined by the investigation.

Blake PA, Rosenberg ML, Florencia J, Costa JB, Quintino LDP, Gangarosa EJ. Cholera in Portugal, 1974. II. Transmission by bottled mineral water. Am J Epidemiol 1977 Apr;105(4):344-8

The outbreaks of cholera in Portugal in 1974 are reported. The Centers for Disease Control, USA and the Lisbon Health Department, Portugal conducted subsequent epidemiologic investigations to determine if water from the springs had caused cholera in visitors to the resort or in consumers of the bottled spring water. In August 1973, the national public health laboratory reported that Vibrio cholerae had been isolated from the water samples from both springs. The springs and the bottling plant were ordered closed, and the marketed bottled water was recalled. In July 1974, the Lisbon District Health Department began a new investigation on cholera patients. Sixteen cases of cholera occurred in residents who visited, worked, or lived near the spring. Thirty-six of the July-September cases were visitors to the spring from other places. During August, the attack rate for the 14,000 visitors from other counties in Lisbon District was 2.57/1000, while for residents of those counties who did not visit the location, the attack rate was only 0.25/1000. The risk of cholera for visitors to the spring during August relative to the risk for non-visitors was 10.3. Results showed that the mineral water was contaminated with cholera vibrios. Thirteen cholera patients and 2 controls had consumed non-carbonated brand A bottled water (p=0.003). The relative risk was with 12. The patients who drank non-carbonated brand A water consumed an average of 2.3 l per week. Consumption of carbonated brand A bottled water was not associated with cholera. The study showed that non-carbonated mineral water was a vehicle of transmission of cholera. Portuguese health authorities

took specific measures to reconstruct the bottling plants and make available safe water for drinking.

Blake PA see Black RE

Blake PA see Lawrence DN

Blake PA see McIntyre RC

Blaser MJ. Environmental interventions for the prevention of travelers' diarrhea. Rev Infect Dis 1986 May-Jun;8(Suppl 2):S142-50

The diarrhoeal illnesses affecting travelers to areas with low standards of hygiene are due to exposure to microbial agents not in wide circulation in the travelers' home area. A major objective for the prevention of travelers' diarrhoea should be to minimize exposure to these infectious agents. Studies of sporadic and epidemic travelers' diarrhoea have shown that contaminated food and water are usually the most important vehicles for transmission of these agents. Travelers must know which foods and water sources to avoid and which they may reasonably be assured are safe. Also, methods for disinfecting potentially contaminated sources must be simple and practical. Acceptable methods for ensuring the safety of food and drink are amply documented in the literature. However, although the consumption of certain foods and beverages is clearly associated with an increased risk of developing travelers' diarrhoea, in some retrospective studies adherence to strict dietary rules generally did not appear to diminish the incidence. Despite these findings, whose validity may have been weakened by study design flaws, careful attention to the preparation and choice of food and beverage is recommended for prevention of both diarrhoeal and non-diarrhoeal illnesses. (Author's abstract)

Blum D, Feachem RG. Measuring the impact of water supply and sanitation investments on diarrhoeal diseases: problems of methodology. Int J Epidemiol 1983;12(3):357-65

A review of the published literature on the impact of water supply and/or excreta disposal facilities on diarrhoea or related infectious diseases, reveals several methodological problems that hamper the drawing of definitive conclusions from these studies. This paper examines 8 of these methodological problems: lack of adequate control, the one to one comparison, confounding variables, health indicator recall, health indicator definition, failure to analyze by age, failure to record facility usage, and the seasonality of impact variables. The impact evaluation may yield useful results for planners and resource allocators if the methodological problems discussed here are taken into account in the execution of the study, and the factors influencing allocation are recognized and controlled. It is suggested that an evaluation of the impact on health of environmental interventions may best be undertaken by the combined efforts of engineers, social scientists and epidemiologists in 'opportunistic' settings and that the intervening behavioral processes so necessary for health impact to occur should be a primary focus of such evaluations. In addition to concentrating on opportunistic settings, it is often preferable to study a limited selection of health and environmental variables in the context of a very specific hypothesis about how a given intervention may affect a given infection.

Boghitoiu G, Bogus L, Gusita C, et al. [Waterborne epidemic of bacillary

dysentery in a hospital]. Microbiol Parazitol Epidemiol (Bucur) 1971 Jul-Aug;16:331-8

Bogus L see Boghitoiu G

Boot MT. "Making the links"; guidelines for hygiene education in community water supply and sanitation, with particular emphasis on public standpost water supplies. The Hague: IRC International Reference Centre for Community Water Supply and Sanitation, 1984. 82 p.

Borden HH, Harris RW, Mosher WE. A waterborne outbreak of gastroenteritis in western New York State. Am J Public Health 1970 Feb;60(2):283-9

An outbreak of waterborne gastroenteritis in western New York State in the USA is described. A survey of 622 individuals was carried out in the study village near Buffalo and surrounding areas. A sample of 157 individuals, supplied by a different water supply system, was surveyed as a control population. About 60% of the population surveyed used their own well water, while 40% were supplied by the suspect water system. Local physicians, hospitals, nursing homes and public schools were also surveyed. A questionnaire was administered to all individuals in the household. Symptoms of the disease, such as nausea, abdominal pain, and diarrhoea of 24-72 h duration, were the same in the study and in the control populations. The onset of disease was quite variable. A secondary attack rate could not be determined. The group most affected was aged between 10 and 14 years. The one to 19-year age group showed higher incidence rates than older groups. Of the 622 individual surveyed, 184 were found to be ill. The illness attack rate was 29.6%. The household attack rate was 51.3%, and an intra-household attack rate was 49.7%. The control population was examined in a similar fashion. The attack rate among the control group was 16.6%; the household attack rate was 37.5%. No particular water line or branch could be suspected, since the source of disease was traced to food and milk. No pathogenic organisms were found. The characteristics and distribution of this illness pointed to the waterborne nature of this outbreak.

Boring JR, 3d see Drachman RH

Boulos C see Thacker SB

Boyce JM, Hughes JM, Alim ARMA, Khan MU, Aziz KMA, Wells JG, Curlin GT. Patterns of Shigella infection in families in rural Bangladesh. Am J Trop Med Hyg 1982 Sep;31(5):1015-20

To assess the transmission mode of Shigella infection in rural Bangladesh, questionnaire and culture surveys were conducted in "baris" (neighborhoods), where people with Shigella-associated diarrhoea and index controls with non-Shigella diarrhoea lived. In Shigella baris, 19% and, in control baris, 7% of the people were infected during the survey periods ($p<0.001$). Prevalence of Shigella infection was highest for children aged 1-9 years and for females aged over 39, and was unrelated to socioeconomic status, family size, or household crowding. Use of surface water for drinking was not a risk factor. In fact, use of river water was more frequent in control baris. Both household and bari contacts of Shigella index cases frequently excreted different serotypes from that excreted by the index case. In Shigella baris, families with infection were significantly more likely than uninfected families to have a history of an overnight stay away from home by a family member during the previous week.

These observations suggest that there are multiple introductions of Shigella into some families, and that the epidemiology of Shigella infection for rural Bangladesh families differs from that observed for families living in more industrialized countries.

Boyce JM see Hughes JM

Boyer KM see Merson MH

Boyle J see Rubenstein A

Bradford H see Colwell RR

Bradley D see Cairncross S

Bradley DJ. Health problems of water management. J Trop Med Hyg 1970 Nov;73:286-94

Bradley DJ. Infective disease and domestic water supplies. In: Tschannerl G, ed. Water supply; proceedings of the Conference on Rural Water Supply in East Africa, Dar es-Salaam, Tanzania, 5-8 April 1971. Dar es-Salaam: University of Dar es-Salaam, Bureau of Resource Assessment and Land-use Planning, 1971:115-30. (Research paper, 20)

Bradley DJ, Emurwon P. Predicting the epidemiological effects of changing water sources. I. A quantitative approach. East Afr Med J 1968 May;45(5):284-91

This work reports on the ways of determining the effect of changes in the sources of water on disease. Means of detecting the extent of pollution of water bodies are also discussed. The patterns of disease are observed before and immediately after the changes in the sources of water. The principal ways in which infective human fecal wastes reach the sources of water are identified in relation to the mechanism of movement of specific pathogens. Results of field studies on fecal coliform levels of surface water at various locations in 3 regions of East Africa are reported. Over 90% of the 161 isolates tested showed the presence of Escherichia coli type 1. Major findings are explained through logarithmic histograms of the distribution of fecal coliforms in water bodies. Small ponds in Mwanza contained coliform counts under 1,000/100 ml in most cases. Fecal coliform counts, as found from water samples from 2 large rivers, Pasiansi and Mirongo, are compared, and possible reasonings are given for the differences observed. It was seen that the levels of pollution were higher in urban streams. It was evident that the crude dug well did appear to reduce pollution. Efforts by sanitarians to protect springs from pollution have proved successful as evidenced by coliform count variations in protected and unprotected sources. Environmental hygiene is very important, and conscious efforts are recommended to protect the sources of water from contamination. Mild pollution of a large common source tended to have greater epidemiological repercussions than heavily polluted small sources having little consumption. Treating water and boiling it before household use has been emphasized. The leading factors that complicate epidemiological interpretation of coliform indices of small sources are also discussed.

Bradley DJ. Water supplies: the consequence of change. In: Elliott K, Knight J, eds. Human rights in health. Amsterdam: Elsevier, 1974:81-98. (Ciba Foundation symposium, 23 [new series])

Bradley DJ, Feachem RG. Water supplies, sanitation and diarrhoeal diseases. Scientific Working Group on Environmental Health and Diarrhoeal Disease Prevention, Kuala Lumpur, 3-6 July 1979. Geneva: World Health Organization, 1979. 34 p.

Bradley DJ see Feachem RG

Bradley DJ see White GF

Bradley RM. Basic sanitation in developing countries: survey of water use in a low income urban area in the Middle East. R Soc Health J 1980;100(2):67-71

The existing supply and excreta disposal facilities in developing countries are discussed in the backdrop of financial implications of the International Drinking Water and Sanitation Decade. It appears from the work carried out to date that the provision of 40 to 50 l per head would be a reasonable target to aim towards attaining meaningful health benefits from increased investment in water supply facilities, together with a reliable method of excreta disposal. There are wide variations in water consumption rates depending upon social customs and upon the cost of buying water, and also on its availability. The water use from stand pipes is most often influenced by the carrying distance. Findings of a sample survey carried out in a low-income urban area in the Middle East in 1979 are given. The lack of an adequate quantity of water and excreta disposal system was found to cause water-washed diseases. As for excreta disposal facilities, it is concluded that in-house water supply should not be provided without sewerage; seepage trenches were found acceptable for excreta disposal, while sullage disposal to the ground could be adequate under certain suitable conditions. The International Drinking Water and Sanitation Decade target represents a considerable financial investment. Since families in developing countries could afford to spend no more than 20% of their household income on water supply and excreta disposal facilities, the financial difficulties may be met by other funds for improving these essential services.

Brady PG, Wolfe JC. Waterborne giardiasis. Ann Intern Med 1974 Oct;81(4):498-9

A case of giardiasis of an otherwise healthy 44-year-old woman, who had not traveled extensively, is described. She was admitted to the Ireland Army Hospital on 27 August 1973 with diarrhoea of one month's duration, watery bowel movements, numbering up to 20 per day, accompanied by tenesmus or at times with traces of blood and with vague abdominal discomfort. Mucosal edema and lymphoid hyperplasia were found by small bowel biopsies. Giardia lamblia trophozoites were found in the mucus. Treatment began with 250 mg of metronidazole, given orally 3 times daily for 14 days. Three weeks later, the patient complained of 6 to 10 watery bowel movements per day. A course of quinacrine hydrochloride, given 100 mg orally 3 times a day for 10 days, brought no improvement. On 30 October, the patient was readmitted. She had no weight loss, and associated complaints were limited. On 2 November, a repeat small bowel biopsy showed normal jejunal histology. Mucus was negative for Giardia. The patient was given "metamucil" and diphenoxalate after which the diarrhoea decreased to 4 formed bowel movements per day. But in January 1974, the patients' stools again turned watery and were more frequent (10 per day) with G. lamblia cysts present. A second course of the same drugs was given for 10 days. Two weeks later, her stool movements fell to only 4 per day. Stools then showed negative for G. lamblia. The source of infection was found to be the water supply from an underground cistern of the patient's farm. The water

contained G. lamblia trophozoites. Stools of 5 of the 10 family members contained G. lamblia. In October 1973, the cistern was treated with bleaching powder. In the follow-up examination of January 1974, water samples from the cistern did not show the presence of G. lamblia.

Bridson K see Baine WB

Briscoe J, Ahmed S, Chakraborty M. Domestic water use in a village in Bangladesh. I. A methodology and a preliminary analysis of use patterns during the "cholera season". Prog Water Technol 1979;11(1-2):131-41

A more subtle understanding of existing water use patterns and preferences is important to predict who will use a particular new source and for what purpose they will use it. Using consumer behavior theory, a method was, therefore, developed for formally analyzing how people choose water sources for different domestic uses. A preliminary analysis of data collected from a Bangladeshi village during the months of November, December and January, the traditional "cholera season" has been presented. Although the results were incomplete, there were some policy implications. It is initially suggested that a program for constructing "ghats" (a structure providing access to water source) at ponds may induce beneficial changes in water use habits. The formal analysis, however, suggests that such a program would have little effect on water use patterns.

Briscoe J, Feachem RG, Rahaman MM. Evaluating health impact: water supply, sanitation, and hygiene education. New York: UNICEF, 1986. 80 p.

Briscoe J. Intervention studies and the definition of dominant transmission routes. Am J Epidemiol 1984 Sep;120(3):449-55

A common approach to assessing the relative importance of different transmission routes is to eliminate transmission through one route and assume that the ratio "number of cases eliminated: number of residual cases" measures the relative importance the eliminated route vis-a-vis the residual transmission route. A quantitative model is used to generate synthetic data similar to those analyzed by epidemiologists. These data are analyzed using this conventional procedure and the inferences drawn from the synthetic data compared with the causal relationships structured into the model. The implications for the analysis of real-world data are analyzed by examining data on the importance of water and other transmission routes for cholera in Bangladesh. (Author's abstract)

Briscoe J, Feachem RG, Rahaman MM. Measuring the impact of water supply and sanitation facilities on diarrhoea morbidity: prospects for case-control methods. Geneva: World Health Organization, 1985. 71 p. (WHO/CWS/85.3; CDD/OPR/85.1)

Epidemiological studies of the effect of water supply and sanitation facilities on diarrhoeal disease using the conventional prospective methodologies face formidable problems. They require very large sample sizes, require many years to complete and face a variety of serious validity problems. An alternative approach, using a case-control study design, is proposed. Methods for dealing with some of the major potential problems due to misclassification and selection biases are outlined. The approach is feasible and that it overcomes many of the more serious defects in standard health impact evaluation designs. Specifically, the required sample sizes are an order of magnitude less than

those required in the standard designs; the studies can be initiated after a project is functioning effectively and is used appropriately by the population; the ethical problems encountered in withholding improved facilities from study populations are absent; the results of the study can be available within a year of initiation of the evaluation; and the resource requirements of the studies are modest. It is proposed that detailed protocols for case-control health impact evaluations of water and sanitation facilities be developed and tested in developing countries, preferably in the context of ongoing diarrhoeal disease research projects. It is hoped that, after the development and testing of such protocols, it will be possible to develop general guidelines for the conduct of case-control studies of the impact of water supply and sanitation facilities on morbidity due to diarrhoeal diseases. (Author's abstract)

Briscoe J. Public health in rural India: the case of excreta disposal. Cambridge: Center for Population Studies, Harvard University, 1976. xix, 414 p. PhD Thesis. (Research paper, 12)

Briscoe J. The role of water supply in improving health in poor countries (with special reference to Bangladesh). Am J Clin Nutr 1978 Nov;31(11):2100-13

Findings from a limited set of studies on water supply and diarrhoeal diseases, conducted in a rural area of Bangladesh, are reported. Some hypotheses have been offered to explain the unexpected and contradictory findings. These hypotheses are: 1) the use of tubewell water for drinking does not protect individuals against cholera; 2) cholera in rural Bangladesh is not primarily a waterborne disease; 3) the small amount of protection afforded by drinking bacteriologically safe water is overwhelmed by the exposure to polluted surface water through bathing, food preparation, and utensil washing; 4) in families who are tubewell users, there may be individuals who do not drink tubewell water, and they constitute the group that is most susceptible to cholera; and 5) those who use water from "disconnected" tanks for their surface water requirements are likely to have lower cholera attack rates than those who use canal or river water for drinking, cooking, bathing, and utensil washing. The policy implications of studies on water supply and cholera, the use of cholera as a model for water-related diseases, the use of "intermediate variables" in research and planning, and the specification of water supply standards for different water uses have been discussed. In water supply policy, the fundamental need appears to be a reorienting and restructuring of the decision-making process. The continuation of traditional water use habits even when people of developing countries are presented with alternative sources of pure water is generally ascribed to the "ignorance of the uneducated masses". The prescription then becomes education of the ignorant and the identification of the communication barriers. The importance of decision-making on issues relating to water improvement program has been stressed.

Briscoe J. Water supply and health in developing countries: selective primary health care revisited. Am J Public Health 1984;74(9):1009-13.

Briscoe J. Water supply and health in developing countries: selective primary health care revisited. In: Proceedings of the International Conference on Oral Rehydration Therapy, Washington, D.C., 7-10 June 1983:141-50

Brisou J. An environmental sanitation plan for the Mediterranean seaboard: pollution and human health. Geneva: World Health Organization, 1976. 96 p. (Public health papers, 62)

Britt B, Kourany M, Millar JW. A pilot search for environmental factors influencing diarrheal disease in young children in Panama. J Trop Pediatr Environ Child Health 1973 Sep;19:282-7

This study was conducted during July-August 1970 in Panama to observe and relate various factors in the environment of young children which may influence specific types of diarrhoea. Children with diarrhoea reporting to a Children's Hospital in San Miguelioto were included in the study. Seventy medical records were collected from the 3 health facilities: emergency room ward, medical ward, and the pediatric health clinic of the hospitals. Thirteen personal interviews were taken from the mothers of children from one of the 3 health facilities. No unusual trend of diarrhoeal disease was noted during the 3 weeks in August. Most children were malnourished. Chronic health problems were indicated. Treatment with kaomycin, penicillin, and 'kantrex' could not achieve full recovery of diarrhoea. The general living conditions of the families were examined. Evidence was noted of the many possibilities for direct and indirect transmission. These possibilities involved storage and preparation of water, milk, and other foods used in bottle feeding of the child. Contamination by air and use of a common cup are 2 additional modes of possible disease spread. Panamanian containers and earthenware jars appeared contaminated. All of the children, aged under 2, in 13 families were transferred from breast to bottle before the normally recommended time of 6 months. Some cultural practices and types of milk used may present problems. In a future study, the possibility exists for diagnosing the specific type of diarrhoea and relating it to environmental factors for poor health status, food contamination from specific microorganisms, or specific disease. Use of boiled drinking water is emphasized.

Brodsky RE see Shaw PK

Brown KH see Black RE

Bruch HA, Ascoli W, Scrimshaw NS, Gordon JE. Studies of diarrheal disease in Central America. V. Environmental factors in the origin and transmission of acute diarrheal disease in four Guatemalan villages. Am J Trop Med Hyg 1963 Jul;12(4):567-79

Various environmental factors in the origin and transmission of acute diarrhoeal disease in 4 Guatemalan villages in Central America are discussed. The acute diarrhoeas and dysenteries of infancy and early childhood predominate among intestinal disorders of Guatemalan highland villages. Weaning practices along with malnutrition may be the causes of weanling diarrhoea. Transmission is mainly by direct contact, highly favored by the habits and customs of the people and also indirectly by food contaminated by the environment or through the agency of other family members. The findings revealed that the 2 populations, one of 1,164 and the other 3,147, of the Central Guatemalan highlands in the study, differed epidemiologically. The results showed a preponderance of diarrhoeal disease among children aged 0-5 years, the rate being 66.3 per 100 per year. The frequency among school children was much less, 9.2%, and only few cases occurred among adults. Almost two-thirds of the households struck by gastrointestinal disorders were invaded by diarrhoeal disease one or more times during the year. The likelihood of repeated attacks during a year was greater for large families. When the family had 4 to 6 members, 71% had diarrhoea, and 88% were affected when parents and children together exceeded 7 persons. As many as 14 separate epidemics occurred during the year in one family of 19 persons. The secondary attack rate was only 1.4%,

indicating that most of the family members were immune. The seasonal distribution of cases and of deaths reached its height in the dry period of the year (March or April). In highland Guatemala, the seasonal migration of the village people provides fresh reservoirs of infection that result in a high endemic prevalence of acute diarrhoeal disease with frequently interposed epidemics.

Brutus M see Thacker SB

Buehler JW see Goodman RA

Bunyarathapan P see Vathanophas K

Burns E see Feachem RG

Burr ML, Davis AR, Zbijowski AG. Diarrhoea and the drought. Public Health (Lond) 1978 Mar;92(2):86-7

Burrows W see Barua D

Cairncross AM see Feachem RG

Cairncross S, Carruthers I, Curtis D, Feachem R, Bradley D, Baldwin G. Evaluation for village water supply planning. Chichester: Wiley, 1980. xviii, 179 p.

Caldwell JR see Schroeder SA

Cardenas M. Rural water supply and sanitation education in Paraguay. Assign Child 1979;(45/46):109-20

Carlisle MS see Georgi ME

Carr F see Baine WB

Carruthers I see Cairnoross S

Cechowicz L see Gawronowa H

Chakraborty AK, Das JC. Comparative study of incidence of diarrhea among children in two different environmental situations in Calcutta. Indian Pediatr 1983 Dec;20(12):907-13

One hundred under-5 children in a Calcutta, India slum and an equal number of age-matched children in the Calcutta Metropolitan Development Authority's multi-storeyed buildings, were followed up for 10 months during 1981-1982. All were from a low-socioeconomic class, but those in the Calcutta Metropolitan Development Authority buildings had better sanitary facilities. The average numbers of diarrhoea episodes per child in the slum and in the Calcutta Metropolitan Development Authority housing were 1.6 and 1.4 respectively, indicating no significant difference. Incidence was highest among infants and declined sharply after ages 3 and 2, respectively, in slum and Calcutta Metropolitan Development Authority buildings. Provision of running water and latrines did not reduce the incidence of diarrhoea. However, such incidence declined in both types of housing, with increasing educational level of

mothers. Moreover, at both sites, the incidence of diarrhoea was lowest (0.8 and 0.9) among children whose parents had good knowledge of health, and was highest (1.9 and 1.8) among those whose parents' knowledge was poor. Attack rates were 89.8% and 86.0% among malnourished children, compared to 64.7% and 64.9% for normal children, respectively, in slum and Calcutta Metropolitan Development Authority buildings. The differences were significant ($p<0.01$ in slum, and $p<0.05$ in the buildings). Partially breast-fed children suffered more than did the fully breast-fed.

Chakraborty J see Khan MU

Chakraborty M see Briscoe J

Chan-Teo CH see Shum H

Chandler AC. A comparison of helminthic and protozoan infections in two Egyptian villages two years after the installation of sanitary improvements in one of them. Am J Trop Med Hyg 1954 Jan;3(1):59-73

Comparative surveys were made of helminthic and protozoan infections in 2 Egyptian villages located close together. One, Sindbis, had bored-hole latrines installed in most houses, and also had an unpolluted water supply system made available for the entire population 2 years ago, while the other, Aghour El Kurba, had been left as it was. In Aghour El Kurba, the incidence of Ascaris was 76%, and the average eggs per g among those infected 6,900. The corresponding figures in Sindbis were 50% and 4,200. The results indicated a definite lowering of exposure to Ascaris infection in Sindbis as a result of the sanitary improvements. The incidence of Ancylostoma for males and females was also higher in Aghour El Kurba (42% and 17% respectively) as compared to that in Sindbis (12% and 7%). Light Trichostrongylus infections were very common, 29% in Sindbis and 40% in Aghour El Kurba, reflecting the close association with animals in the homes. Trichuris infections were few, and Hymenolepis nana was found in only 7% of the people examined. No difference in the incidence rates of various species of protozoa was found between the 2 villages, and the average number of different infections harbored per person (2.3) was identical in both places. The failure of the sanitary improvements in Sindbis to be reflected in a lower incidence of protozoan infections may be due to loss of very few of the infections that were in existence 2 years ago.

Chandler AC. An evaluation of the effects, after two years of sanitary improvements in an Egyptian village. J Egypt Med Assoc 1953;36:357-67

Chang W see Hung T

Chang X see Hung T

Chao T see Hung T

Chaparwal BC see Parekh P

Cheever FS. Dysentery outbreak aboard naval vessels in San Pedro Bay, Philippine Islands. U S Naval Med Bull 1946;46:479-94

Chen G see Hung T

Chen L see Cvjetanovic B

Chen LC. Evaluating the health benefits of improved water supply through assessment of nutritional status in developing countries. In: Underwood BA, ed. Nutrition intervention strategies in national development. New York: Academic Press, 1983:227-39

Chen PCY. Socio-cultural aspects of a cholera epidemic in Trengganu, Malaysia. Trop Geogr Med 1971 Sep;23(3):296-303

The importance of indigenous rural Malay beliefs and practices in precipitating and aggravating the El Tor cholera epidemic of 1964 in Trengganu, Malaysia is evaluated. The first case of El Tor cholera in Trengganu was reported on 25 May 1964. The patients' stool cultures yielded cholera vibrios (Ogawa type). Seventy-three cases with 22 deaths were reported. The epidemic finally resulted in 286 cases with 99 deaths and was characterized by its magnitude, prolonged duration, and a high rate of under-reporting. It seemed highly probable that these characteristics were associated with the indigenous practice of contaminating common water sources with human feces to the indigenous concept of cholera causation, treatment, prevention and control, to the customary obligation of the group to render support at times of illness, and to their practice of concealing cholera cases and deaths in order that custom may not be stifled by control measures, requiring isolation, quarantine, and surveillance of cases and carriers. Vaccination was well received by Malaysians. Within one month of the onset of the epidemic, 247,304 (71.5%) of the population of Trengganu received active immunization against cholera. Health workers should be aware of the sociocultural aspects of each disease condition so that they may decide on acceptable alternative measures for the control and prevention of that disease.

Chernoschekov KA, Kaniuka GF. Role played by water factor in the seasonal morbidity elevations of acute intestinal infections. Zh Mikrobiol Epidemiol Immunobiol 1978 Apr;(4):137-9

Chesson AS, Jr. see Koomen J, Jr.

Chia M see Skoda JD

Child mortality - nutrition - gastroenteritis - water contamination [editorial]. Lancet 1978 Sep 16;2(8090):616

Chou Z see Hung T

Chowdhuri ANR see Aggarwal P

Chowdhury MAR, Aziz KMS, Rahim Z, Kay B. Isolation of Vibrio mimicus from aquatic environment of Bangladesh. In: Committees, programme and abstracts of the Fourth Annual Conference of the Bangladesh Society of Microbiologists, Dhaka, 7-8 February 1985. Dhaka: Bangladesh Society of Microbiologists, 1985:3

To investigate the prevalence of Vibrio mimicus in Bangladeshi water environment, water, soil sediments, and floating macrophytes, namely Eichhornia crassipes and Pistia stratiotes, samples were analyzed bacteriologically from September to December 1984. Samples were collected at an interval of 15 days from the Buriganga river, Dhanmondi Lake, and Curzon Hall pond of Dhaka University. V. mimicus was isolated from all the samples cultured.

Comparative counts of V. mimicus were done on the river and lake water samples, and counts ranged from 200-700/100 ml in Buriganga river and 12-100/100 ml in Dhanmondi lake. The high incidence of V. mimicus throughout the study period in aquatic Bangladesh environment is indicative of a hitherto unknown public health hazard. (Modified author's abstract)

Chowdhury MAR, Aziz KMS, Rahim Z, Kay BA. Vibrio mimicus as a component of pollution of urban water body. In: Islam AS, Haque MM, Ameen M, Ahmed N, Haque MS, eds. Proceedings of the Regional Seminar on Protecting the Environment from Degradation, Dhaka, 13-16 May 1985. Dhaka: Science & Technology Division, Ministry of Education, Government of Bangladesh, 1985:108-13

The prevalence of Vibrio mimicus in Dhanmondi lake at Dhaka, Bangladesh was investigated. Surface water, lake bottom soil sediment, some floating hydrophytes, namely Eichhornia crassipes and Pistia stratiotes, were chosen as samples for the study carried out from September 1984 to April 1985. V. mimicus was isolated from all the samples cultured. V. mimicus was isolated throughout the study period except in one sample in January 1985. Although V. mimicus is susceptible to many antimicrobials, resistance to ampicillin, streptomycin, and trimethoprim-sulfamethoxazole was found among the isolates. V. mimicus was associated with roots of floating macrophytes of the lake. This association indicates the possibility of a plantborne spread of these species in the aquatic environments as in the case of V. cholerae non-01. The high incidence of pathogenic V. mimicus and other V. cholerae non-01 in the lake is indicative of significant hitherto undescribed public health hazard.

Christie RW see Lopez CE

Clark RL. Effects of a water supply system on local health attitudes in Nepal. Br Med J 1985 Jan 19;290(6461):225-7

This paper evaluates the effects of a water supply system on local health attitudes and on the assessment and management of children with diarrhoea by comparing those areas with a water supply system and those without in Nepal. Over a 2-month period, households in Karleswar, Nepal were interviewed through questionnaires. Half (55%) of them used tapstand water supply, but 18% used tapstands as their only water source. The rest used water from an open contour channel (Kola). Children, aged under 7, showed severe diarrhoeal symptoms. About 46% (93 children) had frequent and troublesome loose stools in the previous week. Only 2 of the 93 children with diarrhoea in the previous week had visited a health post. The availability of tapstands was not associated with a change in diarrhoeal morbidity in children or with a change in any of the other health problems. The water supply system did have a social effect. Households with tapstands agreed that maintenance was a problem. There was an association between the availability of tapstands and various health attitudes. The availability of tapstands was not associated with any difference in the method of assessment. The availability of tapstands was associated with the knowledge that bad water and bad food were causes of diarrhoea. Health education should be directed at specific unhygienic practices. Latrines and the provision of better storage arrangements in the home can help decrease food and water contamination.

Cline B see Merson MH

Colwell RR, Seidler RJ, Kaper J, Joseph SW, Garges S, Lockman H, Maneval D,

Bradford H, Roberts N, Remmers E, Huq I, Huq A. Occurrence of Vibrio cholerae serotype 01 in Maryland and Louisiana Estuaries. Appl Environ Microbiol 1981 Feb;41(2):555-8

Thirty-three strains of Vibrio cholerae 01 (Inaba) were isolated from water samples collected from Chesapeake Bay and from Louisiana saltmarshes and sewers between 1977 and 1978. V. cholerae non-01 was isolated from both the areas, along with some isolations of V. cholerae 01 strains as well. The finding is important because, in September 1978, the first outbreak of cholera in the USA, since 1911, occurred in Louisiana. Percent guanine plus cytosine (overall) deoxyribonucleic acid base composition was determined by the thermal denaturation method to confirm phenotypic identification of V. cholerae. The occurrence of V. cholerae 01 in the aquatic environment in the absence of fecal contamination suggests that this organism survives and multiplies in the natural environment, and sporadic outbreaks can be expected when proper food handling techniques are not used.

Colwell RR see Huq A

Colwell RR see Huq MI

Conn JM see Lopez CE

Costa JB see Blake PA

Craun GF. Disease outbreaks caused by drinking water. J Water Pollut Control Fed 1979 Jun;51(6):1751-60

This is a review of the outbreaks of diseases caused by drinking water. One hundred and ninety-two outbreaks of waterborne diseases were reported in the USA from 1971 to 1977. Almost 49% of the outbreaks and 42% of the illnesses were caused by both untreated or inadequately treated ground water. The most commonly identified pathogen was Giardia lamblia. An etiologic agent was determined in only 43% of the 192 outbreaks. The remaining outbreaks were acute gastrointestinal illness. Bacteriological examination on water supplies by the Public Health Laboratory Service regarding outbreaks of waterborne diseases in Britain was reviewed. In contrast to the USA, there have been few outbreaks in Britain in recent years. The first Campylobacter gastroenteritis occurred in the USA in 1978. Campylobacter fetus subsp. jejuni was the causative agent. Some 544 crewman of the U S Navy sufferred from gastrointestinal disease due to chemical poisoning. Other outbreaks have also been reported, which include the spread of cholera El Tor in Sri Lanka in 1973, mineral water contamination in the USSR with Vibrio cholerae, and 2 outbreaks of Aeromonas (Plesiomonas) shigelloides in Osaka, Japan. Gastroenteritis in Missouri during the 1978 outbreak has been discussed also among descriptions and reports of several other isolated worldwide outbreaks of waterborne gastroenteritis.

Craun GF. Disease outbreaks caused by drinking water. J Water Pollut Control Fed 1981 Jun;53(6):1134-8

This paper describes the outbreaks of diseases caused by drinking water. In July 1977, 544 members of a crew of 5,261 of a U S naval aircraft carrier at sea off the coast of California in the USA had diarrhoea by chemical hydroquinone poisoning of the ship's water. In another outbreak, 34 persons

became ill with acute flouride poisoning in an elementary school in New Mexico, USA, in 1978. Eight patients undergoing dialysis became ill, and one patient died at a dialysis center in Annapolis by fluoride intoxication. Outbreaks of infantile methemoglobinemia, caused by high-nitrate well water, were reported in Yugoslavia and Poland. The prevalence of dracontiasis was 26.6% in Cameroon. Giardia lamblia were the most frequently identified intestinal parasite in the USA and in Britain. Most outbreaks had occurred in water systems that used surface water sources. State Health Departments reported 3 cases of outbreaks associated with hepatitis A for an incidence of 12 per 100,000 person-year, compared to the reported US incidence of 10 per 100,000 person-year. Other outbreaks of waterborne hepatitis in India and shigellosis in 2 groups of American travelers in Mexico in 1979-1980, an outbreak in Rumania caused by Shigella flexneri in 1978, are discussed. Another outbreak of diarrhoea, caused by Escherichia coli-producing heat-stable enterotoxin, occurred at a Miami-based cruise ship. Other related diseases, caused by inadequately treated or untreated water, are also discussed.

Craun GF. Microbiology - waterborne outbreaks. J Water Pollut Control Fed 1972 Jun;44:1175-82

Craun GF. Outbreaks of waterborne disease in the United States: 1971-1978. J Am Water Works Assoc 1981 Jul:360-9

The outbreaks of waterborne diseases are discussed. Some 224 outbreaks of waterborne diseases affecting 48,193 individuals were reported in the USA during 1971-1978. Outbreaks in municipal or community systems affected 492 persons, in semi-public or non-community systems affected 111 persons and outbreaks in individual systems affected only 10 persons. The major cause of outbreaks in municipal and community systems was contamination of the distribution system, through cross-connections and backsiphonage. Treatment deficiencies, such as inadequate filtration and interruption of disinfection, were responsible for 33% of the outbreaks. The use of untreated contaminated ground water and treatment deficiencies were responsible for 81% of all outbreaks and illnesses in semi-public and non-community systems. A pathogenic organism was identified in 45% of the outbreaks. Toxigenic strains of Escherichia coli had caused the outbreaks of acute diarrhoeal disease. Ten percent of the outbreaks were due to chemical poisoning. Twenty-four outbreaks of waterborne giardiasis were reported during 1971-1978, and 15 outbreaks of waterborne viral hepatitis were also reported during the same time. The largest outbreak had occurred at Sewickley affecting 5,000 persons. The first Campylobacter diarrhoea was reported in the USA in May 1976, which was associated with the consumption of water from the town supply. The largest outbreak of waterborne typhoid fever in the USA had also occurred during 1971-1978. An outbreak of waterborne gastrointestinal illness was due to Yersinia enterocolitica. This organism was also isolated from well water during 1971-1978. Outbreaks due to treatment deficiencies arose out of improper chlorination and malfunctions in other types of disinfection equipment (ultraviolet light and iodination).

Craun GF, Gunn RA. Outbreaks of waterborne disease in the United States: 1975-1976. J Am Water Works Assoc 1979 Aug;71(8):422-8

This review describes the outbreaks of waterborne diseases in the USA from 1975 to 1976 and updates previously published summaries on this subject. The Center for Disease Control in Atlanta and the Environmental Protection Agency,

USA carried out a cooperative effort to investigate outbreaks of waterborne diseases, since 1971. Outbreaks associated with water used for drinking are included in this analysis. Twenty-four outbreaks of waterborne diseases affecting 10,879 persons were reported in 1975, and 35 outbreaks affecting 5,068 persons were reported in 1976. No deaths were associated with the outbreaks. An etiologic agent was determined for 16 (27%) of the 59 outbreaks. Six chemical agents of these outbreaks were identified. Microbiological agents were identified in 10 outbreaks. Giardia lamblia, Shigella sonnei, S. flexneri, Escherichia coli, Salmonella typhimurium, and hepatitis A were the important organisms found. No etiologic agent was determined for the remaining 43 outbreaks. Outbreaks in semi-public systems affected 123 persons per outbreak compared to 739 persons per outbreak in municipal systems and 14 persons per outbreak in individual systems. Twenty-three (82%) of the 28 outbreaks involved a transient population. The majority (76%) of waterborne outbreaks during 1975-1976 were caused by the use of untreated or inadequately treated water. Several examples of outbreaks have been discussed, and the role of waterborne disease surveillance has been emphasized.

Craun GF, McCabe LJ. Review of the causes of waterborne-disease outbreaks. J Am Water Works Assoc 1973 Jan;65(1):74-84

The causes of outbreaks of waterborne diseases are reviewed. It was reported that 14 outbreaks of waterborne diseases had occurred each year in the USA causing 1,600 illnesses and one death per year during 1966-1970. The overall outbreak rate in 1946-1970 was 0.08 waterborne outbreaks per million people per year. There were 128 known outbreaks of diseases or poisoning attributed to impure drinking water. These outbreaks resulted in 46,374 illnesses and 20 deaths. There were 39 outbreaks of gastroenteritis, and this caused 26,546 cases of illness. Salmonella was the most commonly identified pathogen during this period. Nineteen waterborne outbreaks were due to Shigella. Enteropathogenic Escherichia coli and Giardia lamblia were also found. Five outbreaks were due to pesticide poisoning. Only 56% of the waterborne outbreaks were officially reported during 1961-1970. During 1946-1970, there were 356 known waterborne outbreaks. These outbreaks resulted in 72,358 illnesses and 36 deaths. Gastroenteritis, typhoid infections, hepatitis, and shigellosis were the main diseases. About 71% of the outbreaks occurred through private supplies and 83% through public supplies. Seasonal variation of the outbreaks was noted. Causes of outbreaks, distribution by population, public systems' source and treatment, and the case histories of the outbreaks are discussed in this report. It is concluded that most of the waterborne outbreaks had occurred due to inadequacies in water systems and deficiencies in their operation. The disinfection of ground-water systems is recommended as a simple means for reducing the incidence of waterborne diseases.

Craun GF. A summary of waterborne illness transmitted through contaminated groundwater. J Environ Health 1985 Nov-Dec;48(3):122-7

This report is a summary of waterborne illnesses transmitted through contaminated ground water occurring in the USA from 1971 to 1982. Three hundred and ninety-nine waterborne outbreaks and 86,050 cases of waterborne diseases were reported during this period. Two hundred and four outbreaks (51%) and 34,337 cases of illness (40%) were caused by contaminated ground water. Contaminated, untreated or inadequately disinfected ground water caused 65% of the waterborne outbreaks and 66% of the waterborne illnesses, which occurred in non-community and individual water systems, compared to only 32% of

the outbreaks and 31% of the illnesses in community water systems. Illnesses most frequently transmitted through ground water included acute gastroenteritis of undetermined etiology, chemical poisoning, hepatitis A, shigellosis, and viral gastroenteritis. Waterborne outbreaks in water systems using untreated well water were caused primarily by the overflow or seepage of sewerage from septic tanks or cesspools, chemical contamination and surface run-off contamination. An increase in the number of outbreaks resulting from the use of untreated, contaminated well water was noted during the summer months.

Craun GF. Waterborne disease - a status report emphasizing outbreaks in ground water systems. Ground Wat 1979;12:2

Craun GF, McCabe LJ, Hughes JM. Waterborne disease outbreaks in the US - 1971-1974. J Am Water Works Assoc 1976 Aug;68(8):4106-10

This report describes the outbreaks of waterborne diseases in the USA during 1971-1974. The outbreaks, associated with water used for drinking or domestic purposes, are included in this analysis. At least 99 outbreaks occurred resulting in 17,000 cases of illnesses. An etiologic agent was determined in 54% of the outbreaks. Shigella was the most commonly identified pathogen. There were 13 outbreaks, and 2,747 cases of shigellosis were recorded. Most of these occurred in non-municipal systems. Some municipal systems with inadequate treatment and distribution arrangements were also affected. Twelve outbreaks of waterborne giardiasis were documented, which affected 5,127 individuals. In 1974, 4,800 cases of giardiasis occurred in Rome, New York. Outbreaks of giardiasis involved small municipal systems or semi-public systems in recreational areas. Some 13 outbreaks of waterborne viral hepatitis were also occurred affecting 351 people. The use of untreated ground water was responsible for outbreaks of hepatitis A. Chemical poisoning, involving 474 people, also occurred. Four typhoid outbreaks affected 222 people and involved semi-public and individual water systems. The semi-public water system was associated with 55%, municipal systems accounted for 31%, and individual systems accounted for 14% of the outbreaks. It is concluded that constant surveillance, appropriate water treatment and proper operation of water systems are necessary to prevent outbreaks of waterborne diseases.

Craun GF. Waterborne disease outbreaks in the United States. J Environ Health 1979 Mar-Apr;41(5):259-65

Craun GF. Waterborne giardiasis in the United States 1965-84 [letter]. Lancet 1986 Aug 30;2(8505):513-4

Responding to reports on the outbreak of giardiasis associated with mains water in the UK, this letter provides information on waterborne giardiasis in the USA. Ninety outbreaks and 23,776 cases of giardiasis had been reported in the USA by the end of 1984. It was found that 69% of the outbreaks and 74% of the cases related to community water systems with at least 25 year-round residents of 15 service connections. Most outbreaks were in the north-eastern, north-western, and Rocky Mountain states, being mostly the outcome of the use of contaminated surface water, which either had not been treated or had been treated by simple chlorination only. Fifteen percent of the USA cases resulted from outbreaks caused by contamination of water mains through cross-connections or damage and repair of mains. Experiences from different outbreaks showed that routine water sampling before the outbreak might fail to indicate the potential problem. While untreated or inadequately treated water is clearly

the major cause of waterborne giardiasis, all potential sources of contamination should be considered in investigations of such outbreaks.

Craun GF. Waterborne giardiasis in the United States: a review. Am J Public Health 1979 Aug;69(8):817-9

This paper describes the outbreaks of waterborne giardiasis in the USA. Twenty-three outbreaks of waterborne giardiasis, affecting 7,009 persons, were reported at the Center for Disease Control, and the Environmental Protection Agency, USA, in 1965. One outbreak, which occurred in 1954 in Portland, affected 50,000 persons and the second occurred in Boulder, Colorado in 1972. Colorado reported 9 outbreaks, more than any other state. The outbreaks generally affected the small municipal water systems or semi-public water systems in recreational areas. Most outbreaks occurred as the result of consuming untreated surface water. Disinfection was the only treatment mode. The largest outbreak of waterborne giardiasis occurred in Rome, New York. The treated water reportedly met both turbidity and coliform standards prior to and during the outbreak. The chlorination equipment and pressure filters had been found to be faulty. Outbreaks of waterborne giardiasis affected both visitors and campers, including also the usual residents of an area. Outbreaks involving visitors occurred during the summer. Most outbreaks affecting residents occurred during late fall through early spring. Studies in Colorado and Minnesota suggest that consumption of untreated drinking water is an important transmission agent. To protect against transmission, all surface water should receive chemical pretreatment, preferably with sedimentation and filtration in addition to disinfection. Outbreak data indicated that negative coliform tests did not provide assurance that water was free of Giardia cysts.

Craun GF see Black RE

Craun GF see Haley CE

Craun GF see Horwitz MA

Craun GF see Hughes JM

Craun GF see Taylor A, Jr.

Craun GF see Weissman JB

Creech WB see Lawrence DN

Cronin A see Feachem RG

Cross R see Feachem RG

Cukor G see Hopkins RS

Cummings RH see Eliassen R

Curlin G, Aziz KMA, Khan MR. Impact of the handpump tubewell on diarrheal disease rates in rural Bangladesh. In: Proceedings of the 10th Meeting of the Scientific Review and Technical Advisory Committee of the Cholera Research Laboratory, 1975. Dhaka: Cholera Research Laboratory, 1975:107-9

The impact of the handpump tubewell on cholera, shigellosis, and other diarrhoeal illnesses was studied in 12 villages in the Matlab field study area of the Cholera Research Laboratory (now International Centre for Diarrhoeal Disease Research, Bangladesh), Bangladesh. This paper reports the first year's observations. Every tubewell in the study area produced water with higher conductivity than any available surface water. Thus, the measure of conductivity clearly delineated tubewell and surface water. The age-specific diarrhoea rates showed a striking preponderance of disease in the younger age groups. The rates in the 0-4-year age group were approximately 3-4 times compared to that of the 10-14 or 15+ age groups. The rates for the 5-9-year age groups stood at intermediate levels. Tubewell use patterns did not change throughout the year. Diarrhoea rates among those who drank tubewell water and those who did not were compared for each 2-month period in each village. Regardless of the source of drinking water, similar seasonal patterns of the incidence of diarrhoea were observed in each of the 12 villages. In 5 of the 6 two-month periods, cholera rates were higher among tubewell drinkers, although for only 2 periods these differences were statistically significant. The shigellosis rates were lower for tubewell drinkers, but these differences were not statistically significant. The findings suggest that the approach to rural water improvement programs for health benefits need to be re-examined and restructured when necessary.

Curlin G see Aziz KMA

Curlin GT, Aziz KMA, Khan MR. The influence of drinking tubewell water on diarrhoea rates in Matlab Thana, Bangladesh. Dhaka: Cholera Research Laboratory, 1977. 18 p. (Working paper no. 1). Also published in: Fukumi H, Zinnaka Y, eds. Symposium on Cholera: proceedings of the 12th joint conference, U S-Japan Cooperative Medical Science Program, Sapporo, 1976. Tokyo: National Institute of Health, 1977:48-54

This paper gives the first year's results of a United Nations Children's Fund-Cholera Research Laboratory study of the health impact of handpump tubewells, as measured by diarrhoea rates, in a rural population in Matlab, Bangladesh. During the first year, weekly household surveillance for diarrhoea among approximately 20,000 persons in 12 villages revealed striking patterns of seasonal and age-specific rates. As expected, younger ages had higher rates, but the observed reduction in overall rates by 50% during the monsoon was not expected. Approximately 40% of the residents drank tubewell water, although insignificant numbers used tubewell water for other domestic purposes. Drinking tubewell water was not associated with a reduction in overall diarrhoea rate or in the rates for those hospitalized or the outpatient rates of cholera or shigellosis. The preliminary conclusion, therefore, is that tubewells, as they are currently used, are not associated with a reduction in diarrhoea rates.

Curlin GT see Boyce JM

Curlin GT see Hughes JM

Curlin GT see Khan MU

Curtis D see Cairncross S

Curtis D see Feachem RG

Cutting WAM, Hawkins P. The role of water in relation to diarrhoeal disease. J Trop Med Hyg 1982 Feb;85(1):31-9

Behavioral and social factors are important in respect of the water use for washing and more relevant when considering the use of excreta disposal facilities. Obviously cultural, educational and economic considerations are closely related and important too. No community has reduced diarrhoea to a minor health problem without having adequate systems for sewage disposal, food hygiene and health education, as well as adequate water supplies. A whole package of inputs is required, if better water is to benefit the community. Increased usage of water probably requires behavioral changes which are very difficult to introduce once an individual and family have adopted a particular pattern of bathing and water use. These changes cannot occur until their social and economic determinants change. Improvements in the water quality, the quantity used and the mode of supply are unlikely to have beneficial effects unless they are part of a larger package of social and economic improvements.

Cvjetanovic B. Health effects and impact of water supply and sanitation. World Health Stat Q 1986;39(1):105-17

A review on selected aspects of the health benefits of water supply and sanitation, and analyses of the concepts, methodologies and interpretations of the results of studies on health effects are included in this paper. The findings of various studies point to the variety of local factors, which make some water supply and/or sanitation projects more (or less) effective than others in the control of specific diseases. However, the provision of water supply alone is considerably less effective than when coupled with health education programs. It is concluded that the impact of water supply and sanitation on health depends on the quality and quantity of water supply and the type of sanitation system, the proportion of the population covered, and the utilization of available water and sanitation facilities by the population. Water supply and sanitation have proved to be a cost-effective strategy in the control of enteric and diarrhoeal diseases.

Cvjetanovic B, Chen L, Kronmal R, Rohde C, Suskind R. Measuring and evaluating diarrhea and malabsorption in association with village water supply and sanitation: a review of the Food Wastage/Sanitation Cost Benefit Methodology Project (Guatemala). Arlington, Virginia: Water and Sanitation for Health Project, 1981. 36 p. (WASH technical report, 12)

Cvjetanovic B. Sanitation versus immunization in control of enteric and diarrhoeal diseases. Prog Water Technol 1979;11(1-2):81-7

Improved sanitation systems and immunization are often introduced as control methods in places endemic with diarrhoeal diseases and other similar illnesses. They have certain advantages and drawbacks in specific epidemiological circumstances. The decision-makers have to adopt an appropriate control strategy for matching prevailing circumstances to obtain the highest health benefits consistent with the efforts and resources invested. This paper presents the relative effectiveness, costs and benefits of sanitation and immunization programs, referring particularly to the epidemiological models. The effect of immunization is temporary, disease specific and limited to enteric fever and cholera. Immunization implies, from an economic point of view, the provision of consumable commodity, while sanitation, such as

provision of potable water and safe excreta disposal, is capital investment of permanent value. Sanitation covers all diseases related to use of dirty hands and poor hygiene. Investment on sanitation has a cumulative effect as more resources are allocated to it. However, proper and extensive use and good maintenance are necessary to obtain the best possible health benefits from investments in sanitary facilities. This again requires some investment in health education and possibly some other items, such as drainage of used water, provision of soap, etc. The simple methods as well as complex ones, such as mathematical models, are available and should be used for the evaluation of alternative strategies for control of enteric infections based on sanitation or vaccination. Studies carried out in developing countries indicate higher cost-benefit value for sanitation than vaccination in control of enteric infections. Thus, sanitation is to be considered always as a method of choice unless there is evidence that immunization for some reason would prove more effective, e.g. in travelers and other special high risk groups.

Cvjetanovic B see Sundaresan TK

Darwin K see Matulessy PF

Das CR see Bhaskaran TR

Das JC see Chakraborty AK

Davies R see Dykes AC

Davis AR see Burr ML

De S see Bhaskaran TR

De SP see Deb BC

De SP see Niyogi SG

De SP see Saha MR

de Araoz J, Subrahmanyam DV. Environmental health measures in cholera control. In: Principles and practice of cholera control. Geneva: World Health Organization, 1970:95-109. (Public health papers, 40)

de la Cruz E see Moore HA

de Souza MA see Shields DS

Deb BC, Sircar BK, Sengupta PG, De SP, Mondal SK, Gupta DN, Saha NC, Ghosh S, Mitra U, Pal SC. Studies on interventions to prevent eltor cholera transmission in urban slums. Bull WHO 1986;64(1):127-31

Transmission of El Tor cholera infection in endemic communities continues unabated because of the absence of effective intervention measures. To determine the effect of 2 hygienic measures to prevent transmission of infection through stored water, 466 family contacts of 91 bacteriologically proven, hospitalized cholera patients were studied in Calcutta, India. The methods were: (1) chlorination of stored water; and (2) the use of a narrow-necked earthenware vessel (called a Sorai) for storing the water. Of

the 151 persons in the chlorinated group, 11 (7.3%) were detected with cholera infection. Seven (4.4%) infected persons were detected among the 159 persons in the Sorai group of families. In contrast, 27 (17.3%) inapparently infected persons were identified among the 156 persons in the control group. The differences in the number of detected infections between the chlorination and control groups ($p<0.01$) and between the Sorai and control groups ($p<0.001$) were statistically significant. The results suggest a causal relationship between contamination of the stored water and the high rates of infection. The Sorai is cheap and was well accepted by the local communities; its narrow neck prevented the introduction of the hand thus preventing contamination of the stored water. The results also showed that, by using either of the 2 interventions, it was possible to reduce the spread of Vibrio cholerae infection among household contacts to the extent of 74.6% and 57.8% in the Sorai and chlorinated groups respectively.

Deb BC see Niyogi SG

Deb BC see Saha MR

DeCapito T see Stewart WH

Den S see Hung T

Derryberry M. Health education aspects of sanitation programmes in rural areas and small communities. Bull WHO 1954;10(2):145-54

In large population centers, the sanitarian can affect the environmental changes needed without necessarily gaining the widespread participation or understanding of the people who are to benefit. In villages and rural areas, however, this is not so, since the people themselves will have to perform many of the actions needed to break the chain of transmission of disease. The sanitarian to be successful must, therefore, apply the sciences of human behavior in any attempt to carry out environmental improvements. Before any educational program for environmental sanitation can be planned, it is necessary to obtain the essential facts about the people of the community. In the actual planning, the sanitarian must consider how to ensure the participation of the people, what decisions can be left to the people themselves, what informational materials are likely to be needed and how they are to be used, and what the criteria of progress are to be. If all these questions are satisfactorily answered, the sanitarian can assist the people to accept responsibility for their own betterment.

Deshpande AW see Raman V

Dewailly E, Poirier C, Meyer FM. Health hazards associated with windsurfing on polluted water. Am J Public Health 1986 Jun;76(6):690-1

DeWitt WE see Merson MH

Dezelic N see Bantic Z

Diamant BZ. The role of environmental engineering in the preventive control of water-borne diseases in developing countries. R Soc Health J 1979 Jun;99(3):120-6

Dixon FR see Weibel SR

Djerassi L, Lutian M, Smilowitz M, Avital J, Porat V. [An epidemic of gastrointestinal infections in a high-rise building due to sewage contamination of drinking water]. Harefuah 1978 Dec;95(11):396-7

Dolin R see Morens DM

Donovan TJ see Bashford DJ

Dordevic D see Sokolovski B

Dosajh U see Bhatnagar S

Dosunmu-Ogunbi O, Coker AO, Blum D, Grange AO. Strategies for control of diarrhoeal diseases. In: Khan A, Rowland MGM, Aziz KMS, eds. Proceedings of the First African Conference on Diarrhoeal Diseases, Arusha, 13-17 November 1984. Harare: International Steering Committee, 1986

A community-based longitudinal study on the impact of an environmental intervention program on the prevalence of enteric pathogens and on the etiology of acute diarrhoeal diseases in a rural area of Nigeria was begun in December 1982. Baseline data were collected prior to introduction of intervention measures comprising improved water supply (boreholes/hand pumps), promotion of ventilated improved pit latrines and on related health and hygiene education. The study provides information on the incidence of acute diarrhoea, prevalence of diarrhoeagenic agents in children, aged under 6, with and without (control) diarrhoea and on the impact of environmental intervention measures. During baseline studies, 490 stool samples from 286 ill and 204 normal (healthy) cases were examined for etiological agents of acute diarrhoea in children. Prevalence of these agents was as follows: 85 (29.9%) for ill, 45 (22.3%) for healthy persons, and 130 (26.5%) for all cases. During intervention, 373 stool samples were examined, and the prevalence of these agents was as follows: 87 (33.5%) for ill, 47 (41.7%) for healthy persons, and 133 (35.7%) for all cases. Etiological agents were sought in stool samples of 115 patients, treated at the pediatric department of Lagos University Teaching Hospital. Rotavirus was the commonest organism identified. Bacterial agents included Campylobacter jejuni (9.4%), Yersinia enterocolitica (6.1%), enterotoxigenic Escherichia coli (5.5%), enteropathogenic E. coli (11.6%), Shigella (24.3%), and Salmonella (7%). Acceptability and effectiveness of oral rehydration therapy (ORT) in the community were also examined. Problems associated with introducing conventional intervention measures and in popularizing ORT are discussed.

Downs H see Merson H

Drachman RH, Payne FJ, Jenkins AA, Mackel DC, Petersen NJ, Boring JR, 3d, Gareu FE, Fraser RS, Myers GG. An outbreak of water-borne Shigella gastroenteritis. Am J Hyg 1960 Nov;72:321-34

Drake BM see Gehlback SH

Drasar B see Feachem R

D'Souza S see Levine RJ

Dutt PR see Rajasekaran P

Dworkin D, Dworkin J. Water supply and diarrhea: Guatemala revisited.

Washington, D.C.: U S Agency for International Development, 1980. 44 p. (AID evaluation special study, 2)

Dworkin J see Dworkin D

Dykes AC, Juranek DD, Lorenz RA, Sinclair S, Jakubowski W, Davies R. Municipal waterborne giardiasis: an epidemiologic investigation: beavers implicated as a possible reservoir. Ann Intern Med 1980 Feb;92(2,pt.1):165-70

Waterborne giardiasis, communicated through municipal water supply systems, is described. An epidemiologic investigation was carried out where 128 cases of giardiasis were reported from Camas, Washington, USA, in June 1976. One had a Salmonella infection, and 75 had negative viral cultures. The mean duration of illness for clinical (questionnaire) cases was 22 days. Persons, aged over 40, had a higher attack rate than those younger persons, and 2 of the 9 ill persons had giardiasis. The attack rate for giardiasis among city residents having heated filtered water was not lower than the attack rates among county residents having partially treated unfiltered water. The city water supply came from small ponds created by retainer walls on 2 streams. Visual inspection of the filters revealed a loss of 15.2 cm of media in one and 30.5 cm in the other. Giardia cysts passed through the treatment system due to media loss, media disruption, and inadequate pretreatment. The rate of giardiasis in areas receiving greater than 70% surface water was 4.7%, and the rate in areas receiving 0 to 69% surface water was 0%. Giardia cysts were found from the 4 samples collected at the Bulter Reservoir sediment, Upper Prune Hill Reservoir, the combined influent to the water treatment plant, and at Boulder Creek. Three beavers, captured from ponds on Jones Greek, below the water intakes, had Giardia cysts. Giardia organisms were also found in infected dogs in the study area. Giardia from the beavers and from the specimens of water supply appeared identical to Giardia lamblia found in infected humans.

Dykes AC see Black RE

Dykes AC see Lopez CE

Eden KV, Rosenberg ML, Stoopler M, Wood BT, Highsmith AK, Skaliy P, Wells JG, Feeley JC. Waterborne gastrointestinal illness at a ski resort - isolation of Yersinia enterocolitica from drinking water. Public Health Rep 1977;92(3):245-50

Eisnach L see Hopkins RS

El Attar L see Khairy AEM

El Gaddal AA. The Blue Nile Health Project: a comprehensive approach to the prevention and control of water-associated diseases in irrigated schemes of the Sudan. J Trop Med Hyg 1985 Apr;88(2):47-56

This is a general report on the Blue Nile Health Project in Sudan. The project was initiated in 1979 to develop better strategies for controlling the major water-associated diseases in tropical irrigation schemes. The Gezira, Managil and Rahad irrigation systems, all irrigated from the Blue Nile River, were selected for the project area as typical of irrigation systems throughout Africa and the Middle East, where malaria, diarrhoeal diseases and

schistosomiasis are endemic, and as the areas most urgently in need of disease control in Sudan. The methods used for control of water-associated diseases emphasize permanent improvements in water supply and sanitation, in environmental and agricultural practices, in health education, community participation and primary health services, and a reduction in dependence on pesticides and drugs. (Author's abstract)

El Sebaie O see Khairy AEM

Eliassen R, Cummings RH. Analysis of waterborne outbreaks, 1938-45. J Am Water Works Assoc 1948;40:509. Abstract in: Bull Hyg 1948 Nov;23:703

Elliott K, Knight J, eds. Human rights in health. North-Holland: Elsevier, 1974. viii, 304 p. [Ciba Foundation symposium, 23 (new series)]

Emurwon P see Bradley DJ

Eng N see Nyerges N

Enticott RG see Philipp R

Eslien JJ see Morens DM

Esrey SA, Habicht JP. Epidemiologic evidence for health benefits from improved water and sanitation in developing countries. Epidemiol Rev 1986;8:117-28

Esrey SA, Habicht JP. The impact of improved water supplies and excreta disposal facilities on diarrheal morbidity, growth, and mortality among children. Ithaca: Division of Nutritional Sciences, Cornell University, 1985. (Cornell international nutrition monograph series)

Esrey SA, Feachem RG, Hughes JM. Interventions for the control of diarrhoeal diseases among young children: improving water supplies and excreta disposal facilities. Bull WHO 1985;63(4):757-72

The effectiveness of improvements, brought about in water supply and excreta disposal systems for reducing the incidence of diarrhoea among young children in developing countries, is discussed. The effectiveness of improved water supply and excreta disposal is examined through 3 hypotheses. Hypothesis 1 states that supply or excreta disposal improvements can reduce the ingestion by young children of pathogens causing diarrhoea; hypothesis 2 states that a reduction in the ingestion of these pathogens by young children can reduce diarrhoeal morbidity or mortality rates; and finally, hypothesis 3 suggests that water supply or excreta disposal improvements can reduce diarrhoeal morbidity or mortality rates among young children. An extensive literature on hypothesis 3 is provided. Some 67 studies from 28 countries were reviewed to measure the impact on health of improved water supply or sanitation. Impact of diarrhoeal morbidity is also discussed. The median reduction in morbidity rate was 22%. The impact of a water supply and excreta disposal improvement on specific etiologies has been highlighted. Studies of the impact on mortality indicated a 21% (range 0.81%)-median reduction in mortality rate. In this regard, results from selected studies are described. Feasibility of such improvement projects and their cost are reviewed. Studies showed that improvements in water quality had less of an impact than improvements in water

availability or excreta disposal. More studies on the impact of water supply and excreta disposal on diarrhoea are needed to derive more definitive conclusions.

Evans EJ see Philipp R

Everet LG see Merson MH

Eyler JM. William Farr on the cholera: the sanitarian's disease theory and the statistician's method. J Hist Med 1973 Apr;28:79-100

Faich GA see Taylor A, Jr.

Faigenblum J see Schneider RE

Faigenblum JM see Shiffman MA

Fang Z see Hung T

Farooki MA. The role of frogs and fish in the survival of Vibrio cholerae in water. Pak J Med Res 1965 Jul;4(3):281-309

To elucidate the role of frogs and fishes in enhancing the survival of vibrios in contaminated water and raw tap water (pH 7.6-7.8) was inoculated with large quantities of fresh Vibrio cholerae cultures. Plate subcultures of such contaminated water at varying (half hourly) intervals revealed that survival of V. cholerae in raw tap water was very short ($\frac{3}{4}$ to $4\frac{3}{4}$ h; mean $2\frac{1}{4}$ h). Ordinary local species of frogs and toads, washed in tap water, were added to the bottles containing tap water. This was followed by additions of Vibrio cultures in quantities equal to those used for the control experiments with plain water. Survival of V. cholerae in water increased significantly in association with frogs (range $2\frac{1}{4}$ h to more than 7 h; mean $5\frac{1}{2}$ h). Small fishes (4-5 inches in length), obtained from local river water, were used in the same way as frogs. Survival of V. cholerae in water was significantly prolonged in association with fish (range $1\frac{1}{4}$-$6\frac{3}{4}$ h; mean $4\frac{3}{4}$ h). The enhanced vitality and viability of V. cholerae, in association with frogs or fishes, have significant implications in cholera endemicity.

Feachem R, Miller C, Drasar B. Environmental aspects of cholera epidemiology. II. Occurrence and survival of Vibrio cholerae in the environment. Trop Dis Bull 1981 Oct;78(10):865-80

The occurrence and survival of Vibrio cholerae in the environment is discussed on the basis of a review of available literature. Some traditionally held beliefs about epidemiology of cholera may be challenged in the light of recent discoveries. There is now strong evidence suggestive of the fact that an aquatic reservoir for V. cholerae exists. Some V. cholerae strains have been isolated from non-contaminated aquatic environments and may be part of the permanent microflora. Moreover, V. cholerae appear to have prolonged existence in some environments, i.e. sewage. Although the evidence is limited, foods also act as one of the vehicles for spreading cholera. Possible inter-biotypic and intra-biotypic variability in environmental persistence of the El Tor and classical cholera biotypes remains to be documented.

Feachem R. Is cholera primarily water-borne? [letter]. Lancet 1976 Oct 30;2 (7992):957-8

This letter examines whether cholera is primarily waterborne or not in the context of recent work done in the field of transmission of cholera Vibrio. Hygiene may be an important factor in breaking the transmission of cholera and diarrhoeal diseases and not water quality alone. Current evidence suggests that fecal-oral infections may be transmitted by non-waterborne routes, being largely the outcome of poor personal and domestic hygiene. A recent study of typhoid and diarrhoeal diseases in Lesotho shows also that such infection is not primarily waterborne. The prevalence of typhoid and diarrhoeal diseases in villages with and without piped water supplies was identical, and wet season outbreaks of typhoid and diarrhoeal diseases occurred with equal regularity in villages with and without piped water. Data on the concentrations of Vibrio in water sources referred to could have allowed more definitive conclusion to be reached. It is suggested that diseases, such as cholera and typhoid in the rural tropics, although at times are waterborne, are just as likely to be non-waterborne. Investments in improving the availability and reliability of water supplies and encouraging the use of large volumes of water in following better personal and domestic hygiene are likely to be more effective in terms of disease reduction.

Feachem R. Priorities for diarrhoeal disease control: water, excreta, behaviour and diarrhoea. Diarrhoea Dial 1981;4:4-5

Feachem R, McGarry M, Mara D, eds. Water, wastes and health in hot climates. London: Wiley, 1977. xvi, 399 p.

Feachem R see Cairncross S

Feachem RG, Hogan RC, Merson MH. Diarrhoeal disease control: reviews of potential interventions. Bull WHO 1983;61(4):637-40

Feachem RG. Environmental aspects of cholera epidemiology. III. Transmission and control. Trop Dis Bull 1982 Jan;79(1):1-47

This paper, the last in a series of 3 studies on environmental aspects of cholera epidemiology, draws together some of the themes of the other 2, and presents a detailed discussion on transmission and control of cholera. A review of the historical perspectives show that many modern cholera epidemiologists have come extremely close to the exclusive waterborne theory of transmission. One of the purposes of this paper is to refute the hypothesis that cholera is exclusively waterborne and to show that, even in Bangladesh, other interpretations of the epidemiological factors are likely to be responsible in transmission. Data on the epidemiologic features of cholera, infectious dose and transmission, and transmission studies in Bangladesh are given. Water supply, sanitation and cholera, waterborne and non-waterborne cholera, person-to-person transmission and the epidemiological role of aquatic reservoirs are discussed. Some of the salient points are summarized, and future research priorities are outlined.

Feachem RG, Guy MW, Harrison S, Iwugo KO, Marshall T, Mbere N, Muller R, Wright AM. Excreta disposal facilities and intestinal parasitism in urban Africa: preliminary studies in Botswana, Ghana and Zambia. Trans R Soc Trop Med Hyg 1983;77(4):515-21

The relationship between intestinal parasitism and a variety of excreta disposal systems were investigated in selected urban environments of Africa.

The cities selected were Gaborone (Botswana), Ndola (Zambia), and Kumasi (Ghana). Parasitic prevalence and intensity rates amongst groups of urban residents having similar socioeconomic status and housing, but different excreta disposal technologies, were compared. Protozoal prevalence rates in Gaborone were considerably lower than that of other cities with the exception of infections associated with Giardia and Entamoeba coli. Ndola had the highest prevalence of all protozoal infections (71%) and had a considerably higher prevalence of E. histolytica infection (26%) than the other cities. Gaborone had a low prevalence of all excreted helminths, except Hymenolepis nana (3%), while the communities surveyed in Ndola and Kumasi were commonly infected with hookworm (24% and 16%) and roundworm (27% and 33%). In Gaborone, there was no difference in intestinal parasitism between those using aqua privies and having access to public taps and those in identical houses enjoying flush toilets, in-house water connections and showers. In Ndola, the group with sewered aqua privies had larger houses, cleaner toilets, safer water supplies, longer residence and more people in well-paid employment than those using pit latrines or communal flush toilets. The sewered aqua privy users were not different from the other groups with regard to hookworm and protozoal infection, but showed higher rates of Ascaris infection. In Kumasi, despite the differences in toilet type - from squalid communal aqua privies through often fouled bucket latrines to well-maintained flush toilet systems - and despite also the differences in water provision, no evidence was obtained of any differences in intestinal parasitism between the groups studied. The results suggest that the provision of superior water and sanitation facilities to a small cluster of houses or to houses scattered throughout an area may not protect those families from infection, if the overall level of fecal contamination of the environment is high. Since the sample sizes and response rates achieved in this study were low, follow-up studies with larger samples have been recommended.

Feachem RG. Infections related to water and excreta: the health dimension of the decade. In: Water supply and sanitation in developing countries. London: Institute of Water Engineers and Scientists, 1983:25-46

Feachem RG. Infectious disease related to water supply and excreta disposal facilities. AMBIO 1977;6(1):55-8

Feachem RG. Interventions for the control of diarrhoeal diseases among young children: promotion of personal and domestic hygiene. Bull WHO 1984;62(3): 467-76

Interventions for the control of diarrhoeal diseases among young children, and aspects concerning the promotion of personal and domestic hygiene are described. Three studies from Bangladesh, the USA and Guatemala on the impact of hygiene education programs on diarrhoea are reviewed. In Bangladesh and the USA, this education focused exclusively on handwashing, while in Guatemala, the program sought to improve several aspects of personal and domestic hygiene. Four groups, one given soap and water, a soap-only group, a water-only group and a control group with shigellosis, were chosen for the study in Bangladesh. The secondary case rate was 2.2% for the soap and water group, while it was 14.2% for the control group who used nothing. It is concluded that the intervention had lowered the secondary case rate by 84%. Attack rates of non-Shigella diarrhoea were 37% lower in the soap and water group than in the control group. In the USA, the impact of handwashing on the incidence of diarrhoea in 4 day-care centers was studied. Two groups of children, aged 6-17

months and the other, aged 18-29 months, were studied. The incidence of diarrhoea among the children, aged 6-29 months, was reduced by 48% in the handwashing day-care centers. The hygiene education program of Guatemala was carried out in 1979-1980, in which 106 mothers with children, aged under 6, were included, while 32 mothers acted as controls. The impact on the proportion of days with diarrhoea was higher than the impact on the incidence. Diarrhoea peacked during March-June than throughout the year. The reduction of incidence rate of diarrhoea due to hygiene education ranged between 14% and 48%. The 3 studies suggest that hygiene education, especially the handwashing, had a marked impact on diarrhoeal morbidity rates.

Feachem RG. Preventing diarrhoea: what are the policy options? Health Policy Plan 1986 Jun;1(2):109-17

Feachem RG. The role of water supply and sanitation in reducing mortality in China, Costa Rica, Kerala State (India) and Sri Lanka. In: Halstead SB, Walsh JA, Warren KS, eds. Good health at low cost; proceedings of a conference, held at the Bellagio Conference Center, Italy, 29 Apr-3 May 1985:191-8

Feachem RG. Rural water and sanitation; community participation in appropriate water supply and sanitation technologies: the mythology for the decade. Proc R Soc Lond (B) 1980 Jul;209(1174):15-29

This paper describes the aspect of community participation in appropriate water supply and sanitation technologies. The current undergraduate and postgraduate civil engineering courses in Africa need to provide more curriculum material on low-cost water supply, unsewered sanitation, compositing or other appropriate technologies. The simplicity and easy maintenance of the possible technologies have been discussed. Community participation is the major subject addressed in this paper. With the specific virtues and problems of community participation, 5 general and overriding problems have been discussed, e.g. practicability, relevance, cost, standardizaion, and the political context. The aims of community participation include (i) improving designs, (ii) reducing costs of construction, (iii) facilitating and reducing costs of operation and maintenance, (iv) improving the realization of project benefits, and (v) encouraging the community to evolve new development initiatives. If a country has a strong political commitment to improve the conditions of her masses, along with a reasonably healthy national economy and an efficient ministry of water and sanitation that is able to plan and execute sound program, only then the prospects for the "Decade" may appear bright. Appropriate technology and some degree of community participation are desirable in any water and sanitation program.

Feachem RG, Bradley DJ, Garelick H, Mara DD. Sanitation and disease: health aspects of excreta and wastewater management. New York: Wiley, 1983. 501 p. [World Bank studies in water supply and sanitation, 3]

Feachem RG, Burns E, Cairncross AM, Cronin A, Cross R, Curtis D, Khan MK, Lamb D, Southal H. Water, health and development: an interdisciplinary evaluation. London: Tri-Med Books, 1978. 267 p.

Feachem RG see Blum D

Feachem RG see Bradley DJ

Feachem RG see Briscoe J

Feachem RG see Esrey SA

Feeley JC see Eden KV

Felsenfeld O. The survival of cholera vibrios. In: Barua D, Burrows W, eds. Cholera. Philadelphia: Saunders, 1974:359-66

Fenwich KWH. The short terms effects of a pilot environmental health project in rural Africa: the Zaina scheme re-assessed after four years. In: White GF, Bradley DJ, White AU. Drawers of water; domestic water use in East Africa. Chicago: University of Chicago Press, 1972:154-7

Ferdinand RO see Thacker SB

Ferreira PS see Blake PA

Figueroa G see Schlesinger L

Flood T see McIntyre RC

Florencia J see Blake PA

Flynn M. Needs for research upon the role of water in transmission of cholera. In: Bushnell OA, Brookhyser CS, eds. Proceedings of the Cholera Research Symposium, Honolulu, 24-29 January 1965. Washington, D.C.: U S Department of Health, Education, and Welfare, 1965:314-6

Frankwell RJ. Incidence of enteric diseases and their relationship to water use and water quality in rural communities of Thailand. Bangkok: Southeast Asia Technology, 1974. v.p.

Fraser RS see Drachman RH

Friedmann CTH see Mahoney LE

Freij L, Sterky G, Wadstrom T, Wall S. Child health and diarrhoeal disease in relation to supply and use of water in African communities. Prog Water Technol 1979;11(1-2):49-55

A child health community study was carried out in 1972-1973 and in 1974-1975 in the Kirkos area of Addis Ababa in Ethiopia. In the study community, a large proportion of households lacked adequate housing and sanitation. Average estimates indicated that children, aged under 2, could have some kind of illness symptoms for 104 days of the year, of which 59 days were due to diarrhoeal diseases. The corresponding figure in children, aged over 5, was 4 days of diarrhoea per year. Exploratory statistical methods showed personal hygiene and quantity of water to be powerful predictors of diarrhoeal disease. Later etiological studies have yielded putative agents, mainly rotaviruses, in 60% of the ill children during the rainy season and in 28% during the dry season. Water wells and river water were found to contain both classical enteropathogenic and enterotoxigenic serotypes of Escherichia coli. Knowledge from cholera epidemics and recent epidemiological studies of new pathogens makes it highly probable that African waters have unique characteristics as sources of infection. Intermediate technologies and community involvement are needed among other multidisciplinary efforts to solve child health problems.

Development of simple diagnostic procedures may facilitate diagnostic work and may provide simple tools for evaluation of water projects at the village level.

Frost F see Harter L

Furniss AL see Bashford DJ

Gadkari AS see Handa BK

Gandhi HS see Trivedi BK

Gangarosa EJ see Black RE

Gangarosa EJ see Blake PA

Gangarosa EJ see Rosenberg ML

Gangarosa EJ see Taylor A, Jr.

Gangarosa EJ see Weissman JB

Garelick H see Feachem RG

Gareu FE see Drachman RH

Garges S see Colwell RR

Gary GW see Kaplan JE

Gary GW see Morens DM

Gary GW see Wilson R

Gary GW, Jr. see Black RE

Gary GW, Jr. see Taylor JW

Gaspard B see Harter L

Gaspard B see Hopkins RS

Gaspard GB see Hopkins RS

Gawad AA see Khairy AEM

Gawronowa H, Horoch C, Kozlowska T, Sikorska J, Szmuness W. [An epidemic of water-borne dysentery and diarrhea]. Przegl Epidemiol 1962;16:473-8

Gawronowa H, Cechowicz L, Marynczak R, et al. [Waterborne epidemic at Chelm Lubelski]. Przegl Epidemiol 1971;25:409-16

Gehlbach SH, MacCormack JN, Drake BM, Thompson WV. Spread of disease by fecal-oral route in day nurseries. Health Serv Rep 1973 Apr;88(4):320-2

Two outbreaks in day nurseries in North Carolina, USA by the fecal-oral route are reported. In outbreak number one, 5 young adults of a mill town of 15,000

people had hepatitis. A cook of the nursery located in that town became ill with serum bilirubin level of 4.0 mg/100 ml and a serum glutanic oxaloacetic transaminase level of 1,000 international units. Twenty-one of the 27 children of the nursery mothers and 3 other nursery workers were given 0.01 cc immune serum globulin per pound intramuscularly. The presence of higher serum glutamic oxaloacetic transaminase levels in children in the nursery suggests a high attack rate of sub-clinical hepatitis in the nursery. Eighty children had diarrhoea, vomiting, and fever during a 6-week period in a day nursery in outbreak number 2. Stool specimens were collected from 73 patients, of whom 37 had stool cultures positive for S. sonnei. Four workers of the nursery became ill. Of them, 3 had stool cultures positive for Shigella. Jaundice developed in 2 teenage girls working in the nursery. Their illnesses were diagnosed as hepatitis. All 3 had stool cultures positive for Shigella sonnei. In both outbreaks, overcrowding, poor sanitary practices and improper personal hygiene were seen. Because day nurseries serve a population likely to transmit disease by the fecal-oral route, close public health supervision is recommended.

Geldreich EE, Nash HD, Reasoner DJ, Taylor RH. The necessity of controlling bacterial populations in potable waters - bottled water and emergency water supplies. J Am Water Works Assoc 1975 Mar;67(3):117-24

Georgi ME, Carlisle MS, Smiley LE. Giardiasis in a great blue heron (Ardea herodias) in New York State: another potential source of waterborne giardiasis. Am J Epidemiol 1986 May;123(5):916-7

Gerba CP see Melnick JL

Ghannoum MA, Moore KE, Al-Dulaimi M, Nasr M. The incidence of water-related diseases in the Brak area, Libya from 1977 to 1979, before and after the installation of water treatment plants. Zentralbl Bakteriol Hyg [B] 1981;173 (6):501-8

This study examines the incidence of 9 water-related diseases in the Brak area in Libya from 1977 to 1979, before and after the installation of water treatment plants. Data collected from information supplied to the Brak Hospital's outpatient department were used. The incidence of each disease was compared for similar months for the years 1977, 1978 and 1979, using the Wilcoxon Rank Sum test. Throughout the study period, there was a steady rise in the population, but the overall increase in 3 years was only 10.7%. The total incidence of diseases studied dropped from 12% in 1977 to 8.5% in 1978, and 6.0% in 1979. This drop was mainly attributed to the drop in the commonest reported disease - bacillary dysentery. The incidence of other disease groups was much lower than bacillary dysentery. The environmental temperature and the incidence of the disease were found correlated. Immediately following the installation of water treatment plants, there was a conspicuous drop in the incidence of waterborne diseases. However, the incidence of malaria and giardiasis did not drop during the entire study period. Over time, as the plant deteriorated and turned less efficient, the illness incidence rose. It is concluded that water treatment plants are beneficial in reducing the incidence of waterborne diseases.

Ghosh BN see Niyogi SG

Ghosh G, Rao AV. Water supply in Calcutta in relation to cholera. Indian J Med Res 1965 Jul;53(7):659-68

Calcutta is the only major city of the world where cholera is endemic. In this city, there exists a dual system of water supply. Unfiltered water, available continuously, is used for washing streets, flushing latrines, etc. While the filtered water supply is intermittent. The slum areas are mostly unsewered or open-sewered and are poorly supplied with filtered water. Defective water supply system is popularly believed to be the major cause in the spread of cholera. In a 2-year study, samples of filtered water from street taps and from tubewells in the slum areas were regularly collected and bacteriologically examined. Altogether 302 samples of filtered tap water, 147 samples of tubewell water and 15 samples from filtered water reservoirs were examined for Bacillus coli. Samples, which showed even one or more B. coli per 100 ml of water, were subjected to differential tests; but in no case, there was any fecal contamination. Fifty-one samples of potable water from sources, known to have been used by cholera patients during an epidemic, were examined for the presence of cholera Vibrio, but the results were all negative. It is concluded that the quality of potable water in the study slum areas is quite satisfactory, and this water supply was not the cause of spread of cholera or other gastrointestinal diseases in the area. However, the role of other sources of dirty water in the transmission of cholera has not been studied.

Ghosh S see Deb BC

Giardiasis and water [editorial]. Lancet 1980 May 31;1(8179):1176

Gibbs KR. There is no safe water in rural Bangladesh: so what about the kids? Shishu Diganta (Dhaka) 1980 Dec;(9):25-7

In Bangladesh, there is one operational tubewell for every 160 persons. All the spot checks indicate that the tubewell gives totally uncontaminated water in virtually every case, while the pump does not. The reasons are: contaminated water is used for priming, and villagers (particularly children) touch the spout very often after defecation, thereby contaminating it and even assisting the spread of diarrhoeal diseases during epidemics. Frequently, water containers add to the contamination of the water being carried. It is observed that, however, handpumps can and do give better health to children. There is a need to organize how they are used by informing everyone - men, women and children that: (i) small families are healthier, (ii) high water users from tubewells are healthier, (iii) women's privacy at the pump is healthier, (iv) washing clothes at the pump is healthier, and (v) playing at the pump is healthier. There is a need to inform people why this is so.

Githeko AK see Sabwa DM

Gittlesohn AM see Hollister AC, Jr.

Glasse RM. Cultural aspects of the transmission of cholera. In: Proceedings of the Cholera Research Symposium, Honolulu, Hawaii, 24-29 January 1965. Washington, D.C.: U S Department of Health, Education, and Welfare, 1965:337-9

The cultural and environmental factors that could be important in the transmission of cholera are investigated. This report is a broad sketch of the ecological and cultural setting during 1964 for cholera in one village of Bangladesh with a population of 13,612 people. Preliminary analysis of the composition of the joint and simple families suggests that these units may be useful in an epidemiological study. The mean size of a simple family is 4.53

individuals and that of the joint family 8.16. In both types, food is prepared at a common hearth; water for household use is usually stored in a clay jar, one to each house, so that people eating food from the same hearth may be drinking water from a different source, exposed to different possibilities of contamination. Such observations on a larger sample may help the epidemiologist to construct meaningful hypotheses concerning the relationships between the incidence of cholera and the role of food and water in households.

Gleason NN see Mackie TT

Godbole SH, Wagle PM. Isolation of Vibrio cholerae from a well water during a small outbreak of cholera. Indian J Med Sci 1970 Aug;24:484-6

Goh KT see Lam S

Goh SGJ see Lloyd-Evans N

Goldfield M see Lobel HO

Goldmann DA see Merson MH

Gomez B see Ryder RW

Gongalez N see Schlesinger L

Goodman RA, Buehler JW, Greenberg HB, McKinley TW. Norwalk gastroenteritis associated with a water system in a rural Georgia community. Arch Environ Health 1982 Nov/Dec;37(6):358-60

An outbreak of acute gastroenteritis that occurred January 1982 in a rural community in Georgia, USA is reported. Twenty-seven persons with gastroenteritis were interviewed by the Office of Epidemiology, Georgia Department of Human Resources and the Environmental Protection Division. These persons had nausea, abdominal cramps, diarrhoea and/or vomiting, headache, myalgias, and low fever. Duration of illness ranged from 1 to 3 days. Twenty of the 22 (91%) persons exhibited in their serum a 4-fold rise in antibody titer to the Norwalk virus. Gastroenteritis occurred in 30.6% persons in 57 households. One or more cases of illness occurred in 20 of the 25 (80%) households served by the community water system in contrast to 5 of the 22 (16%) households served by other sources ($X^2=21.0$, $p<0.001$). The outbreak was due to Norwalk virus infection. The findings of this investigation implicated the local commercial water system as the source of this infection. A prompt investigation of outbreaks of community gastroenteritis increases the likelihood of identifying causative agents and may facilitate implementation of measures to prevent future outbreaks.

Goodman RA see Kaplan JE

Gorbatow O. [Water, milk and fly hygiene and their relation to summer diarrhea in rural community]. Nord Hyg Tidskr 1951:225-39

Gordon JE see Bruch HA

Gordon RC, Pogan GJ. Water-borne outbreak of shigellosis at an Indian Bible School. J Okla State Med Assoc 1970 Aug;63:376-7

Govil KK see Zaheer M

Grab B see Sundaresan TK

Gracey M, Stone DE, Sutoto, Sutejo. Environmental pollution and diarrhoeal disease in Jakarta, Indonesia. J Trop Pediatr Environ Child Health 1976 Feb;22(1):18-23

The extent of environmental pollution and the incidence pattern of diarrhoeal diseases in Jakarta, Indonesia are described. Water specimens were obtained from Ciliwung River which ran through the Dr Cipto Mangunkusumo Hospital grounds, where studies were carried out. All water specimens from the Ciliwung River contained very large numbers of microorganisms (range=$3.1x10^4$ to $3.6x10^7$ per ml), including enteric pathogens in 3 of the 7 specimens. These included Salmonella paratyphi B and Shigella flexneri. Six of the 7 specimens grew anaerobes (range=$2.5x10^2$ to $1.0x10^7$ per ml), including Clostridium sp., Bacteroides sp., peptostreptococci and Gram-negative curved and spiral rods. Specimens from suburbs surrounding the hospital contained from $1.9x10^3$ to $1.8x10^8$ microorganisms per ml. Four of the 9 specimens grew enteric pathogens (5 isolations of Salmonella sp. in 4 specimens). Five of the 9 specimens contained Escherichia coli and 5 of the 9 grew anaerobes. One of the two specimens from the gastroenteritis ward grew Salmonella sp. Specimens from the sink and table in the milk kitchen contained saprophytic organisms. The rate of exposure of the people in the area studied was very high. The high contamination of the river water was due to using the river as a natural sewer. The provision of adequate sewerage systems and clean water supplies requires attention. The study's finding emphasizes the importance of public health measures in improving health standards and mortality rates in children in developing countries.

Gracey M, Ostergaard P, Adnan SW, Iveson JB. Faecal pollution of surface waters in Jakarta. Trans R Soc Trop Med Hyg 1979;73(3):306-8

Fecal pollution of surface waters in Jakarta, Indonesia is reported. Samples of surface water were taken in 1976 from the Ciliwung river and adjoining canals which drain into the Java sea. About 20 ml of water samples were collected into a sterile container and kept at -20°C, until the microbiological studies were done 6 to 10 weeks later. In tests for Salmonella, 10 to 200 ml of water samples were collected and transported frozen. All 20 specimens grew heavy numbers of Enterobacteriaceae ranging from $1.3x10^5$ per dl to $7.9x10^6$ per dl. Fifteen of the 20 specimens grew Escherichia coli (range = $3.1x10^3$ per dl to $3.1x10^6$ per dl); Klebsiella sp. were recovered in high numbers from 7 specimens and Citrobacter from 4 among other pathogens. Ten (48%) of the 21 samples and 12 (63%) of the aquatic sediments yielded Salmonella. Thirty-seven Salmonella isolations, comprising 14 serotypes, were recorded. This study showed that the surface waters or sediments of Ciliwung river and adjoining canals in Jakarta had a high prevalence of Enterobacteriaceae, including a wide range of Salmonella serotypes. Many of the poorer sections of the population, who used surface waters for washing or cooking, served as carriers of Salmonella, adding to the hazards of spreading diarrhoeal diseases throughout the community and also among travelers to such places.

Gracey M. Polluted water and childhood diarrhoea in Jakarta, Indonesia. Prog Water Technol 1979;11(1-2):57-64

Evidence has been presented from work done in Jakarta, Indonesia, supporting

the view that pollution, especially of water, is a major contributor to the incidence of diarrhoeal diseases and also malnutrition in crowded, tropical, urban environments. All 20 specimens of surface water, taken from the Ciliwung River and adjoining canals of Jakarta, grew large numbers of Enterobacteriaceae with individual counts ranging from $1.3x10^5$ per 100 ml to $7.9x10^6$ per 100 ml. Fifteen of the 20 specimens grew Escherichia coli; Klebsiella were present in large numbers in 7 specimens. Citrobacter (4), E. cloacae (5), and E. agglomerans (7) were also found. Salmonella were isolated from 3 specimens and Shigella from 1. The results confirmed the importance of this environmental factor in causing a high rate of infectious diarrhoeal disease in young children there. Despite contrasts of climate, water supplies and life styles, the 'malnutrition-diarrhoea cycle' is also an important problem in remote Australian aboriginal communities. More studies are needed to document the relative contributions of these environmental factors in communities where intestinal infections are major health problems. Effective preventive health measures will depend on appropriate application of this knowledge in the underprivileged communities.

Granger SI see Schroeder SA

Green DM, Scott SS, Mowat DA, Shearer EJ, Thompson JM. Water-borne outbreak of viral gastroenteritis and Sonny dysentery. J Hyg (Camb) 1968 Sep;66:383-92

Greenberg BG see Mackie TT

Greenberg HB see Goodman RA

Greenberg HB see Wilson R

Greenberg HB see Taylor JW

Greenberg JH, Schmidt EA, Bell FS, Jr. A common source epidemic of shigellosis. Public Health Rep 1966 Nov;81(11):1019-24

Grisdale SK see Philipp R

Gross RJ see Black RE

Grosse RN see Shuval HI

Guerrant RL see Rosenberg ML

Guerrant RL see Shields DS

Guimaraes CL see Blake PA

Gunn RA see Craun GF

Gunn RA see Haley CE

Gupta DN see Deb BC

Gupta JP see Aggarwal P

Gusita C see Boghitoiu G

Guthrie LC see Lewis JN

Guy MW see Feachem RG

Habicht JP see Esrey SA

Haines TW see McCabe LJ

Haley CE, Gunn RA, Hughes JM, Lippy EC, Craun GF. Outbreaks of waterborne disease in the United States, 1978. J Infect Dis 1980 Jun;141(6):794-7

Outbreak patterns of diseases related to drinking water in the USA in 1978 are summarized. Some 32 outbreaks of waterborne diseases, involving 11,435 cases, were reported to the Centers for Disease Control, Atlanta and to the Environmental Protection Agency, Cincinnati, Ohio in 1978. In 16 (50%) of the outbreaks, the etiology was determined. Shigella accounted for 4 outbreaks, Giardia lamblia for 4, Norwalk-like agents for 3, Salmonella for 2, chemicals for 2, and Campylobacter fetus (subsp jejuni) for 1. A community water system in Colorado had an outbreak of giardiasis (5,000 cases), while another 3,000 people were infected with C. fetus (subsp jejuni) in an outbreak in Vermont. Most outbreaks involved non-community water supplies. Nine (50%) of these outbreaks were caused by use of untreated water. Community water supplies accounted for 10 (31%) of all outbreaks. Treatment deficiencies were responsible for 6 of the 10 outbreaks. Individual water supplies accounted for 4 (13%) of the outbreaks. The reported outbreaks were a fraction of the total outbreaks that occurred in 1978. In the future, the proportion of outbreaks of unknown etiology should decrease, if public health authorities are promptly notified when a waterborne outbreak occurs.

Hall CB see Ryder RW

Han AM, Myint TM. Knowledge, attitudes and behaviour in relation to diarrhoea in a rural community in Burma. Southeast Asian J Trop Med Public Health 1986 Mar;17(1):59-62.

In a rural community of Burma, 488 households with one or more under-5 children were included in a survey to determine how people comprehend the importance of food, water and defecation in causing diarrhoea and to determine whether people wash their hands properly or use soap after defecation and before preparing and eating food. Eighty-three percent of the respondents were mothers, while the remaining were fathers, grand parents, or other family members. Most respondents (53 to 86%) agreed that food, water and feces could cause diarrhoea. They also agreed that washing of hands before preparing and eating food and after defecation (86 to 99%) was necessary. Necessity of latrines was recognized by 94% of the respondents. Although 34 to 88% practiced handwashing before eating and food handling and after defecation, only 5 to 12% had regularly used soap. Drinking water for under-5 children was obtained by dipping the drinking mug or cup into the drinking water pot (83%). Such practices could contaminate the stored drinking water and lead to illnesses, including diarrhoea.

Han AM, Oo KN, Aye T, Hlaing T. Personal toilet after defaecation and the degree of hand contamination according to different methods used. J Trop Med Hyg 1986 Oct;89(5):237-41

Transmission due to contaminated hands is one of the important routes by which the pathogens of diarrhoea spread. The hands commonly become contaminated while cleaning the anus after defecation. This study, carried out during May-June 1985, reports the different methods of anal cleansing after defecation in families residing in a low-socioeconomic community in Rangoon, Burma, the degree of hand contamination before and after defecation in mothers with children, aged under 5, in this community, and the association of diarrhoea and dysentery with the cleaning methods. A cross-sectional survey was employed for collection of behavioral and hand contamination data. The incidence of acute diarrhoea and dysentery among under-5 children was monitored for 1 month and was correlated with the cleaning method used by their mothers. In this community, water was the principal method used (77%) for cleaning the anus after defecation in all age groups as well as in the specific age groups. No one used toilet paper, and only 9% used paper other than toilet paper. The level of education seemed to be a factor in determining the use of paper or water. The use of paper alone or paper plus water increased as the level of education becomes higher. Water use decreased from 91% among the illiterates to 77% in those with primary or secondary school education and down to 50% in those with high school or college education. The reverse was true for the use of paper/paper plus water which increased from 0 and 5% to 9 and 14% to 18 and 32%. The hands of mothers using water were more contaminated than those using paper. However, thorough handwashing with soap and water was found to be effective in decontaminating the hands. Furthermore, there was a relation between the incidence of diarrhoea and dysentery and the method of cleaning. The incidence was lowest in those children whose mothers used paper, and the reverse was true for those who used paper. The risk to water users was 3.8 times that of paper users, but the relative risk was not statistically significant. These findings indicate the importance of handwashing after defecation and before food handling or eating and of the use of paper in cleaning the anus after defecation because of the reduced feces-finger contact.

Handa BK, Panicker PVRC, Kulkarni SW, Gadkari AS, Raman V. The impact of sanitation in ten Indian villages. In: Pacey A, ed. Sanitation in developing countries. Chichester: Wiley, 1978:34-41

Haq M see Rahaman MM

Harada K, Shigehara S, Kameda M, et al. [Detection of Shigella sonnei from a water supply causing a disease outbreak]. Jpn J Bacteriol 1967 Aug;22:478-81

Harris RW see Borden HH

Harrison S see Feachem RG

Harter L, Frost F, Vogt R, Little AA, Hopkins R, Gaspard B, Lippy EC. A three-state study of waterborne disease surveillance techniques. Am J Public Health 1985 Nov;75(11):1327-8

This report comprises a 3-state study of surveillance techniques of waterborne diseases by the State Health Department of Colorado (1980-1982), Vermont (1980-1982) and Washington (1981-1983) in the USA. Investigations of the water system and user surveys were conducted when any of the surveillance activities revealed contaminated water or excess illnesss in the community. The 3-state surveillance projects identified 68 outbreaks of diseases. Among them, only 15 were waterborne. Very high coliform counts were found in some drinking water

samples and also pathogens in raw water supplies. No related illness was found in the communities served by the water systems. In Colorado, one outbreak of waterborne giardiasis was identified. Fourteen outbreaks of waterborne diseases were identified through the surveillance system in all 3 states: 10 outbreaks in Colorado, one in Vermont, and 3 in Washington. Fourteen outbreaks of waterborne diseases were also identified during the 2 preceding years by the traditional passive surveillance systems of 3 states. It is concluded that the passive surveillance method may be useful for local and state public health agencies when current surveillance is inadequate.

Hasan KZ see Aziz KMA

Hassan FR see Weir JM

Hatch MH see Black RE

Hawkins P see Cutting WAM

Hazlet KK see Rosenberg ML

Healy GR see Shaw PK

Hebert JR, Miller DR. Measuring the impact of water supply and sanitation on diarrhoeal diseases: problems of methodology [letter]. Int J Epidemiol 1984 Sep;13(3):374-6

Hebert JR, Miller DR. Water supply and sanitation: effect on diarrhoeal diseases [letter]. Int J Epidemiol 1984 Dec;13(4):543-4

Heidbreder GA see Mahoney LE

Helms R see Shiffman MA

Hemphill EC see Hollister AC, Jr.

Hemphill EC see Stewart WH

Hemphill EC see Watt J

Henry FJ. Environmental sanitation infection and nutritional status of infants in rural St. Lucia, West Indies. Trans R Soc Trop Med Hyg 1981;75(4):507-13

Cohorts of children in 3 valleys in rural St. Lucia in the West Indies were studied with regard to anthropometry, intestinal helminths, diarrhoea and other illnesses, while findings related to different levels of sanitation and water supplies are also presented. Some 75 babies in each of 3 valleys were followed up for 2 years. An increase in Ascaris incidence was observed. As sanitation improved, decrease in incidence was seen. The relationship was not clear, however, for Trichuris. After installation of improved water supply and latrines, the Ascaris and Trichuris infections dropped 30% and 50% respectively. The percentage of children with diarrhoea dropped during the 2-year period. Diarrhoea was predominant in children aged under 1. Features of growth and overall health pattern among babies in each of the 3 valleys are given. All the growth curves were below the Harvard Standard curve after the age of 6 months. The children, living in poor sanitation areas, had a growth

rate that was lower than the others. It is concluded that these variations in growth levels and health patterns were attributable to the lower infection rates and better nutritional status of the children in those environments, where piped water supply and modern sanitary systems were available.

Herron CA see Baine WB

Hibler CP see Shaw PK

Highsmith AK see Eden KV

Hines VD see Petersen NJ

Hinman AR see Renteln HA

Hlaing T see Han AM

Hobson W. The spread and control of: (1) water and foodborne infections; and (2) worm infections. In: The theory and practice of public health. 2d ed. London: Oxford University Press, 1965:141-52, 201-6

Hoff JC see Jakubowski W

Hogan RC see Feachem RG

Hollister AC, Jr., Beck MD, Gittlesohn AM, Hemphill EC. Influence of water availability on Shigella prevalence in children of farm labor families. Am J Public Health 1955 Mar;45(3):354-62

Among several population groups with high diarrhoeal morbidity and mortality in Fresno County and San Joaquin Valley, California, USA, the etiology of the disease was studied. The study carried out in 1952-1953 attempted to clearly define the relationship with Shigella prevalence and the availability of water for personal hygiene (laundry, bathing, and handwashing). The major finding of this study was that shigellosis was an important health problem among the study populations, and the most important mode of transmission was person-to-person contact. Another similar study, done in 1950, determined that a single environmental factor — water availability played an important role in determining the prevalence of Shigella infections. It is suggested that increased water availability, preferably through piped supply, could be used as an efficient control mechanism over the occurrence of Shigella infections.

Hollister AC, Jr. see Watt J

Holm PT see Werner SB

Holman RC see Wilson R

Holman RC see Morens DM

Hood MA, Ness GE. Survival of Vibrio cholerae and Escherichia coli in estuarine waters and sediments. Appl Environ Microbiol 1982 Mar;43(3):578-84

The comparative survival of Vibrio cholerae and Escherichia coli in estuarine water and sediment chambers was studied, using plate counting and direct

counting techniques. V. cholerae strains, including environmental, clinical, and serotype 01 and non-01 isolates and E. coli strains of ATCC 25922 and a freshly cultured human isolate, were studied. The environmental V. cholerae 01 strain survived well in estuarine waters and sediments, and the recovery varied significantly with incubation temperature. After 7 days, the organisms grew abundantly in the sterile sediment, but viable cells declined in nonsterile sediments as well as in nonsterile water. On the other hand, the E. coli strains did not survive in both sterile and nonsterile estuarine waters and could not be recovered by plating. E. coli did not survive well in sterile sediment, but, in nonsterile sediment, its growth was observed to be better than the V. cholerae strains. Freshly cultured human isolates of E. coli did not survive as well as the V. cholerae strains in sterile estuarine water. The differences between direct counts and viable counts of V. cholerae strains in sterile estuarine water were notably less than with E. coli strains. Significant differences between viable and direct counts of V. cholerae were observed with the 01 strain. These findings suggest that V. cholerae can survive better in estuarine water than E. coli. This, in time, has implications for the validity of using fecal coliform E. coli levels to indicate the quantity of water and shellfish. Other environmental studies also showed that fecal coliform levels in estuarine waters did not correlate well with V. cholerae levels.

Hook EW see Shields DS

Hooper RR, Husted SR. A shipboard outbreak of gastroenteritis: toxin in the drinking water. Milit Med 1979 Dec;144(12):804-7

Hopkins R see Harter L

Hopkins RS, Gaspard GB, Williams FP, Jr., Karlin RJ, Cukor G, Blacklow NR. A community waterborne gastroenteritis outbreak: evidence for rotavirus as the agent. Am J Public Health 1984 Mar;74(3):263-5

An outbreak of community waterborne nonbacterial gastroenteritis occurred in Eagle-Vail, Colorado, USA, in March 1981. Illness (defined as vomiting and/or diarrhoea) was statistically associated with water consumption (X^2 for linear trend = 7.07, $p<.005$). Overall attack rate was 32% (41/128). Five of the 7 persons associated with the outbreak were infected with rotavirus as shown by virus detection or serological methods. Bacterial pathogens, Giardia lamblia, and Norwalk virus were excluded as responsible agents. It is concluded that rotavirus should be looked for as a cause of waterborne outbreaks. (Modified author's abstract)

Hopkins RS, Shillam P, Gaspard B, Eisnach L, Karlin RJ. Waterborne disease in Colorado: three years' surveillance and 18 outbreaks. Am J Public Health 1985 Mar;75(3):254-7

This report describes outbreaks of waterborne diseases in Colorado, USA, identified during a 3-year surveillance from July 1980 to June 1983, involving 18 outbreaks. In the first year, coliform contents of community and non-community water systems were assessed. An educational program, directed toward county health officials, was instituted in 1981. Investigation of all waterborne outbreaks was made by community surveys via telephone. Eighteen outbreaks of waterborne gastrointestinal diseases were reported, while an additional 10 outbreaks were also suspected of being waterborne. Nine of the

18 waterborne outbreaks were caused by Giardia lamblia, and only one was due to rotavirus. No agent was identified for the remaining 8 outbreaks. No outbreaks were found through 12 months of daily review of positive coliform test results from state water systems. Community attack rates ranged from 10 to 64.4%. Outbreaks occurred in all seasons. Community water system accounted for 15 of the 18 confirmed and 7 of the 10 suspected waterborne outbreaks. Coliform counts were normal in 9 and unknown in 2 of the 7 outbreaks. Chlorine residuals were inadequate in 6, adequate in 8, and unknown in 4 outbreaks. Most outbreaks occurred in systems without adequate chemical pretreatment, filtration, and chlorination. The decision to classify outbreaks in this study as waterborne was based on demonstration of a dose-response relationship between water consumption and illness. It is concluded that effective inexpensive surface water treatment methods may substantially reduce the risk of waterborne diseases.

Horoch C see Gawronowa H

Horwitz MA, Hughes JM, Craun GF. Outbreaks of waterborne disease in the United States, 1974. J Infect Dis 1976 May;133(5):588-93

This report summarizes surveillance data assimilated by the Center for Disease Control and the Environmental Protection Agency of the USA regarding outbreaks of waterborne diseases in the USA during 1974. In 1974, 28 outbreaks of waterborne diseases affecting 8,413 persons were reported from 19 states of the USA. The mean annual number of outbreaks in 1971-1974 was 24. An etiologic agent was found in 17 of the 28 outbreaks; the remainders of the outbreaks were characterized by acute gastrointestinal illness of unknown etiology. Giardia lamblia was found in 7 outbreaks, while chemicals (fluoride, chromate, phenol, etc.) were responsible for 5 outbreaks. Shigellosis involved the highest median number of cases (600), followed by giardiasis (32), acute gastrointestinal illness of unknown etiology (19), and chemical poisoning (18). In 1974, most outbreaks involved municipal systems rather than the semi-public systems. Twelve outbreaks (43%) were traced to municipal water systems, 10 (36%) to semi-public systems, and 6 (21%) to individual water systems. Outbreaks attributed to water from municipal systems affected far more people on the average than the semi-public or individual water systems. In most outbreaks, untreated or inadequately treated water was responsible for the outbreaks. The most common deficiency found in reported outbreaks of giardiasis was the lack of treatment. Surface water is recommended for regular treatment by sedimentation, filtration, and chlorination.

Horwitz MA see Black RE

Hossain B see Khan MU

Howard J, Lloyd B. Sanitation and disease in Bangladesh urban slums and refugee camps. Prog Water Technol 1979;11(1-2):191-200

Fecal pollution of the environment has made outbreak of excreta-derived disease common in Bangladesh, where there are in excess of 250,000 cases of clinical cholera annually. Thirty-three to 66% of children, aged under 2 living in refugee camps, have had at least one attack of diarrhoea. The consequences are often extremely serious when exacerbated by malnutrition. It was demonstrated that even slight improvements in water supply and sanitation can markedly reduce the transmission of Vibrio cholerae. Surveys in several parts of

Bangladesh have revealed prevalence levels of Ascaris in excess of 95%. The obvious remedies to the problems are: (1) an adequate means of managing human excreta and ensuring a safe water supply, (2) an insistence on basic personal hygiene through social pressure, and (3) a basic health service, including an educational element. This paper emphasizes the attempts to find suitable sanitation technologies. The design, construction and maintenance of Oxfam (type 2) sanitation units have been discussed. Based on the experiences in providing sanitation in Bangladesh and India, directions of future work have been outlined.

Hughes AO see Philipp R

Hughes JM. Epidemiological studies of water supply and sanitation and health. In: Lindstrom JD, ed. The impact of interventions in water supply and sanitation in developing countries; proceedings of a seminar held at the Pan American Health Organization, 25-26 March 1980. Prepared by Logical Technical Services, Corp. Washington, D.C.: U S Agency for International Development, 1981:33-45

Hughes JM, Boyce JM, Levine RJ, Khan MU, Aziz KMA, Huq MI, Curlin GT. Epidemiology of eltor cholera in rural Bangladesh: importance of surface water in transmission. Bull WHO 1982;60(3):395-404

To define the role of water used for cooking, drinking, bathing and washing in the transmission of Vibrio cholerae biotype El Tor infections in an endemic cholera area, surveillance was begun in neighborhoods with a culture-confirmed cholera index case, and in other with non-cholera diarrhoea index cases as controls. In cholera-infected neighborhoods, 44% of the surface water sources were V. cholerae-positive, whereas in control areas, only 2% of the water sources were positive. Canals, rivers and tanks were most often positive. There was an increased infection risk for families using water from culture-positive sources for drinking, cooking, bathing, or washing, and for those using water sources used by index families for drinking, cooking, or bathing. Analysis of results for individuals showed an increased infection risk associated with using water from culture-positive sources for cooking, bathing, or washing, but not with using such water for drinking. Individuals, who used the same water source as an index family for bathing, were more likely to be infected than those using different sources. For families drinking from a culture-negative source, there was an association between infection and bathing in a positive source. For families using a different bathing source from the index family, there was an association between infection and drinking from the same source as the index family; and for families using a different drinking source from the index family, there was an association between infection and bathing in the same source as the index family. These data suggest that use of water is important in transmission of V. cholerae; and that, in addition to providing safe drinking water, education regarding the risks of transmission of cholera from potentially contaminated water used for other purposes, especially bathing, may also be necessary to control transmission in areas where El Tor cholera is endemic.

Hughes JM, Merson MH, Craun GF, McCabe LJ. Outbreaks of waterborne disease in the United States, 1973. J Infect Dis 1975 Sep;132(3):336-9

Outbreaks of waterborne gastroenteritis in the USA during 1973 are described. In 1973, 24 outbreaks, affecting 1,720 persons, were recorded at the Center for

Disease Control, USA from 12 states. Two persons died during the outbreaks due to shigellosis. Thirteen of the 24 outbreaks were classified as "sewage poisoning". Shigellosis was responsible for most of the outbreaks (17%) and cases (19%). Sixteen outbreaks involved semi-public systems, while 5 could be traced to municipal systems and 3 to individual systems. Deficiencies in water treatment were responsible for the outbreaks. Fourteen (61%) of the outbreaks occurred during June, July, and August. The largest outbreak of typhoid fever in the USA since 1939 occurred in 1973. Coliform bacteria were isolated from the water at the time of the outbreak investigation. In 1973, an outbreak of shigellosis affected 181 persons at a Pennsylvania club. Fecal coliforms were isolated from the club water. The largest outbreak of waterborne shigellosis, affecting 690 passengers and crew members of an American ship, was not recorded in the annual data as it occurred outside the country. Fecal coliforms were found in the ship's water. Two outbreaks of waterborne giardiasis, involving 28 persons in Colorado, were also reported. Untreated surface and ground water were responsible for these outbreaks. The recently passed Safe Drinking Water Act may assist in maintaining water supplies in the USA.

Hughes JM. Potential impacts of improved water supply and excreta disposal or diarrhoeal disease morbidity: an assessment based on a review of published studies. Geneva: Diarrhoeal Diseases Control Programme, World Health Organization, 1981. 36 p.

Hughes JM, Boyce JM, Levine RJ, Khan MU, Curlin GT. Water and the transmission of El Tor cholera in rural Bangladesh. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1977. 24 p. (Working paper no. 2)

To determine the most efficient technique for detecting mild and asymptomatic cases in the field during a vaccine trial, and to evaluate the role of water in transmission of cholera in rural Bangladesh, an investigation was conducted in the Matlab field trial area during the 1973-1974 cholera season. Fourteen cholera-infected and 14 control neighborhoods were studied. Visits to the house and neighborhood cholera index cases identified an average of 5.6 persons infected with Vibrio cholerae and 3.3 symptomatic cholera cases for each index case residing in a small neighborhood. Total case rates in the 4 large neighborhoods were significantly lower than that of small neighborhoods ($p<0.001$). No cases were detected in control neighborhoods. Children aged 1-14 years and adult females accounted for 4.8 total cases and 2.7 symptomatic cases per index case and were available at home in contrast to adult males. For these reasons, this group was chosen for the toxoid vaccine trial in 1974. Eleven of the 14 (79%) cholera-infected neighborhoods had at least one water source contaminated with V. cholerae compared with one of the 14 (7%) non-infected neighborhoods ($p<0.001$). In cholera-infected neighborhoods, 43% of all cultured water sources were positive for V. cholerae compared with 2% of sources in the control. Families using a culture-positive water source for drinking, cooking, bathing, or washing were significantly more likely to be infected with cholera than other families. In addition, families using the same water source as the index family for either drinking or bathing were more likely to be infected. The data support the hypothesis that contaminated water is important in the transmission of cholera and also suggest that providing facilities for adequate sewage disposal to decrease contamination of surface water may be important in areas where V. cholerae biotype El Tor is endemic.

Hughes JM see Boyce JM

Hughes JM see Craun GF

Hughes JM see Esrey SA

Hughes JM see Haley CE

Hughes JM see Horwitz MA

Hughes JM see Lawrence DN

Hung T, Chen G, Wang C, Yao H, Fang Z, Chao T, Chou Z, Ye W, Chang X, Den S, Liong X, Chang W. Waterborne outbreak of rotavirus diarrhoea in adults in China caused by a novel rotavirus. Lancet 1984 May 26;1(8387):1139-42

A new rotavirus was found in patients' stools during 2 acute diarrhoea epidemics in China from December 1982 to January 1983. More than 12,000 adults in 2 coal mining districts were affected. The virus isolated from stool samples resembled a rotavirus morphologically. Antigenically, it lacked the group antigen shared by known rotaviruses. Like other rotaviruses, it had a double-stranded ribonucleic acid (RNA) separated into 11 segments by polyacrylamide gel electrophoresis. It showed a unique RNA migration pattern characterized by widely separated segments 7, 8 and 9, and 2 double segments, 3.4 and 5.6. The virus was designated "Adult Diarrhoea Rotavirus" to distinguish it from the rotavirus-causing infantile diarrhoea.

Hunter JM, Rey L, Scott D. Disease prevention and control in water development schemes. Geneva: World Health Organization, 1980. 35 p.

Huq A, Small EB, West PA, Huq MI, Rahman R, Colwell RR. Ecological relationships between Vibrio cholerae and planktonic crustacean copepods. Appl Environ Microbiol 1983 Jan;45(1):275-83

The study examines the association between Vibrio cholerae and zooplankton and determines whether the presence of copepods influences the survival of V. cholerae in the aquatic environment. V. cholerae 01 (classical Inaba and El Tor Ogawa), V. cholerae non-01, V. parahaemolyticus, Escherichia coli, and Pseudomonas sp. were used. Strains of V. cholerae, both 01 and non-01 serovars, were found to attach to the surfaces of live copepods maintained in natural water samples collected from the Chesapeake Bay and Bangladesh environments. Scanning electron microscopy confirmed the specificity of attachment of V. cholerae to live copepods. Attachment to live copepods appeared to be selective, since the heaviest concentrations of bacterial cells were observed in the oral region and on the egg sac of the copepods. In addition, survival of V. cholerae in water was extended in the presence of live copepods. Scanning electron microscopy revealed that there was no attachment when cold-killed (by exposure to -60°C) copepods were employed. Survival of V. cholerae was not as long in the presence of dead copepods as in the live copepod system. V. parahaemolyticus also adhered to live copepods, but without selectivity, i.e. the cells covered the whole copepod. The attachment had no effect on survival of the organism in water. Strains of Pseudomonas sp. and E. coli did not attach to live or dead copepods. The attachment of vibrios to copepods is significant since strains of other bacteria used in the study did not show any adherence. The attachment between V. cholerae and live copepods is suggested to have ecological as well as epidemiological significance. Since V. cholerae serovar 01 is the causative organism for cholera, the results also have epidemiological implications.

Huq A see Collwell RR

Huq A see Spira WM

Huq I see Ahmad K

Huq I see Colwell RR

Huq I see Martin AR

Huq MI, Aziz KMS, Colwell RR. Enterotoxigenic properties of Vibrio fluvialis (Group F Vibrio) isolated from clinical and environmental sources. J Diarrhoeal Dis Res 1985 Jun;3(2):96-9

Toxigenic Vibrio fluvialis (formerly Group F Vibrio) has been isolated from both clinical and environmental sources in Bangladesh and in the USA. Phenotypic and toxigenic characteristics of strains isolated from patients and the environment were similar. Ninety percent of the clinical isolates and 70-80% of the environmental isolates were toxigenic, when concentrated filtrates were tested by the ileal loop assay. V. fluvialis appears to be associated with other potentially pathogenic vibrios in the environment, and can be isolated from the aquatic environment of widely diverse geographical areas.

Huq MI see Hughes JM

Huq MI see Huq A

Huq MI see Khan MU

Huq MI see Shahid NS

Husaini Y see Matulessy PF

Hussain A see Aziz KMA

Hussain AMZ. A study on cholera epidemic in Bogra, 1981. J Preven Soc Med 1982;1(1):49-57

The prevalence rate of cholera was studied after an apparent week-long cholera epidemic in December 1981 in Bogra, Bangladesh. The investigation began as the epidemic was declining, but new cases were being hospitalized. Some 172 patients were examined clinically, 22 in the hospital and 150 in their homes. Of the 47 rectal swabs collected, 11 showed positive cultures for Vibrio cholerae. All strains isolated were of the El Tor biotype, of which 9 were Ogawa and 2 Inaba. No significant sex differences in the incidence rates of cholera were observed. Finally, in 6 of the confirmed cases, the individual had used tubewell water for all purposes, while 10 of the 11 confirmed victims had used tubewell water for drinking alone. This finding confirms the failure of tubewell water to protect people against cholera. In all the households, tubewell sinking sites and their maintenance were unhygienic.

Husted SR see Hooper RR

Indrasuksri T see Vathanophas K

Ioirish AN, Vilkovich VA. [The role of the water factor in the spread of dysentery on river vessels]. Zh Mikrobiol Epidemiol Immunobiol 1976 May;(5):104-6

Ioirish AN see Solodovnikov IuP

Ipatova II see Kukolevska MI

Isaacson M, Smit P. The survival and transmission of V. cholerae in an artificial tropical environment. Prog Water Technol 1979;11(1-2):89-96

An outbreak of cholera in a South African gold mine involved those who were associated, either as trainees or as staff members, with the acclimatization center. This center generated a tropical microclimate for acclimatizing new underground workers to high environmental temperatures. It was postulated that a healthy carrier might, under prevailing conditions of acclimatization, disseminate Vibrio cholerae from the perianal area to the floor by means of sweat flowing down the lower limbs. This belief was strengthened when V. cholerae was subsequently isolated from perspiration fluid. V. cholerae, seeded into the environment of the climatic chamber, could be recirculated by stead droplets and water of condensation. This was confirmed by the experimental demonstration that V. cholerae not only survived for considerable periods of time, but also multiplied readily in human sweat, tap water and other fluids found in this particular environment. These findings are of potential importance in epidemiology of cholera in the tropics as low-dose excretors' and even as 'high-dose disseminators' and water supplies may be contaminated by healthy carriers other than via direct fecal contamination. The high pH, high NaCl content, favorable temperatures and the absence of sunlight provide excellent conditions for the survival and multiplication of V. cholerae. Although sweat is usually acidic (pH 4.0 to 6.8), alkaline values have also been reported earlier. It is probable that acclimatization to heat affected the pH of sweat of the study subjects.

Isely RB. A community organisation approach to clean water and waste disposal in Cameroonian villages. Prog Water Technol 1979;11(1-2):109-16

Described here is a community organization approach to clean water and waste disposal in Cameroonian villages. The Mefou, with a population of 200,000, living in 400 villages, was selected as the study area. The cultivated plots are the usual site of defecation, while some latrines of an older type having a hole, maintained by a wood frame in the center, were in existence. The number of health committees reached 43 in total by 30 June 1976. There were 2 phases: (1) organizational phase and (2) maintenance phase of development of a health committee. The formal stages in the development of each committee consisted of an initial demographic and sanitation survey and a series of meetings dealing with aspects ranging from problem identification to definition of a program work. Enteric disease was found as the major health problem. Stools from 987 persons were examined; Ascaris ova were carried by 78.6% of them, whipworm by 44.7%, and hookworm by 15.5%. The projects, carried out by the committees, involved spring protection and latrine construction. With 27 of the 43 committees reporting by mid-1974, 26 informed of latrine construction at an average of 15.6 latrines per village, each village having 200-300 inhabitants. The range was from 2 to 44 latrines per village. In 1977, it was confirmed by the Ministry of Health that the majority were in use. In the 26 reporting villages, 82 springs were protected giving an average of 3.4 per village. The

number per village ranged from one to 7. Coliforms were not found in the spring water at any village. Community level and national level implications of such projects are discussed. It is concluded that local labor and local materials should be used in water reservoir protection projects.

Islam MR see Khan MU

Islam MS see Rahaman MM

Islam S see Khan M

Ismail M. Environmental health hazards in ecologically disturbed Bangladesh wetlands. In: Islam AS, Haque MM, Ameen M, Ahmed N, Haque S, eds. Proceedings of the Regional Seminar on Protecting the Environment from Degradation, South Asian Association for Regional Cooperation, 13-16 May 1985. Dhaka: Science & Technology Division, Ministry of Education, Government of Bangladesh, 1985:158-65

This work summarizes the findings of an investigation on the impact of water development projects on environmental health hazards in Bangladesh. A case study on some animal diseases in selected villages of Daulatpur Upazila of Kushtia district was included in the present work. The high population density, lack of sanitation and proper nutrition and the shortage of adequate medical facilities, all contribute to the precarious health environment. More than 60% of all diseases in Bangladesh are water-related according to UNICEF (1977). Dysentery and gastroenteritis, respectively, ranked second and third among killer diseases in 1975. The death resulting from dysentery and gastroenteritis is 1 per 168 and 1 per 16 respectively. There is a high lethality ratio for typhoid and tuberculosis, mortality ratios standing at about 1:400 and 1:100 respectively. The high tetanus and rabies figures emphasize the intimate association of people with animals. Malaria is usually transmitted by anopheles mosquitoes. Some 112 of the 4,951 cases of cholera died in 1975 as reported by the Public Health Services. Fasciolopsiasis, caused by trematode flukes, is followed by dysentery and gastroenteritis. Animal diseases are of considerable concern in and near the wetlands of Bangladesh. Increased salt levels in the soil reduce the quality of the pasture, thus contributing to malnutrition in animals. Fascioliasis, caused by Fasciola gigantea, and the outbreak of nasal schistosomiasis, caused by Schistosoma nasalis, are common with the cattle of Bangladesh. Limitations of biological control of snail-caused diseases are discussed. More studies on the spread of snailborne diseases in Bangladesh are needed.

Iveson JB see Gracey M

Iwugo KO see Feachem RG

Iyer L see Kale VV

Jahan K see Ahmad K

Jakubowski W, Hoff JC, eds. Waterborne transmission of giardiasis; proceedings of a symposium, 18-20 September 1978. Cincinnati: U S Environmental Protection Agency, 1979. xiv, 306 p.

Jakubowski W see Dykes AC

Jenkins AA see Drachman RH

Jephcott AE, Begg NT, Baker IA. Outbreak of giardiasis associated with mains water in the United Kingdom. Lancet 1986 Mar 29; 1(8483):730-2

An outbreak of giardiasis, associated with a fully treated UK water supply system, is reported. Some 108 cases of giardiasis were detected by the Bristol Public Health Laboratory in 1985. Sixty-eight cases with giardiasis or diarrhoea, who lived within the reservoir supply area, were included for the study. One hundred and nine adult controls were also studied. The response rate for cases (94%) was higher than that for controls (70%). A highly significant association was found between the illness and water consumption, both at home and at work. Of many food samples tested, only lettuce showed a correlation. Since lettuce is usually washed with tap water before consumption, this bears evidence of a waterborne spread. The routine microbiological tests on the main reservoir outlet revealed non-post-treatment contamination at the reservoir. The contamination of supply occurred beyond the reservoir. It is suggested that the stool examination for Giardia lamblia should be carried out in all cases of undiagnosed diarrhoea in the community during any future waterborne outbreak.

Jephcott AE see Philipp R

Jiwa SFH, Krovacek K, Wadstrom T. Enterotoxigenic bacteria in food and water from an Ethiopian community. Appl Environ Microbiol 1981 Apr;41(4):1010-9

The harmful effects of the presence of enterotoxigenic bacteria in food and water in Addis Ababa, Ethiopia in 1977, are outlined. For the checks in food, 70% of the food samples were brought from a local market, and the remainder were purchased from the city hawkers. Using the Chinese hamster ovary cell assay, 40 of the 213 isolates (18.8%) showed the presence of heat-labile (LT) enterotoxin. These LT enterotoxin-producing isolates comprised 33 of the 177 (18.6%) strains from 24 of the 68 food samples (35.3%) and 7 of the 36 (19.4%) isolates of 4 of the 17 water samples (23.5%). Three pseudomonads (LT enterotoxin-producers) were heat-stable (ST) enterotoxin-positive. In the rabbit ileal loop test, the volume to length ratios ranged from 0.5 to 3.1 ml/cm of gut. Fifteen of the 33 (45.5%) enterotoxigenic isolates were oxidase-positive. No enterotoxigenic Escherichia coli was isolated from the food samples. Seven food samples yielded more than one species of enterotoxigenic bacterium. Only one E. coli (O-group 68) was isolated from a water sample. It also yielded Salmonella emek. One enterotoxigenic strain, Shigella dysenteriae, was found. Only 4 of the 15 LT enterotoxin-producing oxidase-positive strains were positive in the rabbit skin test after 9 months of storage. Three of a strain were positive in the adrenal cell test after one year. The occurrence of multiple enterotoxigenic bacteria in food and water samples suggests that, under certain environmental conditions, enteric plasmid transfer may occur between species, although its stability in certain species may not be high. This approach for surveying a community for possible sources of enterotoxigenic bacteria may well be applied elsewhere.

Jobin W. Report of the Scientific Advisory Group on the Blue Nile Health Project, 27-29 October 1979; first meeting. Alexandria: Regional Office for the Eastern Mediterranean, World Health Organization, 1980. 18 p. (EM/VBV/23; EM/MAL/173; EM/SCHIS./77; EM/SUD/VBC/CO/RB)

Jobin W see Tameim O

Joint ICMR-GWB-WHO Cholera Study Group, Calcutta, India. Cholera carrier studies in Calcutta, 1968. Bull WHO 1970;43(3):379-87

Findings from studies on cholera carriers, carried out at Calcutta, India in 1968, are described. Suspected cases of cholera, admitted to the Infectious Diseases Hospital in Calcutta, were included in the study, and within 48 h of admission, demographic data were recorded on family cards of each patient. Vibrio cholerae could be isolated from members of 19 of the 23 households. Within the first 10 days of the investigation, 86 carriers were detected, and another 10 were detected during the next 14 days. Repeated isolations were obtained from 43 (45%) of the 96 carriers at intervals of 1-79 days. The carrier rate was highest in children aged between 5 and 9. One case of overt cholera was linked with a carrier. Of the 96 carriers, 36 (21% of 171 persons) were members of families in which index cases had occurred, and 60 (19% of 321 persons) belonged to other members of the household. Of the 103 families examined, 54 (52%) were found to be infected. Of the 23 index cases, 8 (35%) were found to be V. cholerae-positive sometime after discharge from hospital, where they had received rehydration and antibiotic treatment. The observations showed that carriers played a role in the transmission and maintenance of infection in addition to the part played by various environmental factors.

Jones PH see Werner SB

Joseph SW see Colwell RR

Joseph VR see Thacker SB

Juranek D. Waterborne giardiasis (summary of recent epidemiologic investigations and assessment of methodology). In: Jakubowski W, Hoff JC, eds. Waterborne transmission of giardiasis; proceedings of a symposium, 18-20 September 1978. Cincinnati: U S Environmental Protection Agency, 1979:150-63

Juranek DD see Dykes AC

Juranek DD see Lopez CE

Kabuleeta P see Shaffer R

Kader MA see Weir JM

Kale VV, Iyer L. Bacteriological study of neonatal diarrhoea. J Postgrad Med 1983 Jan;29(1):25-8

To ascertain the bacteriology of diarrhoea in neonates, the serotypes of pathogens of cases with neonatal diarrhoea and its relationship to the contamination of water and milk were studied. Seventy-nine stool and rectal swab samples from neonates with acute diarrhoea, attending the E E M Hospital at Bombay, India, were examined. The infection seemed to be more common in the first week of life (56 cases). The peak incidence was on the 4th day of life. Ninety organisms were isolated. Enteropathogenic Escherichia coli were isolated from 11 of the 42 cases (26.2%), and 055 was the predominant serotype. Salmonella and Shigella species were found in 7.7% and 2.2% of the cases respectively. The presence of Salmonella typhimurium in the fecal samples of the neonates showed that water used for feeds was contaminated. The rectal flora of purely breast-fed neonates with acute diarrhoea was not different from

that of bottle-fed infants. In this study, 19 infants died giving a mortality rate of 24.1%. Normal flora of the intestinal tract and the pH of its contents play an important role in the resistance of infection. Breast feeding is recommended as protection from bacterial infection.

Kameda M see Harada K

Kaniuka GF see Chernoschekov KA

Kaper J see Colwell RR

Kapikian AZ see Ryder RW

Kaplan JE, Goodman RA, Schonberger LB, Lippy EC, Gary GW. Gastroenteritis due to Norwalk virus: an outbreak associated with a municipal water system. J Infect Dis 1982 Aug;146(2):190-7

Gastroenteritis due to Norwalk virus and an outbreak associated with a municipal water system are discussed. The people of Lindale in Rome, Georgia, USA received their water supplies from a spring located 10 miles southwest of the city. From 25 to 27 August 1980, 20 residents of Lindale complained to the local health department concerning an outbreak of illness in their families. A questionnaire was given over to 69 of the 200 employees of a textile plant in Lindale. The highest attack rates were in the vicinity of the textile plant. In the Spring Village subdivision, an attack rate of 68% was found. Nausea (92%), vomiting (85%), and diarrhoea (84%) were observed. An association between illness and drinking water from the school water fountains was noted. In the Spring Village subdivision, a close association was demonstrated between illness and drinking 3 or more glasses of tap water daily. Seventy-four of the 205 residents, living in the distribution area of the water supply, reported illness compared with none of the 32 residents outside the water supply zone (X^2=15.16; p<0.001). Coliform bacteria were found in one of the springs used by the textile plant's workers. Reservoirs in which water was collected after chlorination had been contaminated with pennate diatoms (cell counts >25,000/ml). Twelve of the 19 serum pairs from patients showed the presence of Norwalk virus. This outbreak of gastrointestinal illness was caused by contamination in the local municipal water system by water from an adjoining industrial water system.

Karlin RJ see Hopkins RS

Karyadi see Sutoto

Kasana SK see Agarwal DK

Kawata K. Of typhoid fever and telephone poles: deceptive data on the effect of water supply and privies on health in tropical countries. Prog Water Technol 1979;11(1-2):37-43

Currently available literature on the effect of water supply and privies on the health of populations in tropical countries where enteric diseases are prevalent are not adequately conclusive in their findings. Some scientists have concluded that provisions of water supply and privies have been effective in reducing diarrhoeal diseases, while others have arrived at opposite conclusions. This paper re-examines some of the basic environmental parameters

of several papers to see what were the confounding factors that led to these conclusions. Whether the right questions were asked and whether the assumptions made were true have been discussed. It was found that, in each of the cases discussed in this paper, there were grave uncertainties regarding the construction, maintenance and use pattern of the handpumps.

Kawata K. Water and other environmental interventions - the minimum investment concept. Am J Clin Nutr 1978 Nov;31(11):2114-23

This paper describes water and other environmental interventions - in the minimum investment concept. Effective environmental interventions to reduce enteric infections include provision for water of good quality and of sufficient quantity with ready availability and sanitary disposal of excreta so that the transmission of pathogenic organisms through fluids (water and milk), fingers, flies, food, and fields (soil) does not occur. Studies have shown that, in the southern USA, a 50%-reduction in acute childhood diarrhoeal diseases was obtained when water was piped into homes. In East Africa, there were more diarrhoea cases associated with the use of unpiped water sources. Epidemiological surveys revealed that, in Peru, Chad, and Afghanistan, indiscriminate defecation in and around villages is very common. Several studies have shown that a good secondary sewage treatment plant and a good chlorination process can remove 99% of the coliform organisms. Isolation, inactivation and dilution of pathogens are used in modern control systems. The role of flies in the transmission of Shigella is discussed. It is felt by scientists that the focus of treatment of diarrhoeal disease must shift from the host to environment, if a permanent reduction in acute diarrhoeal diseases is to be achieved.

Kay B see Chowdhury MAR

Keeve JP see Wall JW

Kethar M see Parekh P

Keusch GT. Ecological control of the bacterial diarrheas: a scientific strategy. Am J Clin Nutr 1978 Dec;31(12):2208-18

Khairy AEM, El Sebaie O, Gawad AA, El Attar L. The sanitary condition of rural drinking water in a Nile Delta village. I. Parasitological assessment of 'zir' stored and direct tap water. J Hyg (Camb) 1982 Feb;88(1):57-61

The parasitological, bacteriological and chemical nature of drinking water, stored in an earthenware container called °zir' in rural Egypt, was compared with those of direct tap water. A systematic random sample of 107 of the 578 houses in a Nile Delta village was visited, and samples of water were taken from zirs. Counts were made on 25 samples. Eleven tap water samples were also examined, of which 8 were counted. There were no significant differences with regard to the presence of protozoan cysts between zir and tap water samples, but the prevalence of helminthic ova was clearly different. Ova were absent in direct tap water samples, but found repeatedly in zir water samples; particularly prevalent were Ascaris (15%) and Strongyloides (10.3%). Counts of protozoa in zir water and tap water were high, but they did not differ greatly. Contamination rates for protozoa tended to be higher in winter, while the rates for helminths were mostly higher in summer. The intensity of water pollution rose in relation to the storage period, for up to 12 h, though the prevalence

rate did not change. The role of birds in contaminating water was clear, but this relationship was not statistically significant. Parasitological studies at regular intervals are recommended for piped water supply and also for private sources of water supply, including water storage containers.

Khan AK see Rahaman MM

Khan AQ see Rahaman MM

Khan AR see Rahaman MM

Khan M, Rahaman MM, Aziz KMS, Islam S. Epidemiologic investigation of an outbreak of Shiga bacillus dysentery in an island population. Southeast Asian J Trop Med Public Health 1975 Jun;6(2):251-6

Results of an investigation of an epidemic, caused by a multi-resistant strain of Shiga bacillus on an island in the Bay of Bengal from May to July 1973, are presented. St. Martin is a small island in the Bay of Bengal where only 214 families inhabit. Twelve rectal swabs were collected from a sample of the local people. Shigella dysenteriae type 1 was isolated from 9. The average family size was 6.1. The overall attack rate was 32.9%; the attack rate was, however, highest in the younger age groups. The attack rate among those aged under 1 was 40.4%, in which group the death rate was highest. The death rate for all was 2.1%, and the case fatality rate was 6.4%. The total secondary case rate was 22%. There was 100% infection in 4% of the families. The overall attack rate in small families (1-5 persons) was 33.6%, in medium-sized families (6-8 persons) 34.3%, and in larger families (9 persons and above) 29.7%. The secondary cases in these families were 15.3, 23.2, 22.6% respectively. For children up to 9 years of age, the rates between the smallest and largest families were significantly different ($p<0.05$). The attack rates among people using drinking water from different sources are summarized, which vary from 25.8 (dug-well users) to 34.9% (mosque-well users). The attack rate peaked during the 1st week of July. Ampicillin in adequate doses was used for treatment from the 3rd week of July. During 4th week, the incidence came down. Culture of ringwell water samples showed the presence of coliform ranging from 130 to 900/100 ml, suggesting contamination by feces. Flies may have played an active role in transmission.

Khan M. Intervention of shigellosis by hand washing. In: Rahaman MM, Greenough WB, III, Novak NR, Rahman S, eds. Shigellosis: a continuing global problem; proceedings of an international conference, Cox's Bazaar, 15-20 June 1981. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1983:227-37. (Special publication, 20)

This study reports on the impact of a simple intervention of handwashing with soap and water on the occurrence of secondary infection of clinical cases of Shigella within families of some neighborhoods in Dhaka, Bangladesh. Culture-positive cases were selected from the hospital for a 10-day follow-up. Controls, matched for age, socioeconomic status and neighborhood, were selected. The study families were provided with 2-4 pieces of soap and 2-3 earthen pitchers. Members of all the study families were advised to wash hands with soap and water after cleaning the anal region with water after defecation and before meals. Compliance was checked by observing size of the soap and extent of water use. Rectal swabs of family members were collected daily for culture. The overall secondary infection rate in the study group was 10.4% and

in the control group 32.4%. The secondary case rate in the study group was 2.2% and in control group 14.2%. The results point out an important effect of a simple and inexpensive intervention that is easily understood and implemented by families, even in the unsanitary environments.

Khan M, Mosley WH. The role of boatman in the transmission of cholera. East Pak Med J 1967 Apr;11(2):61-5

Prospective studies were conducted in village "Rayer Bazar" in Bangladesh to explore the possible sources and carriers of spread of cholera infection. After 3 years of cholera surveillance in this community, it was observed that all the reported cases occurred in areas adjacent to the canals in the community at points of heavy boat traffic. Almost all the cases used canal water. In 1966, a prospective bacteriological surveillance of boatmen entering this area detected 3 cases and 2 inapparent infections among 850 individuals. The diarrhoeal stools from the cases entered the canal used by the adjacent community and led to 65 additional cases. This study showed that the canal was repeatedly inoculated by the visiting boatmen. These boatmen in turn again carried the infection to distant parts during the course of their journey. The boatman's views on cholera was noted. They opined that cholera was a curse from God which none could resist. If they contracted cholera, they visited first the local religious person or a homeopath. They considered the modern allopathic treatment as costly and painful. They disliked inoculation as it disabled them. The role of boatman as contacts and carriers is indicated by the fact that there is less cholera in the non-riverine parts of North Bengal, and more in the riverine eastern and southern parts of the country.

Khan M see Rahaman MM

Khan MK see Feachem RG

Khan MR see Curlin G

Khan MR see Khan MU

Khan MR see Levine RJ

Khan MU, Khan MR, Hossain B, Ahmed QS. Alum potash in water to prevent cholera [letter]. Lancet 1984 Nov 3;2(8410):1032

Since cholera is primarily transmitted by water, this ICDDR,B study, carried out in Bangladesh, examines the efficacy of a traditional water purification practice used in the Indian subcontinent, namely, mixing a pinch of aluminium potassium sulphate (alum potash) into each pitcher of household water. Half the families of index cholera patients were randomized to an alum potash group to whom alum was supplied, teaching them how to use it (500 mg/l). Significantly fewer ($p<0.05$) family contacts using alum became infected (23/238) than the controls (47/265). Alum potash flocculates suspended materials, but the primary mechanism of alum's bactericidal activity appears to be acidification. In vitro experiments showed that alum treatment of pond water lowers its pH from 7.5 to 4.1 and kills all Vibrio cholerae 01 within 3 h. Killing of Shigella spp. and Escherichia coli takes longer. The study demonstrates that alum potash can significantly decrease secondary infection rates during cholera outbreaks. In Bangladesh, alum is cheap (1 US cent for 20 l of water) and is widely available. Decontamination of domestic water with alum during cholera epidemic is recommended.

Khan MU, Shahidullah M. Epidemiologic pattern of diarrhoea caused by non-agglutinating vibrios (NAG) and EF-6 organisms in Dhaka. Trop Geogr Med 1982 Mar;34(2):19-27

Non-agglutinating (NAG) vibrios and a new organism (EF-6) caused a severe diarrhoea epidemic in Dhaka in 1976 and 1977. From February until August 1977, a study was conducted to identify the epidemiologic pattern of diarrhoea caused by EF-6 and NAG vibrios, and with study cases selected from cooperating patients at the Treatment Centre of the International Centre for Diarrhoeal Disease Research, Bangladesh. The common NAG vibrios detected were Groups II, V, and VII which were present all the year round with peaks in the spring and post-monsoon seasons, while EF-6 attained its peak in March. NAG and EF-6 diarrhoeas occurred all over the city. The infection rate with EF-6 was highest (54.8%) in children aged 0-4 years. This may be due to the lack of immunity in infants and deserves further exploration. Cholera rates were similar in male and female, except for a higher incidence in adult females. Unlike cholera, both EF-6 and NAG Vibrio infections were twice as common in men than women. The secondary attack rates in contacts of NAG vibrios ranged from 10 to 25%; there were none in the EF-6-affected families. Open water sources were often contaminated with NAG vibrios and occasionally with EF-6, with the highest isolation rates in rivers and canals (55-100%). About half of the isolates from contacts and water sources were of NAG groups other than the index case. The study suggests that water plays a vital role in the transmission of EF-6 and NAG vibrios.

Khan MU. Interruption of shigellosis by hand washing. Trans R Soc Trop Med Hyg 1982;76(2):164-8

As shigellosis is associated with poor hygiene, the effectiveness of a simple intervention, the washing of hands with soap and water, in checking the spread of the disease was evaluated in this study. The study population was comprised of confirmed shigellosis cases from the clinic of the International Centre for Diarrhoeal Disease Research, Bangladesh. Both the study population and matched controls were observed for 10 days. The study population was selected into groups given both soap and water and another given either only water pitchers or only soap. Study families were provided with several pieces of soap and earthenware pitchers for storing water and were advised to wash their hands after washing the anus followed defecation and before taking any food. The control families were not provided with either of any. The quantities of soap and left-over water were checked daily by observing the size of the soap pieces and measuring the water. Each family was observed daily for 1 to 2 h to assess their compliance with instructions. Rectal swabs of the study and control families obtained daily were cultured on Shigella-Salmonella and MacConkey's media. Left-hand washings were cultured in Gram-negative broth (GN broth, B B L, USA). It was observed that secondary infection rate was 10% in the study group and 32.4% in the control group ($p<0.01$). The secondary case (symptomatic) rate was 2.2% in the study group and 14.2% in the control group ($p<0.01$). The results suggest that handwashing has a positive interrupting effect, even in unsanitary environments, and the author suggests that this type of intervention may result in 80% reduction of hospitalization of shigellosis cases and 37% reduction in occurrence of other diarrhoeas.

Khan MU, Mosley WH, Chakraborty J, Sarder AM, Khan MR. The relationship of cholera to water source and use in rural Bangladesh. Int J Epidemiol 1981 Mar;10(1):23-5

To identify the relationship between the water use pattern and the incidence of cholera, the cholera experience of a sample of families in Matlab, Bangladesh, was studied in relation to water supply and use. The findings revealed large variations in the incidence of cholera according to the source of water and its use. Tanks were the primary source for 65% of the families, canals for 20%, and the river for 14%. The highest attack rate was associated with access to canal water (13%). Attack rates did not vary markedly according to the purpose for which a source was used. It was found that the risk of cholera was high, if surface water was used for any purpose, confirming earlier observations in an urban setting. The importance of cultural patterns in water use was identified. The demonstration of close links between water use and the risk of cholera made it evident that, in any setting, the only effective means of cholera control requires provision of a protected water supply for all household uses and a change in practice so that water is not ingested from contaminated sources.

Khan MU, Shahidullah M. Role of water and sanitation in the incidence of cholera in refugee camps. Trans R Soc Trop Med Hyg 1982;76(3):373-7

To determine the role of water and sanitation in the transmission of cholera, the prevalence of cholera in two groups of people in refugee camps was studied: (i) those using brick-built covered latrines connected with sewers and chlorinated pipe water, and (ii) those using uncovered surface latrines, and pond and tubewell water. The study population consisted of cholera cases, admitted to the hospital of the International Centre for Diarrhoeal Disease Research, Bangladesh from 3 camps. In the one camp with sanitation facilities, the cholera rate was 1.6 per 1,000, whereas in the other 2 camps without facilities, the rates were 4.0 and 4.3 per 1,000. The overall rate was 1.73 per 1,000 in 1974 for the city. During 1975, following the demolition of some of the refugee camps, the overall rate for the city fell to 1.25 per 1,000. The rates in the geographical areas around camps were reduced significantly after demolition from 1.75 to 0.88 and 1.36 to 0.81 per 1,000 in the 2 main camp areas. Cholera was not totally eliminated, even in the one camp with sanitation facilities, suggesting that health education as well as proper sanitation is necessary to eradicate cholera.

Khan MU, Roy NC, Huq MI, Stoll B, Islam MR. Shigellosis, an increasing pediatric problem in Dhaka: a fourteen years' epidemiological analysis. Bangladesh J Microbiol 1985;2(1-2):44-5

From stools of 822,812 diarrhoea patients, hospitalized from 1969 to 1982 at the International Centre for Diarrhoeal Disease Research, Bangladesh, Dhaka, Shigella strains were isolated from 19,639 cases. The number of cases increased from 209 (2.5%) in 1969 to 4,833 (7.7%) in 1976. Shigella flexneri predominated in 1969 (74%), S. dysenteriae in 1973 (56%), and S. flexneri again in 1981 (75%). More than 20% of all Shigella isolations were from infants (60% males and 40% females). Over 7% of the severe patients with Shigella infection died. Nearly 40% of all the Shigella deaths were infants aged under one, while 49% were aged between 1 and 4. Areas with meagre sanitation facilities and without piped water supply showed higher prevalence of the disease.

Khan MU, Curlin GT. Urban cholera study, 1974 and 1975, Dacca. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1977. 21 p. (Scientific report, 7)

Major observations of an urban cholera study (1974-1975) at the Cholera

Research Laboratory (now International Centre for Diarrhoeal Disease Research, Bangladesh), Dhaka, are highlighted. During the epidemic of 1974, 203 hospitalized cholera cases and their families were interviewed. Data from 203 matched control families were collected. During the 1975 epidemic, the workers of the Laboratory visited 265 cholera-hit families and distributed water sterilization tablets and tetracycline capsules of a day's dose to all members of the contact families. The findings revealed gradual changes from classical Inaba to El Tor Ogawa in 3 years time. The distribution of cases by months showed 2 distinct peaks, one during pre-monsoon and another in October. The overall attack rates were 1.73 and 1.37 per 1000 in 1974 and 1975 respectively. The average.rate of affliction of the 3 refugee camps was higher than that of the city. In the urban areas, all inhabitants used water from taps or tubewells for drinking. There were no difference in incidence among those using sanitary and open latrines. Over 76% of the index families had a diarrhoea case prior to admission, while only 27% of the control families had so. Some 194 cases and 110 controls ate outside their homes. The rate requiring hospitalization was 4.5% in treated and 8% in untreated groups. The posh localities, such as Gulshan, Banani, Dhanmondi, and the Secretariat, were not affected during any of the epidemics. Females, aged between 15 and 39, showed twice the number of cases than males of the same age group. This difference was believed to be associated with the availability of tap water and waste disposal facilities.

Khan MU, Chakraborty J, Sarder AM, Khan MR. Water source and the incidence of cholera in rural Bangladesh. In: Proceedings of the Third Bangladesh Science Conference, Chittagong, 8-12 January 1978:148

Many researchers have shown an association of water with the incidence of cholera. The rural people of Bangladesh use tank, canal and river water for all purposes. It is not possible for Bangladesh to provide potable water for rural areas in the existing situation. It was examined whether any of the open water sources was safer than others with respect to the incidence of cholera. It has been found that those households that used canal water had the highest rate of cholera and those who used tank water most had the lowest rate of cholera. Similar results were found when the village was the unit of analysis. If the people can be urged to protect the tanks, the rate of cholera may be reduced where a supply of tap water is not possible. The existing pattern of use of shallow tubewells does not seem to influence the rate of cholera.

Khan MU, Mosley WH, Chakraborty J, Sarder AM, Khan MR. Water sources and the incidence of cholera in rural Bangladesh. Dhaka: Cholera Research Laboratory, 1978. 15 p. (Scientific report, 16)

Khan MU see Boyce JM

Khan MU see Hughes JM

Khan MU see Mosley WH

Khan MU see Shahid NS

Khan MU see Spira WM

Khin-Maung-U, Tin-Aye, Myo-Khin, Nyunt-Nyunt-Wai, Thane-Toe. Composition and contamination of oral rehydration solutions prepared with well water by village mothers in Burma. Trans R Soc Trop Med Hyg 1986;80(2):329-32

This work reveals the composition and the extent of contamination of oral rehydration salt solutions (ORS), prepared with well water by village mothers in Burma. Forty-eight mothers were selected at random to prepare ORS by dissolving one pack in 3 condensed milk tins full of water from their own households' domestic storage pot. Ten mothers were asked to use a measuring cylinder to prepare the solution. Twelve technicians made the solutions using both the milk tins and the measuring cylinder. The second study was carried out during May-June 1981 at Ywama village in Htaukkyant, where mothers from 24 households were asked to prepare the ORS using milk tins. These mothers were asked to make ORS using cooled boiled water. CO_2 contents of water samples and coliform counts were measured. Three condensed milk tins full of water made up to a volume of 984 ml. The concentrations of sodium, potassium, and glucose in the ORS prepared by mothers were comparable to those prepared by laboratory workers using a one-liter measuring cylinder. Boiling the water before preparation of the fluid reduces the probable number of fecal coliform counts by about one log to 2 logs. Bicarbonate contents did not show any reduction even though there was increasing contamination with fecal coliforms on continued storage. In case of acute dehydration, ORS may be made with clear unboiled water and used immediately; pre-boiled water is preferable, if available, and the solution should be used within 24 h of mixing.

Kibriya AKMG see Rahaman MM

Kirner JC, Little JD, Angelo LA. A waterborne outbreak of giardiasis in Camas, Washington. J Am Water Works Assoc 1978;70:35-40

Kluttz JA see Mackie TT

Knight J see Elliott K

Kochar V. Sanitation and culture. II. Behavioural aspects of disposal of excreta in a rural W. Bengal region. Indian J Prev Soc Med 1977 Dec;8:142-51

This paper describes the prevalent sanitation systems and the cultural and behavioral aspects of the local people with regard to disposal of excreta in a rural West Bengal region. The field study was conducted in Bandipur anchal of Hooghly district in West Bengal during 1968-1970. A random sample of 100 households (750 persons) was selected for an epidemiological survey by a team. About 95% of the subjects chose their defecation spot within a walking distance of 3 min, while 72% of them selected a socially recognised defecation ground, and 69% of the subjects chose a maximally polluted area. Norms of defecation behavior were studied. Monthly records were made of the location of stools passed by sub-sample subjects over a one-year period. Only 0.8% of the stools were passed in latrines. Open fields, bamboo groves, and residential locations were used for defecation. Seasonal changes in the choice and time of defecation habits are discussed. About 15% of the males and 13% of the females squatted within 12 inches of a recognizable trace of a stool. Ovicidal time-temperature duration affected the egg output of hookworm in about 55% of the stools passed by the adult in an open area. The habits and choices in selection of defecation spots lead to definite patterns of stool distribution which reflect larval aggregations. The protective factors are discussed in detail. Evidence suggests that behavioral control of hookworm infection has actually been operating in the study population and is partly responsible for restricting hookworm infection to low levels.

Kochar V. Sanitation and culture. I. Social aspects of sanitation and personal hygiene in a rural Bengal region. Indian J Prev Soc Med 1977 Sep;8:106-17

The hygienic and sanitation practices in rural West Bengal in India are reported. Behavior and practices pertaining to excreta disposal and the transmission modes of hookworm infection are also presented in some detail. The study was conducted in Bandipur anchal of Hooghly district in West Bengal during 1968-1970. A sample of 100 households (750 persons) of 12 villages was selected for an epidemiological survey. A sub-sample of 50 households was chosen for detailed anthropological study. For a rural Bengali household, the ethical, ritual and aesthetic overtones of personal conduct are intermingled with the notions about health and disease. Cultural entities and interaction with habitats and other ecological foci were reviewed. Most households (92%) had ponds close to their houses. The utensils, clothes, and vegetables, washed in these ponds, were the vehicles of transmission. About 30% of the households live within a human density of more than 12 persons per acre. In the community, a good deal of effort and concern is shown for the indoor sanitation and aesthetics. Waste and its disposal systems are described. The data confirm that the persons from non-agricultural families, from higher castes, and from higher socioeconomic status have relatively better sanitation facilities. New innovation and technology for rural sanitation must be selected, adapted and presented so as to be a part of the existing rural life style and environment.

Koomen J, Jr., Zacha EA, Stevenson WJ, Chesson AS, Jr. An outbreak of unusual waterborne illness in Wayne County - epidemiology aspects. North Carolina Med J 1960 Dec;21:540-4

Koopman JS. Diarrhea and school toilet hygiene in Cali, Colombia. Am J Epidemiol 1978 May;107(5):412-20

Koplan JP see Rosenberg ML

Korns RF. An unusual waterborne outbreak of gastroenteritis. J Bacteriol 1944;47:582

Kosuri MR see Baine WB

Kourany M, Vasquez MA. Housing and certain socioenvironmental factors and prevalence of enteropathogenic bacteria among infants with diarrheal disease in Panama. Am J Trop Med Hyg 1969 Nov;18(6):936-41

Factors, such as housing and certain other socioenvironmental parameters in the prevalence of enteropathogenic bacteria among infants with diarrhoeal disease in Panama, are discussed. Information which reflected the housing conditions of the infants with diarrhoeal disease were recorded. Six types of dwelling were established in Panama city and nearby areas. About 27% of the total population of the city lived in well-kept homes and apartments with modern sanitary conveniences. About 73% occupied sub-standard housing with inadequate sanitary systems, of whom 60% lived in tenement slums, 7% in shanties, and 6% in rustic houses. Infahts from the tenements (45.5%) and shanties (22,5%) made up the bulk of the city's diarrhoea cases, while 19% came from rural housing. Enteropathogenic Escherichia coli, Shigella, and Salmonella were isolated more frequently from infants living in sub-standard dwellings than those of better-class houses. The 2 main pathogens were E. coli 056:B5 and 0128:B12.

It is concluded that planned programs for adequate housing, provision for a safe water supply within each dwelling and safe removal of human excrement will undoubtedly decrease the frequency and severity of diarrhoeal diseases due to enteric infections.

Kourany M see Britt B

Kovach K see Lanyi B

Kozlowska T see Gawronowa H

Krishnaswamy M. Household water supply, hygiene and diarrhoeal diseases in central Thai villages. Bangkok: Asian Institute of Technology, 1973. (Master's thesis)

Krishnaswamy M see Muttamara S

Kronmal R see Cvjetanovic B

Krovacek K see Jiwa SFH

Krubsack JE see Nakamura M

Kukolevskala MI, Lazarev OP, Ipatova II, et al. The role of water in dysentery. Gig Sanit 1967 Apr;32:9-12

Kulkarni SW see Handa BK

Kumar P, Sehgal BS, Singh R. Bore-hole disposal of excreta of children and diarrhoeal morbidity in a rural community. Environ Health 1970;12:155-9

Kunit SJ see Rubenstein A

Kuo C. Measures to control diarrhoeal diseases — environmental sanitation. Regional Meeting on Cholera and Diarrhoeal Diseases, Alexandria, 1-5 June 1978. Alexandria: Regional Office for the Eastern Mediterranean, World Health Organization, 1978. 6 p.

The various implications and issues in the implementation of different measures to control diarrhoeal diseases are described. Environmental sanitation is crucial in the control of diarrhoeal diseases, including cholera. The main emphasis in this approach is to ensure safe quality of the water at the source. Unprotected water sources must not be used by people, and replacement of those with improved piped supplies is needed. Sewerage systems with treatment facilities provide for safe evacuation and disposal of human wastes. Food sanitation has also been discussed to prevent the contamination of the disease. Education of the people for a better understanding of the mode of transmission of these diseases and for improvement of their personal hygiene has been emphasized. Flies have been identified as an important insect vector in the spread of diarrhoea. Proper disposal of solid wastes is the permanent solution to fly control. Chemical control has been found to provide quick results. The United Nations Water Conference, held in Argentina in March 1977, recommended the adoption of targets for safe water supply and sanitation for all by 1990 and the designation of 1981-1990 as the International Drinking Water Supply and Sanitation Decade. National authorities have been urged to respond to the call

of the United Nations and to speed up their environmental sanitation programs accordingly.

Lam S, Goh KT. A clinical study of Vibrio cholerae 01 in Singapore related to environmental factors. J Diarrhoeal Dis Res 1984 Dec;2(4):249-52

A Chinese male developed severe watery diarrhoea, and Vibrio cholerae 01 was isolated from his watery stools. Prior to hospitalization, he defecated into a fish pond during the course of illness and contaminated the pond water with cholera vibrios. However, 12 days later, repeated testing of the water and marine samples from pond failed to recover the vibrios.

Lamb D see Feachem RG

Lanoix JN see Wagner EG

Lanyi B, Szita J, Ringelhann B, Kovach K. A water borne outbreak of enteritis associated with Escherichia coli serotype 124:72:32. Acta Microbiol Acad Sci Hung 1959;6:77-84

Lawrence DN, Blake PA, Yashuk JC, Wells JG, Creech WB, Hughes JM. Vibrio parahaemolyticus gastroenteritis outbreaks aboard two cruise ships. Am J Epidemiol 1979 Jan;109(1):71-80

Outbreaks of Vibrio parahaemolyticus gastrointestinal illness occurred on 2 Caribbean cruise ships in late 1974 and early 1975. In all, 697 passengers and 27 crews were affected. Epidemiologic evidence incriminated seafoods served on the ships as the vehicles of transmission. The seafoods were probably contaminated by V. parahaemolyticus after cooking in seawater from the ships' internal seawater distribution systems. Use of seawater in foodhandling areas was discontinued, and no further outbreaks occurred. (Author's abstract)

Lawrence DN see Weissman JB

Lazarev OP see Kukolevska MI

Lee EW. Safe water supply and sanitation in diarrhoeal diseases control. Regional Planning Meeting on Diarrhoeal Diseases Control, Manila, 5-7 June 1979. Manila: Regional Office of the Western Pacific, World Health Organization, 1979. 5 p. (WPR/BVD/DDC/79.3)

The provision of safe drinking water and modern sanitation systems play a preventive role which can have long-term impact on the health of people in any community. The latest World Health Organization survey shows that 1,230 million people are without adequate water supply and another 1,350 million without proper sanitation in developing countries (except China). Only 38% of the Third World population had access to safe drinking water, 80% of all diseases in the world being associated with water use. A large population of the world suffers from waterborne diseases: 400 million from gastroenteritis, 160 million from malaria, 30 million from river-blindness, and 200 million from schistosomiasis. The global problems of water-related diseases led to the creation of an International Drinking Water Supply and Sanitation Decade (1981-1990), the goals of which are the provision of safe drinking water and adequate sanitation for all by 1990. Successful program implementation will require a national commitment, a reorientation of policies, mobilization of

resources, and use of appropriate technology and appropriate administrative developments.

Lee JV see Bashford DJ

Lee YK. Cholera in early Singapore - I (1819-1849). Singapore Med J 1973 Mar;14:42-8

Lema O, Ogwa M, Mhalu FS. Survival of El tor cholera Vibrio in local water sources and beverages in Tanzania. East Afr Med J 1979 Oct;56(10):504-8

Levine RJ, Nalin DR. Cholera is primarily waterborne in Bangladesh [letter]. Lancet 1976 Dec 11;2(7998):1305

Levine RJ, Khan MR, D'Souza S, Nalin DR. Cholera transmission near a cholera hospital. Lancet 1976 Jul 10;2(7967):84-6

This is the first report of cholera ascribed to contamination of a canal water from a hospital outlet. A review of the incidence of cholera from 1964 to 1974 in Matlab, Bangladesh, revealed very high incidence rates in several villages. Higher cholera rates (8.6 and 10.9 per 1,000 annually) in 2 of the villages were probably due to the heavy contamination of canal water from a nearby cholera hospital that was established in 1963. The high-incidence and average-incidence villages were almost within the same distance from the hospital. The ratio of mild to severely affected cases seeking medical attention was 1:3 in both areas suggesting that admission rates did not vary with distance from the hospital. During 5 epidemics studied from November 1968 through February 1971, the hospitalization rate was higher in those 2 villages near the cholera hospital. A high rate of cholera reinfection, 13 times higher than that of other villages, was observed between 1963 and 1969 in these villages. An analysis of water samples from the canal confirmed the presence of cholera vibrios. The higher incidence rate of cholera among the population of these 2 villages and a decline in rate with increased distance from the canal site indicated that canal water was the vehicle of transmission of cholera .

Levine RJ, D'Souza S, Khan MR, Nalin DR. Failure of sanitary wells to protect against cholera and other diarrhoeas in Bangladesh. Lancet 1976 Jul 10;2(7976):86-9

Various aspects of the use of sanitary wells as protection against cholera and other diarrhoeas in Bangladesh are reported. In the study area, the incidence of cholera was high, because of contamination of canal water by a cholera hospital situated nearby. Cholera was confirmed by rectal swab or fecal cultures. In patients with diarrhoea, dehydration, often with shock, were also studied. Incidence data for 11 years were correlated with direct observation of water use by families from cholera-affected households. Eighty-eight such families yielded 5,764 person-years of incidence data. For each family studied, a yearly census and diarrhoea records was constructed from surveillance data. Of the 88 families, 62 took tubewell water for the stated purpose of drinking, and 53 (60%) drank predominantly tubewell water. They all took surface water for other purposes. Tubewell water was found to be free of coliforms (45 specimens tested), and canal water had over 1,800 coliforms/dl (17 specimens tested). Distance from residence to tubewell did not correlate with tubewell usage. About 78% of the families with high school graduates used

private tanks, while 95% of the unschooled families were canal users. In affected homes, annual rates for canal and tank users were almost equal. Families with high school graduation had greater tubewell use, but tubewell use per se did not affect cholera or noncholera diarrhoea incidence. Protection was, however, found to correlate with education and wealth.

Levine RJ see Hughes JM

Lewis JN, Loewenstein MS, Guthrie LC, Sugi M. Shigella sonnei outbreak on the island of Maui. Am J Epidemiol 1972 Jul;96(1):50-8

Lewis M. Sanitation, intestinal infections, and infant mortality in late Victorian Sydney. Med Hist 1979 Jul;23(3):325-38

In the later 19th century Sydney, the oldest and, for much of its history, the largest Australian city, underwent a period of very considerable population growth. As it became a metropolis, Sydney experienced the pathologies associated with urban expansion in other parts of the western world at this time. A high level of infant mortality was one such pathology. An outstanding source of infant mortality in Sydney and in many other western cities was diarrhoeal disease and associated conditions. It is suggested that this was due to an interaction between infection and poor nutrition on a substantial scale, an infant health problem common in the contemporary Third World. Environmental sanitation was at a scandalously low level in the 1870s, but 30 years later sanitary reform had significantly reduced the general death rates from intestinal infections in Sydney. The impact of improved sanitation on infant diarrhoeal and associated mortality was less direct because of the etiology of infant diarrhoeal disease. (Author's abstract)

Lewis W. The significance of water management in relation to public and environmental health. J Infect Dis 1986 Apr;153(4):802-3

Limsuwan A see Sakdisiwasdi O

Lin SD. Giardia lamblia and water supply. J Am Water Works Assoc 1985;77:40-7

Lindell S see Baine WB

Lindell SS, Quinn P. Shigella sonnei isolated from well water. Appl Microbiol 1973 Sep;26(3):424-5

Lindstrom JD, ed. The impact of interventions in water supply and sanitation in developing countries; proceedings of a seminar held at the Pan American Health Organization, 25-26 March 1980. Prepared by Logical Technical Services, Corp. Washington, D.C.: U S Agency for International Development, 1981. 158 p.

Liong X see Hung T

Lippy EC. Water supply problems associated with a waterborne outbreak of giardiasis. In: Jakubowski W, Hoff JC, eds. Waterborne transmission of giardiasis; proceedings of a symposium, 18-20 September 1978. Cincinnati: U S Environmental Protection Agency, 1979:164-73

Lippy EC see Haley CE

Lippy EC see Harter L

Lippy EC see Kaplan JE

Lippy EC see Lopez CE

Lipschutz DE. The water question in London, 1827-1831. Bull Hist Med 1968 Nov-Dec;42:510-26

Little AA see Harter L

Little JD see Kirner JC

Lloyd B see Howard J

Lloyd-Evans N, Pickering HA, Goh SGJ, Rowland MGM. Food and water hygiene and diarrhoea in young Gambian children: a limited case control study. Trans R Soc Trop Med Hyg 1984;78(2):209-11

The microbiological quality of food and water, consumed by infants and young children, is judged for its usefulness as an objective marker of environmental hygiene, and this is related to the widely varying pattern of diarrhoeal morbidity experienced by these individuals. A community of 10,000 persons in Bakua, the Gambia was included in the study. During 1982, the diarrhoeal morbidity in 300 children, aged 6 to 36 months, was monitored using home questionnaires every week for 105 days. The mean number of days of diarrhoeal illness per child was 12 days (range 0 to 56 days). Thirty-nine types of foods were examined, of which 17 had coliform. Escherichia coli counts in control children (22) and children with diarrhoea (17) were 10^5 per g. Half of the water samples in both groups of children had counts greater than 10^2 coliforms/100 ml. Of the 15 stools examined, 3 yielded Salmonella, Shigella plus Campylobacter, and heat-stable toxigenic E. coli respectively. Six had Giardia lamblia, and 3 had Ascaris lumbricoides. No difference was observed in levels of contamination, fecal, or otherwise, between the two groups. The real problem seemed to lie in accounting for the freedom from diarrhoea of some children rather than explaining possible causes of morbidity in others.

Lloyd-Evans N see Watkinson M

Lobel HO, Bisno AL, Goldfield M, Prier JE. A waterborne epidemic of gastroenteritis with secondary person-to-person spread. Am J Epidemiol 1969 Apr;89(4):384-92

A large epidemic of gastroenteritis occurred among persons who had visited a Pennsylvania State park, USA between 5 and 8 June 1966. A total of 454 cases with either vomiting or diarrhoea were identified, and it seemed likely that several thousand illnesses actually occurred. In the present outbreak, both the waterborne and the person-to-person routes of transmission were observed. The average incubation period was 29 h, with an attack rate of 69%. Epidemiologic and laboratory evidence implicated that the outbreak was due to ingestion of contaminated water supplied by the gristmill well. Secondary cases of gastroenteritis occurred in household contacts who had not been exposed to the park water supply; the average incubation period of the secondary cases was 63 h, and the secondary attack rate was 44%. The high secondary attack rate among household contacts suggested the presence of an infectious agent. No recognized bacterial pathogens or viral organisms could consistently be isolated from the stools of 171 patients or from the drinking

water. The epidemic was not followed by the occurrence of hepatitis. (Modified author's abstract)

Lockman H see Colwell RR

Loewenson R see Mason PR

Loewenstein MS see Lewis JN

Lopez CE, Dykes AC, Juranek DD, Sinclair SP, Conn JM, Christie RW, Lippy EC, Schultz MG, Mires MH. Waterborne giardiasis: a communitywide outbreak of disease and a high rate of asymptomatic infection. Am J Epidemiol 1980 Oct;112 (4):495-507

This paper summarizes the findings of an investigation of waterborne giardiasis. On 29 April 1977, the Centers for Disease Control, USA, began an investigation of the outbreak of giardiasis in selected communities of New Hampshire, USA. In a 6-week period, 213 cases of Giardia lamblia infection were diagnosed at the hospital laboratory, of whom 90% were residents of the town of Berlin. The infection rates were higher in the 10-19 (60%) and 50-59 (62%) years age groups. There were no differences in infection rates by sex. About 95% of the G. lamblia infection cases had recent gastrointestinal illnesses. The most frequent symptoms were diarrhoea (86.4%), abdominal cramps (80.5%), anorexia (64.9%), flatulence (58.4%), abdominal distention (55.2%), and weight loss (53.2%). The median duration of diarrhoea was 10 days. In symptomatic cases, quinacrine or metronidazole were given. Improvement of gastrointestinal symptoms was obtained within 72 h. A community-wide survey of city residents revealed that the majority (76%) of G. lamblia infections, occurring during the epidemic period, were asymptomatic and ran a self-limited course without treatment. Various surveys, such as hospital emergency room survey, community questionnaire survey and community stool survey for parasites, were conducted. Outbreak control measures are discussed. Water was the most likely source of infection during this epidemic. The role of immune mechanisms and other host factors in human infection with G. lamblia needs to be better defined.

Lorenz RA see Dykes AC

Lunde MN see Mackie TT

Lundrie P see O'Neil AE

Lutian M see Djerassi L

Lyman DO see Shaw PK

McCabe DB. Water and wastewater systems to combat cholera in East Pakistan. J Water Pollut Control Fed 1970 Nov;42:1968-81

McCabe LJ, Haines TW. Diarrheal disease control by improved human excreta disposal. Public Health Rep 1957 Oct;72(10):921-8

Aspects relating to excreta disposal and incidence of diarrhoeal diseases are reported. The existing sewage and excreta system of a community in Georgia, USA was studied in 1952. About half of the community was served by a sewerage

system with treatment, which made disposal methods easier. About 52% of the 344 occupied dwellings had unsatisfactory facilities for excreta disposal, mostly surface privies. During April-May 1952, the disposal facilities at 178 dwellings were improved by constructing a new privy having an 8-foot deep bored-hole. Twenty-two privies were remodeled at schools, churches, and commercial buildings. Blocks with a high proportion of children were selected for a study of Shigella prevalence and morbidity due to shigellosis. The study population was comprised of 333 persons or about one-third of the community. Similar epidemiological and entomological observations were made in 3 other towns - Pavo (population: 806), Coolidge (population: 764), and Meigs (population: 1,125) - to compare the results. Flies were observed to be breeding more conspicuously as a result of the privy reconstruction, but most muscoid group showed a marked decrease. The bored-hole privy was less attractive to houseflies than the unmodified privies. The reduction of housefly breeding observed in rehabilitated privies had no effect on community fly populations. During the 18 months of observation after the privy remodeling program, Boston had significantly lower Shigella infections than it did before this program was introduced. After improved excreta disposal methods were established, the reported diarrhoea rate in Boston was half as high as that seen at the check towns.

McCabe LJ see Craun GF

McCabe LJ see Hughes JM

McCabe LJ see Taylor A, Jr.

McCabe LJ, Jr. see Stewart WH

McCormack JN see Gehlbach SH

McCormack WM see Werner SB

McGarry M see Feachem R

McIntyre RC, Tira T, Flood T, Blake PA. Modes of transmission of cholera in a newly infected population on an atoll: implications for control measures. Lancet 1979 Feb 10;1(8111):311-4

McJunkin FE. Water and human health. Washington, D.C.: National Demonstration Water Project, U S Agency for International Development, 1982. 111 p.

McJunkin FE. Water and sanitation. Washington, D.C.: National Demonstration Water Project, U S Agency for International Development, 1982. xi, 134 p.

McJunkin FE. Water supply and health: an overview. In: Lindstrom JD, ed. The impact of interventions in water supply and sanitation in developing countries; proceedings of a seminar held at the Pan American Health Organization, 25-26 March 1980. Prepared by Logical Technical Services, Corp. Washington, D.C.: U S Agency for International Development, 1981:1-31

Mackel DC see Drachman RH

Mackie JW see Mackie TT

Mackie TT, Mackie JW, Vaughn CM, Gleason NN, Greenberg BG, Nenninger ES, Lunde

MN, Moore LLA, Kluttz JA, Taliafero MO. Intestinal parasitic infections in Forsyth County, North Carolina. IV. Domestic environmental sanitation and the prevalence of Entamoeba histolytica. Am J Trop Med Hyg 1956 Jan;5(1):29-39

McKinley TW see Goodman RA

MacLeod KIE see Shaw PK

MacNamara NC. Asiatic cholera: history up to July 15, 1982; causes and treatment. London: MacMillan, 1892. 71 p.

Mahoney LE, Friedmann CTH, Murray RA, Schulenburg EL, Heidbreder GA. A waterborne gastroenteritis epidemic in Pico Rivera, California. Am J Public Health 1974 Oct;64(10):963-8

An epidemic of waterborne gastroenteritis at Pico Rivera, California, USA in 1971 is described. Some 11,000 residents of Pico Rivera became ill with gastroenteritis. No pathogens were isolated from any of the cases. Symptoms were similar to those of the syndrome of 'sewage poisoning'. The attack rate was 77% in people who obtained their water supply from the tap. The attack rate was 24% in people who used bottled water. This difference was statistically significant. The findings suggest that the water supply is related to the outbreak of diarrhoea. The incidence of diarrhoea, seen outside the district, ranged from 0 to 2% of the persons each day. Within the district, the attack rate for diarrhoea was also within this range, but peaked at 7% on August 1 and then returned to original levels by August 6. The western segment of the Water District had increased the incidence of diarrhoea with an attack rate that peaked at 11% on August 1 and returned to baseline levels on August 7. Age- and sex-specific attack rates within Water District were higher than in areas served by other water companies. There was no remarkable difference in symptom patterns between the areas. The mean duration of illness in Water District was more than 3 days. There was significantly less numbers of those who had fallen ill and who did not drink tap water, and this was most marked in the Water District west area. Other epidemic enteric diseases which were significant had been studied during this period. Water samples showed high fecal coliform counts, while samples showed Streptococci ranging from <45 to 620/100 ml. The outbreak was confined to one Water District of Pico Rivera only.

Mallison GF see Baine WB

Mallison GF see Merson MH

Maneval D see Colwell RR

Mara D see Feachem R

Mara DD see Feachem RG

Marshall T see Feachem RG

Martin AR, Mosley WH, Sau BB, Ahmed S, Huq I. Epidemiologic analysis of endemic cholera in urban East Pakistan, 1964-66. Am J Epidemiol 1969 May;89(5):572-82

This is a combined retrospective and prospective analysis of the

epidemiological characteristics of the 983 cholera patients admitted to the Pakistan-SEATO Cholera Research Laboratory (now the International Centre for Diarrhoeal Disease Research, Bangladesh) during the cholera seasons of 1964-1965 and 1965-1966. In both seasons, less than half those studied were found to be infected with Vibrio cholerae 01. A striking preponderance of the Inaba serovar was seen. The disease was seasonal, with a peak during the dry winter months and virtual disappearance during the summer monsoon. In 1965-1966, a second smaller cluster of cholera cases occurred in April and May. The outbreaks tended to be localized in small communities using common facilities for water, food, and sanitation. The infection rate was higher in children than in adults and was almost equal in distribution in both sexes. Multiple family members were infected where there were known prior cholera cases, or due to exposure resulting from ingestion of contaminated water or food, in an area where other cholera cases were present, due to family outbreaks.

Martin WT see Baine WB

Marynczak R see Gawronowa H

Mason PR, Patterson BA, Loewenson R. Piped water supply and intestinal parasitism in Zimbabwean school children. Trans R Soc Trop Med Hyg 1986;80(1): 88-93

Information on piped water supply system and intestinal parasitism among Zimbabwean school children are reported. The children, aged 6 to 18 years, were included for the study. Two schools in villages in a communal land of Harare were surveyed. Entamoeba coli was found in 28.5% of the cases. Giardia lamblia cysts were identified in stained smears in 26.1% of the positive specimens. Identification of other protozoan cysts in concentrates occurred with 70% of the children. Specific helminth infections occurred in less than 1% of the children. In the case of helminths, protozoa and of G. lamblia, the prevalence in urban areas was significantly higher than that in rural areas ($p<0.01$). Piped water in communal lands was associated with decreased frequency of schistosomiasis and hymenolipiasis, but not with decreased frequency of protozoa. Schistosomiasis was common in commercial farm labor communities, particularly in those farms adjoining the local river, despite the availability of stored borehole water supplied through communal taps. The prevalence of intestinal parasitism in children from urban areas with municipal water supplied to taps in each household was similar to that of children from urban areas who used stream water. The provision of piped water was not found to be associated with reduced prevalence of intestinal parasitism, though additional factors, such as frequency of contact with infected water, provision of ancillary improvements and actual usage of available water supplies, would need to be more closely assessed.

Mathur R, Reddy V. Bacterial contamination of oral rehydration solution prepared from well water. Indian J Med Res 1983 Dec;78:814-8

Oral rehydration solution (ORS), prepared either with untreated well water or boiled water, was examined to determine the bacterial growth rate during storage. After 12 h, the bacterial count was significantly higher ($p<0.01$) in ORS prepared with contaminated well water than with clean well water. ORS, prepared with boiled water, also showed increased bacterial counts after 12 h, but the number of presumptive coliforms and Escherichia coli was significantly

lower than in ORS prepared from untreated well water. Diarrhoeal morbidity was similar in both groups of children in a village near Hyderabad, India, who consumed ORS made from contaminated and clean water. However, it is safer to boil water for ORS, when clean water is unavailable. Since there is significant bacterial growth after 12 h of storage, it is desirable to use ORS fluid within this period.

Matulessy PF, Rachmad, Sulaiman Z, Husaini Y, Darwin K, Rachmat A. The influences of environmental factors and nutritional status of the underfives to diarrhoeal diseases in Bogor, West Java, Indonesia. Southeast Asian J Trop Med Public Health 1982 Sep;13(3):401-4

The extent and severity of diarrhoeal diseases among pre-school children (aged 5 and below) and the relationship of their illnesses with factors, such as unsafe water, poor sanitation, malnutrition, inadequate housing, and improper human hygienic behavior, were studied in Bogor, West Java, Indonesia from March 1978 to April 1979. Of the 3,022 children selected for the study, 1,552 were suffering from some form of diarrhoea. Attitudes and behavior of household members regarding water use and sanitation were determined. Nutritional status using weight-for-age, following the Harvard classification, was also assessed. A score system was used to classify housing conditions and the environmental sanitation arrangements. Of those having more than 4 liquid stools a day, 74% were found to be undernourished. Nearly half of the cases with diarrhoea were found to occur along with other infections. Respiratory tract infections were commonly seen among those with diarrhoea. The highest number of diarrhoeal cases were in the age group of 13-24 months and the lowest in the group aged 49-60 months. Frequency distributions of families in terms of educational achievements of parents, family composition, parents' occupation and their expenditure patterns are shown. The duration of breast feeding was also determined. It was observed that the incidence of diarrhoea had a close relationship with nutritional status and that 74.6% of these children suffered from protein-energy malnutrition and were underweight. The incidence of diarrhoeal diseases was found to be associated with poverty and with the environmental and educational conditions that usually accompany poverty. More than half of the families lived in poor and unsafe environments with crowded housing. Three basic approaches for controlling and preventing diarrhoeal diseases are outlined. These involve better nutrition, better environment, including the provision of modern sanitation facilities, and immunization along with health education.

Mbaga I see Mhalu FS

Mbere N see Feachem RG

Measurement of the health benefits of investments in water supply; report of an expert panel to the International Bank for Reconstruction and Development. Washington, D.C.: International Bank for Reconstruction and Development, 1976. 12 p. (Public Utilities Department report no. PUN 20)

Mehrabian S see Mohadjer S

Melnick JL, Gerba CP. Is the water safe to drink? [letter]. J Infect Dis 1979 Jun;139(6):736-8

Mendis JB see Skoda JD

Mentzing LO. Waterborne outbreaks of Campylobacter enteritis in central Sweden. Lancet 1981 Aug 15;2(8242):352-4

This report describes an outbreak of waterborne Campylobacter enteritis in central Sweden in 1980. The outbreak affected some 2,000 people. Campylobacter jejuni was isolated from the feces of 221 of the 263 patients examined. Forty-five specimens were also cultured for Shigella and Salmonella, with negative results. Among the patients (over 380), who consulted general practitioners, the highest attack rate was seen in under-5 children, though a sample survey of the community showed that all age groups were equally affected. There was strong circumstantial evidence pointing to tap water as the source of infection, although this could not be bacteriologically confirmed. This is the second major outbreak of waterborne Campylobacter enteritis that has been reported. The sudden onset and short duration of the outbreak indicates a single transient event. Twenty-six of the 48 patients were found to have a date of onset of diarrhoea ranging from 2 to 8 day. The epidemiology of Campylobacter jejuni infections reported so far clearly indicates that consumption of surface water and unpasteurised milk should not normally be regarded as safe.

Merrick T. The effect of piped water on early childhood mortality in urban Brazil, 1970-1976. Washington, D.C.: The World Bank, 1983. 46 p. (World Bank working paper, 594)

Merson MH, Goldmann DA, Boyer KM, Peterson NJ, Patton C, Everett LG, Downs H, Steckler A, Barker WH, Jr. An outbreak of Shigella sonnei gastroenteritis on Colorado River raft trips. Am J Epidemiol 1974 Sep;100(3):186-96

In the summer of 1972, an extensive outbreak of acute gastroenteritis occurred among passengers and boatmen on Colorado River raft trips. The illness was characterized by diarrhoea, abdominal cramps, and fever, and laboratory results indicated that the outbreak was caused by Shigella sonnei. Epidemiologic evidence suggested that illness originated among boatmen and spread to passengers primarily by person-to-person transmission. No common food or water vehicle could be identified as the source of the outbreak. A bacteriologic and chemical analysis of water from the Colorado River and some of its tributaries demonstrated that this water was unsuitable for drinking unless purified. As a result of the outbreak, the Colorado River Health Committee was created to establish guidelines for food and water handling and sewage disposal aboard the rafts and to initiate a health training course for boatmen. (Author's abstract)

Merson MH, Tenney JH, Meyers JD, Wood BT, Wells JG, Rymzo W, Cline B, DeWitt WE, Skaliy P, Mallison GF. Shigellosis at sea: an outbreak aboard a passenger cruise ship. Am J Epidemiol 1975 Feb;101(2):165-75

Between 23 and 30 June 1973, 90% of the 650 passengers and at least 35% of the 299 crew members experienced a diarrhoeal illness during a 7-day Caribbean cruise aboard a passenger cruise liner. Symptoms were consistent with shigellosis, and Shigella flexneri 6, Boyd 88 biotype, was isolated from rectal swabs taken from 8 of the 35 ill passengers and 33 of the 294 crew members. Epidemiologic evidence incriminated the ship's water, including ice, as the probable vehicle of transmission, and elevated coliform counts were found in potable water samples obtained aboard the vessel at the peak of the outbreak. Potential sources of contamination of the vessel's potable water supply were

investigated, and improvements in the loading and chlorination of potable water were recommended. (Author's abstract)

Merson MH see Black RE

Merson MH see Feachem RG

Merson MH see Hughes JM

Meyers FM see Dewailly E

Meyers JD see Merson MH

Mhalu FS, Moshi WK, Mbaga I. A bacillary dysentery epidemic in Dar es Salaam, Tanzania. In: Khan A, Rowland MGM, Aziz KMS, eds. Proceedings of the First African Conference on Diarrhoeal Diseases, Arusha, 13-17 November 1984. Harare: International Steering Committee, 1986

During a nationwide epidemic of bacillary dysentery, 207 patients, admitted to a special medical ward at Dar es Salaam, Tanzania, were studied. Of these, 61% were male and 39% female. Most were aged 20-29 years, and, contrary to expectations, only one was aged under 8. Semi-skilled professionals accounted for 26.2%, housewives 23.8%, and workers 12.4% of the patients. During the outbreak, there was a great shortage of piped water supplies in the city and a nationwide shortage of washing soap. The outbreak was caused by all 4 serogroups of Shigella. Moreover, a recently introduced multiple antibiotic-resistant Shigella dysenteriae type 1 strain, with a group X plasmid, accounted for a big proportion of the cases and displaced much of the S. flexneri, which had previously been responsible for more than 60% of the shigellosis attacks in Dar es Salaam. Results of the study point to the need to ensure the availability of clean water and washing soap, and the improvement of personal hygiene and environmental sanitation for preventing shigellosis.

Mhalu FS. Studies on modes of transmission of cholera in Tanzania. In: Khan A, Rowland MGM, Aziz KMS, eds. Proceedings of the First African Conference on Diarrhoeal Diseases, Arusha, 13-17 November 1984. Harare: International Steering Committee, 1986

While the traditionally accepted view that cholera is most often transmitted through contaminated public water sources holds true for Tanzania also, accumulated evidence during the past 7 years of the ongoing cholera epidemic indicates that the transmission of the disease from person to person through close direct physical contact or through contaminated household items, used under unhygienic conditions, plays a significant role. Recently published data on nosocomial cholera in Dar es Salaam and preliminary results from ongoing studies on the transmission of cholera in affected areas of Tanzania appear to confirm the importance of person-to-person transmission of cholera within households. Provision of bacteriologically safe water and food alone will not result in eradication of cholera in developing countries, unless such measures are accompanied by improvements in sociocultural behavior of the population, including the avoidance of overcrowding.

Mhalu FS see Lema O

Mhalu FS see Mntenga WM

Mia MAL see Rahaman MM

Miller DR see Hebert JR

Millar JW see Britt B

Miller C see Feachem R

Miller DeW. Boiling drinking water: a critical look. Waterlines 1986 Jul;5(1):2-5

Mires MH see Lopez CE

Misra BS see Pandit CG

Mitra U see Deb BC

Mkumbwa ZM. Community response on control methods for diarrhoeal diseases. In: Khan A, Rowland MGM, Aziz KMS, eds. Proceedings of the First African Conference on Diarrhoeal Diseases, Arusha, 13-17 November 1984. Harare: International Steering Committee, 1986

The joint WHO/UNICEF Nutrition Support Programme was introduced in Tanzania in December 1983 with the objectives to: (1) reduce infant and child morbidity and mortality, (2) improve growth, (3) improve maternal nutrition, and (4) develop capabilities at all levels of a society to assess and analyze nutrition problems and to devise appropriate remedies. Eleven projects, covering 167 villages, were launched in Tanzania with an integrated intervention strategy on control of diarrhoeal diseases. The intervention strategy was later transformed into a nutrition campaign. The nutrition campaign's components included training courses for members of the village health committees, health education sessions, immunization, lectures on feeding practices (especially weaning foods) for mothers and others. The extent of protein-energy malnutrition in 30,106 children examined so far is shown. The community response to use of modern ventilated pit latrines was gauged. The response to use of modern ventilated pit latrines and oral rehydration therapy was encouraging, since both involved cheap and simple methods. Overall response patterns of local people to immunization, weaning foods and proper water use were also favorable. It was seen that these responses depended largely on meaningful and readily demonstrable results at village level.

Mntenga WM, Mtango FD, Mhalu FS. Seasonality of cholera in Tanzania; possible role of rainfall in disease transmission. In: Khan A, Rowland MGM, Aziz KMS, eds. Proceedings of the First African Conference on Diarrhoeal Diseases, Arusha, 13-17 November 1984. Harare: International Steering Committee, 1986

Outbreaks of cholera and their seasonal patterns were studied from retrospective data in Tanzania. Outbreaks of cholera have been traced from the first report to those reported up to the present day, and an analysis of outbreak trends and the suspected modes of transmission was done. There have been 4 major epidemics of cholera in Tanzania in the last 150 years. The ongoing 4th epidemic has been devastating in terms of duration, mortality rates and morbidity figures. It began in October 1977. Possible causes of this outbreak were looked for. The study depended on monthly climatological data for the period from January 1979 to December 1983 (5 years) obtained from the

meteorology department. Information on cholera deaths and cases were obtained from the records kept by the Epidemiology Unit of the Tanzanian Ministry of Health. Bacteriological reports were made available from the records kept by surveillance teams. In general, the months of January and February, throughout the country, had moderate rainfall which corresponded with the moderately low incidence and mortality for diarrhoeal diseases. In this study, 2 main rainfall peaks were observed, at the beginning of each of which the number of cholera cases rose to a peak. The positive correlation ($p<0.001$) between notified cholera cases and rainfall appeared to apply for up to 2 to 3 months of continuous rainfall after which they decreased. This increase in relation to rainfall could be ascribed to the possibility that the first rains wash away fecally contaminated ground and drain the water into streams, rivers, wells, and dams. People using untreated water from such contaminated environments run the risk of getting cholera. However, if rainfall continues for longer periods, the incidence and mortality from the disease decrease possibly because the contaminated body of water increases in volume and dilutes the Vibrio cholerae 01 concentration. These results confirm the seasonality of cholera in Tanzania, a finding which is important in planning control measures.

Mochtar MA see Sutoto

Mohadjer S, Mehrabian S. Studies on the survival of Shigella flexneri in river and tap water. Arch Roum Pathol Exp Microbiol 1975 Dec;34(4):307-12

Monckeberg F see Schlesinger L

Mondal SK see Deb BC

Moore B. The risk of infection through bathing in sewage-polluted water. In: Pearson EA, ed. Proceedings of the First International Conference on Waste Disposal in the Marine Environment, 1959. Oxford: Pergamon Press, 1960:29-38

Moore HA, de la Cruz E, Vargas-Mendez O. Diarrheal disease studies in Costa Rica. IV. The influence of sanitation upon the prevalence of intestinal infection and diarrheal disease. Am J Epidemiol 1965 Sep;82(2):162-84

Presented here are the findings of a survey of household sanitary facilities in a community where diarrhoeal morbidity was later observed for one year and where various surveys of intestinal infection and parasitism were carried out. In the coffee-producing area of Costa Rica, 1202 houses were investigated. The houses were supplied with piped water (94%) and had facilities for sanitary excreta disposal (89%). The incidence of diarrhoea was reduced, and the prevalence of Shigella infections and parasitism were least where modern sanitation systems existed. Water pollution could not be shown to have a direct effect upon diarrhoeal morbidity. A marked increase in the proportion of coliform counts was noted at the onset of annual rainy season. There was a seasonal coincidence of high morbidity and very high coliform counts. The median fly counts and the weekly diarrhoeal morbidity rates for the entire study population showed that flies did not play any significant role in determining the extent, amount, or seasonality of diarrhoea. Variations in the bacteriologic quality of meat or milk did not appear to be related to the variations in diarrhoea morbidity. Domestic animals were observed to harbor enteropathogenic bacteria on some occasions, but they were not related to disease episodes in their owners. A variety of intestinal parasites were prevalent. Some reasons for the persistence of extensive parasitism, in spite

of the general use of pit privies, have been elucidated. The prevalence of Ascaris was extremely high where no toilet facility existed. Salmonella infections were probably acquired from food, and Entamoeba histolytica and Giardia lamblia infections primarily from water. The hookworm problem was localized and was appeared related to occupation and dearth of public toilet facilities.

Moore HA, de la Cruz E, Vargas-Mendez O. Diarrheal disease studies in Costa Rica. I. Plan and methods of investigation. Am J Public Health 1966 Feb;56(2): 276-86

Moore KE see Ghannoum KA

Moore LLA see Mackie TT

Morens DM, Zweighaft RM, Vernon TM, Gary GW, Eslien JJ, Wood BT, Holman RC, Dolin R. A waterborne outbreak of gastroenteritis with secondary person-to-person spread; association with a viral agent. Lancet 1979 May 5;1(8123):964-6

In December 1976, an outbreak of gastroenteritis occurred at a resort camp in Colorado, USA. This epidemic was the first outbreak of waterborne gastroenteritis reported to be associated with transmissible virus-like particles and was the result of sewage contamination of potable water. Data obtained by questionnaire from 760 persons indicated that 418 (55%) had had gastroenteritis at the camp or within a week of leaving it, with peak onset within a 2-day period. Median duration of the illness was 24 h. The attack rate increased with consumption of water or ice-containing beverages. The camp water supply was found to be inadequately chlorinated and contaminated by a leaking septic tank. Although routine laboratory tests did not reveal bacterial, viral, or parasitic pathogens, immune electron microscopy detected virus-like particles in 2 of the 5 diarrhoeal stool filtrates. Oral administration of one of these bacteria-free filtrates to 2 volunteers induced a gastrointestinal illness, similar to that observed in the camp visitors. It is concluded that the possibility of waterborne viral disease must be considered in any common-source epidemic of gastroenteritis. (Modified author's abstract)

Mosher WE see Borden HH

Moshi WK see Mhalu FS

Mosley WH, Khan MU. Cholera epidemiology - some environmental aspects. Prog Water Technol 1979;11(1-2):309-16

Details of longitudinal, community-based, epidemiological studies from endemic areas in Bangladesh are given. These lay emphasis on the essential link between transmission of cholera and exposure to specific environmental situations. Cholera has a distinctive epidemiological pattern. Epidemics, even in endemic areas, are sharply localized in time and place. The "place" specificity points to the essential requirement for water to facilitate transmission of disease. The age, sex, and occupational risks of disease are primarily related to exposure to contaminated water. Cholera is rarely seen in infants aged under one; the highest incidence in the endemic areas is among children, their age ranging from 4 to 8 years; in epidemics in newly infected

areas, adult males are typically the prominent victims. Selective exposure to contaminated water can account for most of these patterns. This exposure may, however, involve small doses of Vibrio cholerae ingested in water while rinsing the mouth, utensils, fresh vegetables, or with fish, especially shellfish. The epidemiological pattern of cholera contrasts greatly with that of other diarrhoeal diseases. There is need of a clear epidemiological picture of the predominant routes of transmission of each of etiological agent.

Mosley WH, Bart KJ, Sommer A. An epidemiological assessment of cholera control programs in rural East Pakistan. Int J Epidemiol 1972 Spring;1(1):5-11

Mosley WH see Khan M

Mosley WH see Khan MU

Mosley WH see Martin AR

Mount RA, Rloyd TM. A dysentery outbreak aboard a cruiser in Apra Harbor, Guam, Marianas Islands. U S Naval Med Bull 1948;48:240-9

Mowat DA see Green DM

Mtango FD see Mntenga WM

Mtera KNM. Cultural and behavioural antecedent diseases in Tanzania. In: Khan A, Rowland MGM, Aziz KMS, eds. Proceedings of the First African Conference on Diarrhoeal Diseases, Arusha, 13-17 November 1984. Harare: International Steering Committee, 1986

Cultural and behavioral factors, which contribute to the continuation and spread of diarrhoeal diseases, especially cholera and bacillary dysentery, were examined in Tanzania. Some of these factors are very strongly rooted in the culture and in the religious beliefs of the people which are extremely difficult to change. Mourning rituals, eating and drinking habits, excreta disposal arrangements, care of soiled clothing and certain pre-conceived notions on diarrhoeal diseases were found to be crucial factors in determining the causes and transmission modes of these diseases. Some strange and unscientific beliefs and superstitions relating to defecation practices and eating habits were strongly associated with the transmission of disease. The identified factors have seen described. It is recommended that attempts should be made to teach the local people of the ill-effects of their common beliefs and superstitions.

Muller R see Feachem RG

Munoz JA see Beck MD

Murda A el-G. Evaluation of a health education programme in Tayba Qurashi Village, Central Sudan during 1983. J Trop Med Hyg 1985 Apr;88(2):111-3

Diarrhoeal disease, schistosomiasis, and malaria are spread by improper use of water. The influence of health education on the behavior of women, who spend their time in the houses and are responsible for their children, was studied in regard to the use of water in Tayba Village in Central Sudan. Seventy percent of the women were illiterate. The education campaign improved understanding of

how bilharzia is acquired and how to protect against it. Understanding of how diarrhoea occurs and how to prevent diarrhoea and malaria also increased. Progress was made towards keeping food correctly, in cleanliness of water jars and houses, and in disposal of garbage. The need for cleanliness of latrines and removal of stagnant water was emphasized. (Author's abstract)

Murray RA see Mahoney LE

Murti SVS see Pandit CG

Murty DK see Pandit CG

Music SI see Thacker SB

Muthu PA see Yap KL

Muttamara S, Krishnaswamy M. Diarrhoeal diseases related to sanitation and water supply. Southeast Asian J Trop Med Public Health 1982 Sep;13(3):348-51

Three Thai communities, using river water and 3 Thai communities using klong water for domestic consumption, were studied over a 4-month period to assess water quality, sanitation, and the incidence of diarrhoea. In the river-using communities, the incidence of diarrhoeal disease was 454 per 1,000 population, while in the klong-using communities, it was 85 per 1,000 population. The relationship between water quality, as measured by the MPN coliform index, and the incidence of diarrhoeal cases, showed that an increase in diarrhoeal cases was accompanied by an increase in the MPN value. In general, water quality seemed to influence the incidences of diarrhoeal disease.

Myers GG see Drachman RH

Myint TM see Han AM

Myo-Khin see Khin-Maung-U

Nagy T see Thacker SB

Najai D see Shaffer R

Najera MP. [Role of health education in cholera control]. Rev Sanid Hig Publica (Madr) 1971 Dec;45:1135-47

Nakamura M, Stone RL, Krubsack JE. Survival of Shigella in sea water. Nature 1964 Jul 11;203(4949):213-4

Nalin DR. Cholera, copepods and chitinase [letter]. Lancet 1976 Oct 30;2(7992):958

The waterborne mode of transmission of cholera is described. Cholera is highly seasonal in endemic areas, and man is the only known host though long-term carriers are rare. Although little is known about the bioecology of Vibrio cholerae, much more is known about the bioecology of V. parahaemolyticus — which can adsorb onto the chitin of copepods and which, with related vibrios, constitutes nearly the total viable bacterial flora of these plankton. Over 80% of the vibrios in the USA and Japanese waters are found to be associated

with zooplankton. These vibrios produce chitinase and can use chitin as a nutrient, which can be one of the factors that enable them to survive in unfavorable environmental conditions. In estuarine sediments, these properties are essential for continuation of the annual cycle of V. parahaemolyticus. In the USA, the highest Vibrio counts occur during the season when V. parahaemolyticus-associated food poisoning has occurred. It is suggested that V. cholerae likewise may survive in unfavorable environmental conditions by adhering to or by colonizing copepods or related species, in the Ganges delta area. This would explain why V. cholerae too produce chitinase, and also indicate why surface water vibrios in endemic areas are far lower than the counts needed to pass the stomach acid barrier and causing infection. Low Vibrio counts probably could cause small bowel infection, by traversing stomach acid inside the indigestible chitin of copepods and then reaching human intestines via drinking water, etc. As with V. parahaemolyticus, a seasonal persistence cycle in sediments, bacterial increase during plankton bloom, and the appearance of vibrios in the water column leading to infection, could account for the seasonality of endemic cholera.

Nalin DR see Levine RJ

Nanna P see Sakdisiwasdi O

Nash HD see Geldreich EE

Nasr M see Ghannoum MA

Nations-Shields M see Shields DS

Nenninger ES see Mackie TT

Neogy KN. Viability of V. cholerae and V. El Tor in food and water. Bull Calcutta Sch Trop Med 1965;13(1):10-1

This study evaluates the viability of Vibrio cholerae (classical) and V. cholerae El Tor in some commonly used foodstuffs, cut fruits, and in tank water under laboratory conditions. Organisms, obtained from 24 h nutrient agar cultures, were inoculated in samples of tank water, curd and "panta rice" (boiled rice soaked overnight in water), and suspension of agar cultures in 0.1% peptone saline was smeared on the surface of the cut fruits and sweets. The specimens were then cultured at intervals after primary enrichment in alkaline peptone water. El Tor vibrios survived one week longer than V. cholerae in tank water having pH 6.4-6.6. Both organisms survived well in other foodstuffs, and their viability appeared to be similar. In the cucumber (cut fruit, at pH 6.6), organisms survived for more than 24 h. The viability of V. cholerae El Tor in water and foodstuff is a valuable finding from the public health point of view.

Ness GE see Hood MA

Nesterova VB. [Causes of waterborne dysentery outbreaks]. Gig Sanit 1971 Apr;36:13-6

Niyogi SG, Deb BC, Sircar BK, Sengupta PG, De SP, Sen D, Ghosh BN. Studies on cholera carriers and their role in transmission of the infection: a preliminary report. Indian J Med Res 1979 Dec;70:892-7

This preliminary report highlights the role of cholera carriers in transmission of El Tor cholera infection in endemic communities of Calcutta, India. The study was conducted in the slums in the eastern part of Calcutta, an area highly endemic for cholera. Twenty-nine families with cholera cases and 20 control families were studied for 10 days between April and September 1976 to determine the incidence of cholera carriers as well as the mode of transmission of Vibrio cholerae infection in them. The incidence of carriers (stools) of Vibrio cholerae in the study group was 23%, compared to only 8% in the control ($p<0.01$). Of the 18 study group families having cholera carriers in them, about half had more than one carrier. On the other hand, of the 7 control group families showing carriers, only 14.2% had more than one carrier. This difference was statistically significant ($p<0.01$). All the strains of V. cholerae belonged to biotype El Tor. About 75% of the carriers in the study group were detected within the first 5 days of the occurrence of an index cholera case in the family. Most of the carriers (65.6%) were one-day excretors, though multiple excretors of V. cholerae were also not uncommon. There was hardly any significant difference in age distribution of carriers, although children, aged under 2, showed a higher trend. Epidemiologically, families, using open wells water from wells and ponds for domestic purposes, had higher carrier detection rates (32% and 48% respectively). However, on bacteriological investigation, water samples, cooked food, and flies did not appear to have played any significant role during the present study in transmission of cholera infection. It is suggested that a larger sample size should be studied before arriving at a definite conclusion with regard to the exact mode of transmission of V. cholerae infection.

Noche ML, Jr. Environmental factors in diarrhoeal diseases in the Philippines. Southeast Asian J Trop Med Public Health 1982 Sep;13(3):352-6

In 1977, in the Philippines, diarrhoea was the second highest cause of child morbidity and mortality, particularly among undernourished children aged 6 years and younger. Poor personal hygiene, lack of supervision of food handlers and poor maternal nutrition, coupled with unhygienic and poorly practiced shifts to bottle feeding, usually against a background of poverty, were identified as the major diarrhoea-causing factors. To reduce diarrhoeal morbidity and mortality in such developing countries, there must be joint private/government sector efforts, aimed at improving socioeconomic conditions; integrating preventive and curative efforts into the health care delivery system; health education, especially concerning personal cleanliness; and intensified efforts towards surveillance of environmental problems. Moreover, present health priorities must be reassessed to give a meaningful direction to current efforts and resources. An adequate water supply was found to be critical for the maintenance of health and sanitation and essential to solving diarrhoeal disease problems. Primary health care providers must be aware of the existing relationship between these environmental determinants and sociocultural factors, educational levels and prevailing situations created by poverty. Education is needed for food handlers, food establishment managers and consumers, concerning simple personal cleanliness procedures and the importance of periodic health supervision. Accurate reporting and the immediate treatment of sick personnel handling food should be enforced. Intensification of efforts towards the surveillance and epidemiologic aspects of these environmental problems should be coordinated and collaborated with all government and non-governmental agencies, with full participation by the public. Such efforts should take into consideration local resource limitations.

Nyerges N. [Plan for the control of enteric infections: environmental health, epidemiology, health education, and early diagnosis and treatment]. Bol Of Sanit Panam 1964 May;56:447-65

Nyerges N, Eng N. Plan for the control of gastrointestinal diseases. Environmental sanitation, epidemiology, health education, and early diagnosis and treatment. In: Control of gastrointestinal diseases. Washington, D.C.: Pan American Health Organization, 1963. (Technical discussions, science publication, 100)

Nyunt-Nyunt-Wai see Khin-Maung-U

Odoroff CL see Rubenstein A

Ogwa M see Lema O

Old HN. Sanitation problems of the American Indians. Am J Public Health 1953 Feb;43(2):210-5

The author, in June 1950, was assigned as a full-time engineer-consultant for the purpose of securing factual information and developing a sanitation program. Since then sanitary surveys have been made at all the larger reservations and many non-reservation installations - some 45 or 50 locations in the USA. The visual observations have been supplemented by discussions with agency and area (regional) staffs, tribal councils, and individual Indians as well as state and local health officials. The surveys confirmed the belief of the water that sanitation services among the Indians must take into account primarily home and community conditions rather than stop at bureau installations. At a home within a Wisconsin reservation where one child had died and several others had been hospitalized due to dysentery, there was no well and no privy. In this instance, good water was available at a depth of 30 or 40 feet. Very few Indian homes had water supply under pressure.

O'Neil AE, Richen D, Lundrie P. A waterborne epidemic of acute infectious non-bacterial gastroenteritis in Alberta, Canada. Can J Public Health 1985 May-Jun;76(3):199-203

An epidemic of waterborne acute infectious nonbacterial gastroenteritis in Alberta, Canada is described. In February 1983, an epidemic of gastroenteritis, affecting 3,000 persons, occurred in a city of 6,500 people in Alberta. At first, 9 illnesses were reported at the Drumheller Health Unit. A complete investigation was begun. The questionnaires and interviews provided information on a non-random sample of 3,293 individuals, of whom 1,326 had gastroenteritis. The overall attack rate for non-random sample of those who drank water at Drumheller was 51%. The attack rates were higher in those who drank unboiled Drumheller tap water. The incidence of illness was greater with greater consumption of the tap water. Attack rates were higher in females than in males in all age groups. Vomiting affected 52% of the cases and diarrhoea 60%, while all cases were nauseous. Headache and cramps were common. The duration of illness was 24-48 h. Some 1,569 of the secondary spread cases attended a clinic in Drumheller. Stool cultures gave a negative result for Salmonella, Shigella, Campylobacter, ova, cysts, and parasites, and for viruses. No cross-connection between polluted water and the system was found. Bacterial tests of the raw water at the plant showed fecal coliforms. A close look at points on both banks of the river on which the water plant was situated

yielded nothing that could cause the epidemic. The municipal water supply was identified as the vehicle for the causative agent of the reported illnesses.

Oo KN see Han AM

Oseasohn RO see Benenson AS

Ostergaard P see Gracey M

Otto GF, Spindler LA. Effect of partial sanitation on infestation with intestinal parasites in southwest Virginia. South Med J 1930;23:566-60

Outbreak of diarrheal illness associated with a natural disaster - Utah. MMWR 1983 Dec;32(50):662-4

Pacey A, ed. Sanitation in developing countries. Chichester: Wiley, 1978. xiv, 237 p.

Pal SC see Deb BC

Pal SC see Pandit CG

Pal SC see Saha MR

Pamphile M see Thacker SB

Pandit CG, Pal SC, Murti SVS, Misra BS, Murty DK, Shrivastav JB. Survival of Vibrio cholerae biotype El Tor in well water. Bull WHO 1967;37(4):681-5

Panicker PVRC see Handa BK

Parekh P, Kethar M, Arora R, Sharma S, Chaparwal BC, Singh SD, Arora MM. An epidemiological survey during an outbreak of cholera in Indore city. Indian Pediatr 1981 Sep;18(9):637-41

An outbreak of cholera in the city of Indore, India was first recognized with the identification of Vibrio cholerae in the stool cultures of a large number of children hospitalized for gastroenteritis. This was during the months of May and June 1980. Since hospital figures do not usually reflect the true incidence in the community, an epidemiological survey was carried out with the help of interns and Municipal Corporation and Public Health Engineering staff. Some 364,948 persons (40% of the total population) were interviewed during the survey, of which 1,239 cases of gastroenteritis were detected. The incidence of the disease worked out to 339.50 per 100,000 population. However, the case fatality rate in the community due to the disease was 0.56%. A total of 735 defects in water supply and sanitation were found, and the rate of defective sanitation, irrespective of cause, ranged from 4.10 to 6.69 per 1,000 houses. The outbreak of the disease started from one of the slums situated in the heart of the city, from which the largest number of cases of enteritis was reported. On investigation, it was found that a few days before the onset of the disease, the main pipeline had burst, and water was rising to the surface mixing with sewage water and was consumed for about a week due to the shortage of water supply and ignorance. Immediate measures taken to control the outbreak were found to be successful. Statistical evaluation of the data obtained from the survey established that cholera was endemic in the city, but had flared up into an epidemic in 2 months due to the sanitation defects.

Parhad NM see Raman V

Patel M. Effects of the health service and environmental factors on infant mortality: the case of Sri Lanka. J Epidemiol Commun Health 1980 Jun;34(2):76-82

Pathak SK see Raman V

Patterson BA see Mason PR

Patton C see Merson MH

Patwary Y see Aziz KMA

Payne FJ see Drachman RH

Perry BH see Shuval HI

Pesigan TP. Studies on the viability of El tor vibrios in contaminated food-stuffs, fomites, and water. In: Bushnell OA, Brookhyser CS, eds. Proceedings of the Cholera Research Symposium, Honolulu, Hawaii, 24-29 January 1965. Washington, D.C.: U S Department of Health, Education, and Welfare, 1965:317-21

Petersen NJ, Hines VD. The relation of summertime gastrointestinal illness to the sanitary quality of the water supplies in six Rocky Mountain communities. Am J Hyg 1960 May;71:314-20

A morbidity survey was carried out to determine whether a correlation existed between the sanitary quality of water supplies and the summertime gastrointestinal illness in the population using these supplies. Six rocky mountain communities in Arizona, USA were selected on the basis of size for the study. The cases of gastrointestinal illness found in each community were arranged chronologically according to the date of onset. Only 20 of the 206 cases showed a history of eating away from home during the week preceding illness. Information on gastrointestinal illnesses were obtained from 836 individuals in 270 families in 3 communities grouped as A, B, C; and 1,023 individuals in 300 families in another 3 communities: D, E, F. The average family size of these 2 groups was 3.0 and 3.4 individuals respectively. The attack rate of 13.9% in communities A, B, C, where contaminated water was used by people, was significantly higher than the rate of 8.8% in communities D, E, F ($p<0.01$), with uncontaminated water supply. The overall contribution of the water to the attack rate in the total population was 5%. The attack rate of the population that lived in communities with contaminated water for less than 2 years was more significant. The difference in attack rates in communities using contaminated water was related to length of exposure to the causative agents. A similar relationship of attack rate to length to residence was not found among people using uncontaminated water.

Petersen NJ see Drachman RH

Peterson NJ see Merson MH

Philipp R, Evans EJ, Hughes AO, Grisdale SK, Enticott RG, Jephcott AE. Health risks of Snorkel swimming in untreated water. Int J Epidemiol 1985 Dec;14(4): 624-7

Certain health risks are associated with recreational exposure to bacteriologically polluted water. Swimmers, who took part in a Snorkel swimming event at the Bristol City Docks, England, were studied. Twenty-one (27%) of the 77 swimmers experienced gastrointestinal symptoms within 48 h of entering the untreated water. The gastrointestinal symptoms had a median duration of 72 h (range 13 h-8 days). The incidence of gastrointestinal symptoms was significantly greater ($p<0.001$) than the incidence of such symptoms reported by 2 control populations. The numbers of swimmers, who developed such symptoms, were not statistically different from the numbers found amongst Snorkel event participants in the previous year. Water samples were taken during the event for bacteriological and virological examinations from 3 monitoring points along the swimming route. Chemical analyses of these samples were within EEC guidelines. Therefore, further appraisal of the adequacy of EEC standards for bathing water is necessary.

Pickering H. Social and environmental factors associated with diarrhoea and growth in young children: child health in urban Africa. Soc Sci Med 1985;21 (2):121-7

This study investigates the relationship between social and environmental variables and diarrhoea and the growth of children, aged between 6 and 36 months, in an urban area of the Gambia. The social and environmental conditions of 493 children were observed and recorded over a 12-month period. Two hundred and seventy-seven children were under weekly diarrhoea surveillance for a 15-week period during the wet season, while 322 children had anthropometric measurements taken in May and September. Computer analysis was used to determine the results. Diarrhoea was monitored in 277 children by weekly questionnaires for 105 days during the wet season. The duration of diarrhoea ranged from 0 to 53 days. Thirty children had diarrhoea for 24 days, while another 30 had no diarrhoea at all. These 2 groups were compared. None of the social and environmental variables examined showed a significant relationship with the prevalence of diarrhoea. About 23% of the children in this age group were less than 90% of the National Center for Health Statistics Standard of height-for-age, and several of the variables recorded showed a statistically significant association with this measurement. Improved piped water supply as well as a general improvement of living standard have proved to be effective in bettering the general health status of African children.

Pickering HA see Lloyd-Evans N

Pickfold J see Bannaga SEI

Pineo CS, Subrahmanyam DV. Community water supply and excreta disposal situation in the developing countries: a commentary. Geneva: World Health Organization, 1975. 41 p. (WHO offset publication, 15)

Pipes WO. Bacterial indicators of pollution. Florida: CRC Press, 1982. 174 p.

Pisharoti KA see Rajasekaran P

Pocchiari F. The public health's role in the prevention and control of cholera. In: Diffusion and treatment of cholera infection. Roma: Instituto Poligrafico dello Stato, 1975:5-8

Pogan GJ see Gordon RC

Poirier C see Dewailly E

Poley JR. Causes of chronic diarrhea in infants and children. Postgrad Med 1970 Dec;48(6):143-7

The causes of chronic infantile diarrhoea and their diagnosis are discussed. A reliable feeding history of the patient helps diagnosis by enabling the physician to put the newer diagnostic tests to their optimal use. In addition, growth data should be obtained whenever possible. The symptoms and diagnosis of various types of dietary proteins and carbohydrates are discussed. Both chronic ulcerative colitis and Crohn's disease may be associated with chronic or recurrent diarrhoea. It is suggested that careful proctoscopy and X-ray study of the intestine could assist in differentiating ulcerative colitis from Crohn's disease. The use of drinking water, containing a significant amount of sulfates in infant formula, may also lead to diarrhoea which can be severe, and being usually watery. The World Health Organization, therefore, recommends that water with a sulfate content of more than 400 mg/l is unsafe for infant feeding.

Pollard RA see Thacker SB

Pollard RA see Weissman JB

Porat V see Djerassi L

Pournadeali E, Tayback M. Potable water and village health: is primary prevention affordable? Prog Water Technol 1979;11(1-2):31-5

Pournadeali E, Tayback M. Potable water and village health: is primary prevention affordable? Public Health Rep 1980 May-Jun;95(3):291-4

Prasad BG see Zaheer M

Preka N see Bantic Z

Prier JE see Lobel HO

Professor Koch on the bacteriological diagnosis of cholera, water filtration and cholera, and the cholera in Germany during the winter of 1892-93. Translated by G Duncan. Edinburgh: Douglas, 1894.

Pruneda RC see Rosenberg ML

Qiintino LDP see Blake PA

Quinn P see Lindell SS

Rachmad see Matulessy PF

Rachmat A see Matulessy PF

Radhakrishnan I see Bhaskaran TR

Rahaman MM, Khan M, Aziz KMS, Islam MS, Kibriya AKMG. An outbreak of dysentery caused by Shigella dysenteriae type 1 on a coral island in the Bay of Bengal. J Infect Dis 1975 Jul;132(1):15-9

Rahaman MM, Aziz KMS, Rahman MM. Relationship between water consumption and dysentery in Teknaf: a rural Bangladesh village. In: Proceedings of the 11th Meeting of the Scientific Review and Technical Advisory Committee of the Cholera Research Laboratory. Dhaka: Cholera Research Laboratory, 1977:94-101

Rahaman MM. A strategy for control of shigellosis (dysentery) in Teknaf - a rural Bangladesh village. Prog Water Technol 1979;11(1-2):303-8

An intervention plan for the control of shigellosis and other diarrhoeal illnesses, undertaken in Teknaf, a rural Bangladesh village, having a high mortality rate, is described. To increase the awareness of diarrhoeal diseases, their causes and transmission modes, intensive health and sanitary education, with particular emphasis on women and children, was provided. A pilot scheme of health and sanitary education, initiated in a small community, showed dramatic increases on the knowledge of transmission mode of diarrhoea in one of the study villages. A survey on the use of fixed latrines, conducted in 1976 and again in 1978 after an input of health education and supply of water-sealed latrines, showed a great improvement in reducing illnesses, particularly among adult men and women. A handpump was made available for every 3-4 families in one of the study communities to augment the quality and quantity of water. The objective of the strategy discussed in this report was to test the possibility of improving the existing diarrhoea situation in a community by the use of simple, relatively inexpensive and adaptable technology. The preliminary results of the pilot scheme showed an encouraging trend.

Rahaman MM, Mia MAL, Khan AR, Khan AK, Rahman M, Haq M, Khan AQ, Zoha MS. A survey of basic health information of rural Bangladesh. Bangladesh Med Res Counc Bull 1977 Jun;3(1):70-6

The survey findings on basic health of rural Bangladeshi people are described. The Rural Health Administrators and Medical Officers, located in the rural health centers, were encouraged to participate in the investigation. A training course of 4 days' duration was given to the willing participants. Some 195 families in each thana were included for the study, and 33 families were visited each month. A questionnaire was devised to collect information. Information from 2,149 families of 20 thanas were collected during a one-year period. Nearly 40% were cultivators and 40% laborers, usually landless. About 20% of the families had to collect water from a distance of more than 200 yards. Water sources had a relationship with the incidence of diarrhoea and dysentery. The dug-well user had the highest incidence of diarrhoea and dysentery (about 20%). Among 367 families, who had 1-4 cases of diarrhoea or dysentery, the incidence was 17%. The tubewell-using families had the lowest incidence (15.1%). Distribution of families by number of sufferers from diarrhoea or dysentery during the last 15 days, according to the water sources, was studied. Distribution of families by number of sufferers from diarrhoea or dysentery during the last 15 days, according to the type of latrine used by the families, was also highlighted. The results revealed a lack of relationship between the distances of the nearest latrines and the sources of drinking water (dug-well). The rate was uniform irrespective of distances. About 11% of the families had a member who had chronic cough. Most of the families received vitamin A capsules distributed through UNICEF program within the last one year. This study reflected some of the prevailing health hazards in Bangladesh.

Rahaman MM, Aziz KMS. Teknaf Dysentery Project. In: Proceedings of the 9th

Meeting of the Scientific Review and Technical Advisory Committee of the Cholera Research Laboratory and reports of the collaborative studies between International Center for Medical Research and Cholera Research Laboratory. Dhaka: Cholera Research Laboratory, 1975:148-56

Rahaman MM see Aziz KMA

Rahaman MM see Briscoe J

Rahaman MM see Khan M

Rahaman MM see Rahman M

Rahim Z see Chowdhury MAR

Rahman M, Wojtyniak B, Rahaman MM, Aziz KMS. Impact of environmental sanitation and crowding on infant mortality in rural Bangladesh. Lancet 1985 Jul 6;2(8445):28-31

A prospective study of the impact of water sources, use of latrines, and household crowding on the risk of infant mortality in 2 villages of Bangladesh was carried out with 2,471 infants, born during 1976-1977, who were followed up for one year. The estimates of the final model of logistic regression for post-neonatal mortality are ascertained. None of the exposure variables was significant to neonatal mortality. Neonatal and post-neonatal mortality rates in the study cohort were 100 and 75 per 1,000 live births respectively. Risk of post-neonatal mortality in the households, which did not use latrines, was 3.12 times ($p<0.01$) higher than those which did and 1.5 times ($p<o.05$) higher in the households with 10 or more persons than in smaller-sized households. Post-neonatal mortality in the households, which did not use tubewell water, was higher than in those which used tubewell water. Environmental factors had no effect on neonatal mortality. Socioeconomic level also had no significant effect on post-neonatal mortality in rural Bangladesh.

Rahman M see Rahaman MM

Rahman MM see Rahaman MM

Rahman R see Huq A

Rajagopalan S, Shiffman MA. Guide to simple sanitary measures for the control of enteric diseases. Geneva: World Health Organization, 1974. 103 p.

Rajasekaran P, Dutt PR, Pisharoti KA. Impact of water supply on the incidence of diarrhoea and shigellosis among children in rural communities in Madurai. Indian J Med Res 1977 Aug;66(2):189-99

This study examines the extent to which the public water supplies plays a regulatory role in the spread of waterborne diseases in rural areas, using the incidence of diarrhoea (shigellosis) as an index, in children in India. Some 1,091 under-5 children, living in 691 households of 5 villages with wells and protected water supplies through street taps and taps within houses, were observed twice a week for one year for diarrhoea. Their diarrhoeic stools were examined for Shigella. Incidence of diarrhoea (per 100 person years) was 21.51 (in villages with wells), 36.78 (in those using street taps) and 23.52 (in

those using taps within houses) respectively, the corresponding figures for shigellosis being 9.76, 12.52 and 4.72. Shigella flexneri (88.6%), S. boydii (7.3%), S. dysenteriae (3.1%), and S. sonnei (1.0%) were isolated. Alkalescens dispar (3) and Providence group (25) were also found. The dominant prevalence of S. flexneri was reported. To derive the full benefits of a protected water supply, personal hygiene appears as important a factor as ready availability of adequate quantities of piped water in upkeeping the general health status of a community.

Raman V, Parhad NM, Deshpande AW, Pathak SK. Assessment and control of water quality in a town distribution system with reference to the incidence of gastrointestinal diseases. Prog Water Technol 1979;11(1-2):65-71

This paper summarizes the assessment and control of water quality in a town distribution system with reference to the incidence of gastrointestinal diseases. Multi-faceted approaches and random epidemiological surveys were carried out in 4 pilot water distribution zones for a period of 4 months in Aurangabad in Maharashtra State of India in 1972. The population of the study area, covering 0.582 square miles, was 15,000. The sanitary survey revealed extremely unsatisfactory conditions. The water distribution system in some of the zones was contaminated by extraneous pollution by sewage or polluted water entering the pipelines through leaks due to suction during non-supply hours in the intermittent system of supply. The contamination in some cases was so high that even enteric pathogens, like Salmonella, could be detected (in addition to fecal coliforms and fecal streptococci) in tap waters during the initial period of supply, while the residual chlorine was nil. The total cases of gastrointestinal illnesses was 719 for a population of 1,500,000 (0.4%). The attack rate of hepatitis was 5.0, 8.0, 18.0, and 5.0 in the 4 study zones. Enteric fever was high in all zones except in zone 2. The average per capita consumption of water in each zone varied from 9.5 to 12.5 gallons per day in the 3 zones. Most of the leaks occurred in distributory laterals, house service pipe and ferrule connections. It was possible to bring down the leakage level by 60 to 70% by repairing them. This could also result in improved flow in the houses.

Raman V see Handa BK

Rao AV see Ghosh G

Rao SS. National water supply and sanitation programme with special reference to cholera endemic areas. Indian J Public Health 1975 Jan-Mar;19(1):44-9

Ray K see Aggarwal P

Reasoner DJ see Geldreich EE

Reddy V see Mathur R

Reeves WC see Ryder RW

Reller LB see Rosenberg ML

Remmers E see Colwell RR

Renteln HA, Hinman AR. A waterborne epidemic of gastroenteritis in Madera, California. Am J Epidemiol 1967 Jul;86(1):1-10

An epidemic of gastroenteritis occurred in the city of Madera, California (population 15,000), in August 1965. A citywide survey, based on a probability sample, indicated that the total number of people ill was approximately 2,500. Attack rates and epidemic curves for different parts of the city showed that the epidemic started and was not severe in the western half of the city. High coliform counts were demonstrated in the city's water distribution system and in one well in the southwest portion of the city. Demonstration that undisinfected sewage from an adjacent sewage-irrigated field could enter this well revealed the probable source of the epidemic. No pathogens were isolated from the water supply, and stool cultures from patients yielded Shigella and Salmonella in only a few cases. (Author's abstract)

Rey L see Hunter JM

Richen D see O'Neil AE

Ringelhann B see Lanyi B

Rloyd TM see Mount RA

Roberts N see Colwell RR

Rohde C see Cvjetanovic B

Rosenberg ML, Koplan JP, Wachsmuth IK, Wells JG, Gangarosa EJ, Guerrant RL, Sack DA. Epidemic diarrhea at Crater Lake from enterotoxigenic Escherichia coli. Ann Intern Med 1977 Jun;86(6):714-8

This paper investigates a large outbreak of waterborne epidemic diarrhoea due to enterotoxigenic Escherichia coli (ETEC) at Crater Lake in Oregon, USA. In June and July 1975, gastrointestinal illness occurred in more than 200 staff members and 2,000 visitors at the Crater Lake National Park. It was characterized by prolonged diarrhoea, cramps, nausea, and vomiting, lasting for a median duration of 8 days, and was significantly associated with consumption of park water ($p<0.001$), which had been contaminated by raw sewage. ETEC serotype 06:K15:H16 was isolated from 20 of the 49 ill park residents and from the park's water supply, but not from 71 local residents who had never been ill or had been well for the preceding 4 days. No bacterial, viral, or parasitic pathogens were isolated from either the ill or the healthy persons. This outbreak is the first documented evidence of ETEC as a pathogen in a waterborne outbreak. ETEC represents a public health threat, particularly in situations where water quality and food sanitation are inadequate.

Rosenberg ML, Hazlet KK, Schaefer J, Wells JG, Pruneda RC. Shigellosis from swimming. JAMA 1976 Oct 18;236(16):1849-52

Rosenberg ML, Weissman JB, Gangarosa EJ, Reller LB, Beasley RP. Shigellosis in the United States: ten-year review of nationwide surveillance, 1964-1973. Am J Epidemiol 1976 Nov;104(5):543-51

During 1964-1973, 105,832 isolations of Shigella were reported to the Center for Disease Control, USA through a nationwide surveillance system. The number reported increased by approximately 13% annually, from 5,852 in 1964, when only 17 centers reported all 4 quarters, to 16,797 in 1973, when 52 centers reported each quarter. The rate of reported isolations varied from 4.6 per 100,000

persons in 1965 to 9.1 per 100,000 in 1973. Shigella sonnei accounted for 64% of all these isolates and for more than 80% of the isolates in 1973. Most reported cases of shigellosis occurred in young children and in women of childbearing age. During the 10-year surveillance period, 35 epidemics in 25 states were investigated. Two-thirds of these outbreaks were the result of person-to-person spread; investigations of common-source outbreaks showed the the importance of both water and foodstuffs, especially salads, as potential vehicles of contamination. Indian reservations, custodial institutions, and day-care centers were identified as special high-risk settings for the transmission of shigellosis. It is suggested that public health education coupled with improvements in water and sewerage systems remains the most satisfactory means of control. (Modified author's abstract)

Rosenberg ML see Black PA

Rosenberg ML see Eden KV

Ross JD. Contaminated hospital water supplies [letter]. Br Med J 1979 Jul 7;2(6181):53

Rowe B see Black RE

Rowland MGM, Barrell RAE. Ecological factors in gastroenteritis. In: Clegg EJ, Garlick JP, eds. Disease and urbanization. London: Taylor and Francis, 1980:21-35. (Symposia of the Society for the Study of Human Biology, v.20)

Since 1974, the Dunn Nutrition Unit, Medical Research Council, has carried out a detailed epidemiological study of malnutrition in young children in Keneba of the Gambia, West Africa. It was demonstrated that, in this community, a major cause of morbidity and failure to thrive is diarrhoeal illness. The ecological factors bearing on the nature and spread of gastroenteritis fall into 3 broad categories: the physical environment, social environment, and the host factors. In Keneba, humidity, rainfall, water availability , water pollution and the virtual absence of sanitation facilities appear to be the main components of the first group. Maternal deprivation seems to be a major social problem. The poor diet and nutritional status of the mothers impair lactation, so supplementary infant feeding is needed as early as the 4th month of age. The mothers lack knowledge and facilities for sterilizing feeds and for storing clean water, and the standards of child care and infant feeding are poor, because of the exorbitant seasonal demands made upon them to work in the field; as a result, young children are repeatedly fed highly contaminated, poorly nutritious diets. The practice of breast feeding well into the second year of life is a valuable support to children in such unhygienic surroundings, but the protection it gives declines or disappears during the second half of infancy. This probably results both because increasing quantities of contaminated material are consumed, and because immunity is waning.

Rowland MGM see Barrell RAE

Rowland MGM see Lloyd-Evans N

Roy M see Wolff HL

Roy NC see Khan MU

Rubenstein A, Boyle J, Odoroff CL, Kunitz SJ. Effect of improved sanitary facilities on infant diarrhea in a Hopi village. Public Health Rep 1969;84: 1093-7

Ryder RW, Reeves WC, Singh N, Hall CB, Kapikian AZ, Gomez B, Sack RB. The childhood health effects of an improved water supply system on a remote Panamanian island. Am J Trop Med Hyg 1985 Sep;34(5):921-4

The incidence of diarrhoea, respiratory disease, and skin infections was prospectively determined after the introduction of a system, which distributed unlimited quantities of high quality fresh water to each of the 150 housing units on Tupile, an island devoid of fresh water located off Panama's Caribbean coast and inhabited by 1,500 Cuna Indians. The authors report the probable reasons why the new system did not decrease the incidence of diarrhoea, but markedly decreased the incidence of scabies and impetigo when compared to disease rates on an adjacent control island, where traditional water collection methods continued to be used. Tupile residents used 7.1 l of water/person.day, compared to the 2.3 usage rate of inhabitants on Achutupo, the control island. Despite the ready availability of water in each household. Tupile residents continued to store water in contaminated vessels prior to use. Forty percent of the stored water samples tested on Tupile and 45% on Achutupo were contaminated with Escherichia coli organisms. There were 4.7 episodes per child-year of acute diarrhoea on Tupile, compared with the 3.5 rate on Achutupo. The rotavirus infection rate on Tupile was 0.8 per child-year compared with 0.2 per child-year on Achutupo. Infection rates for Norwalk virus, respiratory syncytial virus and Coxsackie B 1-6 viruses were similar on both islands. Respiratory disease rates were high on both islands (2.2 per child-year on Tupile, 2.7 per child-year on Achutupo). Achutupo had much higher rates of impetigo and scabies (0.6 per child-year) and 2.5 per child-year, respectively) than Tupile (0.2 per child-year). Provision of the water distribution system had a beneficial effect on effect on the incidence of water-washed diseases (impetigo and scabies), but at best had no diarrhoeal disease. (Modified author's abstract)

Rymzo W see Merson MH

Sabil D see Yap KL

Sabwa DM, Githeko AK. Faecal contamination of urban community water supplies and its public health implications. East Afr Med J 1985 Nov;62(11):794-801

Fecal contamination of urban community water supplies and its public health implications for Kisumu Municipality of Kenya are discussed. The location of the study was the Kano plain on the shores of Winam Gulf of Lake Victoria. The area has a hot and wet climate. Rainfall ranges between 38.4 mm in January and 172.5 mm in April. The mean temperature in June is 27.8°C and 31.8°C in February. Surveys were carried out to determine the available types of drinking water supplies. Twenty-four water samples were examined. The study lasted for 5 months between January and May 1984. The two major types of water supply available for drinking within the Municipality were tap water and well water. People residing in high income urban areas used tap water, while those of low income urban areas used tap water and semi-protected wells or unprotected wells. People living in low income rural areas used semi-protected wells or protected wells. Protected wells were completely sealed and had a hand pump. Semi-protected wells were covered on the tap with or without a

removable tap and without a pump. Unprotected wells were open. The depths of the wells varied from 1.5 metres to 5.4 metres in unprotected and semi-protected wells, and 10 to 15 metres in protected wells. Water temperature and pH were constant in all wells. Water from unprotected wells appeared cloudy, while in the rest it was clear. The distance from toilets varied from 12 metres to 30 metres. Escherichia coli were found in some tap water samples, but over 1,800 E. coli per 100 ml in unprotected open wells were detected. There was a general improvement in water quality when surface contamination was controlled. E. coli count found in open wells were 1,600 E. coli per 100 ml, but for semi-protected wells, it was 200 E. coli per 100 ml. The protected wells had between 2 and 35 E. coli per 100 ml. There was no difference in counts between closed and open semi-protected wells. Proper maintenance of the wells, health education, and improved sanitation together may bring about reduced levels of fecal-oral diseases in the area.

Sack DA see Black RE

Sack DA see Rosenberg ML

Sack RB see Ryder RW

Sadek F see Velimirovic B

Saeed YA see Spira WM

Saha MR, Sen D, De SP, Sircar BK, Sengupta PG, Deb BC, Pal SC. Kanagawa phenomenon and serotypic pattern of Vibrio parahaemolyticus strains isolated from various sources in Calcutta. Trans R Soc Trop Med Hyg 1982;76(6):786-9

At the National Institute of Cholera & Enteric Diseases, Calcutta, India, 135 strains of Vibrio parahaemolyticus were isolated in 1976-1977 from cases of human gastroenteritis and from diverse environmental sources. The strains were tested for their ability to produce Kanagawa phenomenon and serotypic patterns. Of the 80 human isolates tested, 69 (86.3%) strains were Kanagawa phenomenon-positive, and 60 (75.0%) were serologically typable. Thirty-two (53.3%) of these typable strains belonged to the serotype 05:K15. Twenty-five randomly selected strains were isolated from various water sources, i.e. ponds, open wells and stored or tap water. Of these, 10 (40.0%) isolates were Kanagawa phenomenon-positive, and 17 (68.0%) were serologically typable. The typable strains belonged to 8 serotypes, the most common being 05:K15. Thirty strains, isolated from such crustaceans as shrimps and crabs and from marine and fresh water fish, were all Kanagawa phenomenon-negative; and 22 (73.3%) of them were serologically typable, belonging to 15 heterogeneous serotypes. The data suggest that, in Calcutta slum areas, water may play a role in the transmission of V. parahaemolyticus infection.

Saha NC see Deb BC

Sakdisiwasdi O, Achananuparp S, Limsuwan A, Nanna P, Barnyen L. Salmonella and Shigella carrier rates and environmental sanitation in a rural district, central Thailand. Southeast Asian J Trop Med Public Health 1982;13(3):380-4

The major factors determining the prevalence of salmonellosis and shigellosis are sanitary conditions and human carriers. Thus, a survey was done to determine the carrier rates of Salmonella and Shigella as well as water use

habits and sewage disposal in 2 villages, located along a canal in rural central Thailand. Stool or rectal swab samples, collected from 931 individuals (45.4% children), were cultured for Salmonella and Shigella. The carrier rates in children, aged under 15, of Salmonella and Shigella were, respectively, 4.9% and 1.2%, while the respective rates for the total population were 3.3% and 0.8%. Of the 8 Shigella-positive specimens, one was S. sonnei and the rest S. flexneri. Almost all Salmonella strains were sensitive to antibiotics commonly used. Only 6.4% were resistant to tetracycline, 3.2% to neomycin and nitrofurantoin. Shigella isolates were sensitive to colistin and nitrofurantoin; but all were resistant to chloramphenicol, 75% to tetracycline, and 25% to both ampicillin and a combination of trimethoprim-sulfamethoxazole. One-fourth of the families defecated in the river or canal or went to the field, and one-third dumped garbage in the river and canal. This contaminated water was used for drinking by 62.7% of all families, and only 28.1% treated the water by boiling. The disease vectors bothering the villagers - rats (58.8%), flies (12.7%), and cockroaches (32.0%) - served as important vehicles for cross-contamination. The prevalence rate of diarrhoeal disease was 1,933 per 100,000. To treat diarrhoeal diseases, 61% used self-medication, 30% a village healer, and only 3% went to a district hospital. It is suggested that 2 things are important: identification and treatment with drugs of transient and chronic carriers; as well as sanitary disposal of human excreta and development of safe water supplies.

Samadi AR see Shahid NS

Sanyal SC see Bhatia BD

Saran M see Srivastava RN

Saran M see Srivastava RN

Sarder AM see Khan MU

Sarkar R see Aggarwal P

Saslaw MS see Weissman JB

Sattar A see Spira WM

Sattar MA see Spira WM

Sau BB see Martin AR

Saunders RJ, Warford JJ. The goal of improved health; and improved water supply and sanitation: studies of its impact on health. In: Village water supply, economic and policy in the developing world. Baltimore: Johns Hopkins University Press, 1976:31-85, 205-21

Saxena SN. Intestinal parasites prevalent in Kasauli (Himachal Pradesh) area. Indian J Public Health 1982 Apr-Jun;26(2):100-5

Single stool specimens from 750 employees of the Central Research Institute, Kasauli, India, were analyzed for the prevalence of intestinal parasites in the area. Thirty percent of the subjects live in an "urban" cantonment area, with a filtered or chlorinated water supply and proper latrines, while 70% are rural

people, whose water source consists of open, natural springs, into which their excreta passes because they lack latrines. Abundant rainfall and humidity help helminthic eggs survive in the soil for longer periods. Of the 770 samples, 279 were positive; 19 with more than one parasitic infection. Moreover, 268 showed helminths, while only 31 harbored protozoa. Hookworm - 181 cases - was the most common infection, present in 64.8% of the positive samples and in 23.5% of the total samples. Comparing populaces, the positivity percentage from rural cases (40.7) was nearly twice that found in urban samples (21.5), which may indicate a high helminthic risk in the area's soil. There was no marked difference in protozoa infections between rural and urban groups. Other parasites found and their percentages of total samples were: Ascaris lumbricoides (4.8), Hymenolepis nana (3.9), Giardia lamblia (3.4), and Trichuris trichiura (1.2). It is concluded that the provision of protected water supplies and means of night soil disposal would go a long way towards protecting the people from such infections; while personal hygiene is also important.

Schaefer J see Rosenberg ML

Schiavone EL. [Influence of water on communicable diseases: some of its solutions]. Red Samid Milit Argent 1963 Jul-Sep;62:189-206

Schlesinger L, Weinberger J, Figueroa G, Segure MT, Gongalez N, Monckeberg F. Environmental sanitation: a nutrition intervention. In: Underwood BA, ed. Nutrition intervention strategies in national development. New York: Academic Press, 1983:241-53

Schliessmann DJ. Diarrhoeal disease and the environment. Bull WHO 1959;21: 381-6

This paper explains the association of the incidence of diarrhoeal disease with environmental factors in the USA. During 1946-1949, the author of this study found the death rate from diarrhoeal disease in the population, aged under 2, to be 6 times higher in slum areas than in well-sanitated areas in a city of 300,000 in the USA. Studies in migratory labor camps in California in 1952-1953 showed that the rates of Shigella infection in children, aged 10 years or under, living in dwellings with water outside, was twice that observed in children having water supplied under pressure inside the dwellings. The high rates seen in Guatemala in 1955 and 1956 were associated with the lack of modern sanitary facilities, with poor housing, with limited water supply, and with poor personal hygiene. Eastern Kentucky in 1954-1956 showed a significant, inverse correlation between water availability and the prevalence of Shigella, Ascaris infection, and diarrhoeal disease morbidity. The reductions in typhoid fever and helminthic and protozoal infections followed the installation of sanitary excreta disposal facilities. Extensive privy-building programs in the USA and in several other countries reduced the typhoid fever and hookworm infection rates. The reduction in the diarrhoea and enteritis death rates in Costa Rica by 50% between 1942 and 1954 was due to the installation of 10,455 privies in the region. The Kentucky studies revealed that persons having privies experienced twice as many cases of diarrhoeal disease than persons residing in houses with in-house toilets. The exclusion of flies from fecal material resulted in significant reductions in Shigella infections in children, aged under 10, and in diarrhoeal disease morbidity rates. To prevent contamination and disease transmission, the development of modern sewerage facilities and improved refuse disposal systems are recommended.

Schliessmann DJ, Atchley FO, Wilcomb MJ, Jr., Welch SF. Relation of environmental factor for the occurrence of enteric diseases in areas of eastern Kentucky. Public Health Monogr 1958;54:1-33

Schmidt EA see Greenberg JH

Schneider R see Shiffman MA

Schneider RE, Shiffman M, Faigenblum J. The potential effect of water on gastrointestinal infections prevalent in developing countries. Am J Clin Nutr 1978 Nov;31(11):2089-99

The ecological factors, involved in gastrointestinal infections that affect the poor population in developing countries, are identified and described. Also highlighted is the evidence available for using water supplies as a means to decrease water supplies, poor sanitation facilities and improper practice of hygiene among poorer sections of a community favor a highly contaminated environment, reflected by the persistence of intestinal parasitism and chronic intestinal infection. Studies done at Guatemala showed that 96% of the rural subjects had one or more species of helminths and/or protozoa. About 10-18% of the stool cultures in apparently healthy rural children had Shigella and Salmonella spp. About 48-53% of well water were contaminated with coliforms, while 88% of the samples from domestic containers were contaminated. Contamination of food was also common. The heavy contamination of the external and home environments is closely related to intestinal infection, gastrointestinal alterations, and malabsorption. A significant proportion of the low-socioeconomic population of developing countries has an altered gastrointestinal ecology related to their residence in unsanitary and heavily contaminated environments. Many developing countries during the last decade have placed great emphasis on development of programs to improve environmental sanitation. Water supplies and their effect on water-related diseases and diarrhoeal disorders are discussed. Water-related diseases have been categorised as water-vectored, water-based, waterborne and water-washed diseases. The usefulness of safe water supplies in controlling each disease category and the importance of water quality versus water volume in the control process are summarized.

Schonberger LB see Kaplan JE

Schroeder SA, Caldwell JR, Vernon TM, White PC, Granger SI, Bennett JV. A waterborne outbreak of gastroenteritis in adults associated with Escherichia coli. Lancet 1968 Apr 6;1(7545):737-40

An outbreak of waterborne gastroenteritis in adults, associated with Escherichia coli, is described. An outbreak of gastroenteritis, traced to a contaminated water supply source, occurred at a conference center near Washington, D.C., USA. E. coli O111:B4 was identified both in the water supply of the center and in fecal specimens from 14 participants. No other enteric pathogen was found. The wells providing water for the center were improperly constructed, and their water had high coliform counts on several occasions, including high E. coli O111:B4 counts. It is possible that bacterial contamination was introduced into the water system through either of the 3 wells. Failure to demonstrate serological response to E. coli O111:B4 in a group of affected individuals in this outbreak is of questionable significance. The discovery of E. coli O111:B4 in both the water supply and in fecal flora

does not necessarily mean that this organism was responsible for the epidemic. People, who consumed water contaminated with this organism, may be expected to harbor it temporarily within their intestinal tracts. Too few samples were taken from the non-ill group for statistically significant differences to be detectable. This is thought to be the first outbreak of gastroenteritis in adults associated with enteropathogenic E. coli from the western hemisphere.

Schulenburg EL see Mahoney LE

Schultz MG see Lopez CE

Schultz MG see Shaw PK

Scott D see Hunter JM

Scott SS see Green DM

Scrimshaw NS see Beck MD

Scrimshaw NS see Bruch HA

Segure MT see Schlesinger L

Sehgal BS see Kumar P

Seidler RJ see Colwell RR

Sen D see Niyogi SG

Sen D see Saha MR

Sengupta PG see Deb BC

Sengupta PG see Niyogi SG

Sengupta PG see Saha MR

Shaffer R, Najai D, Kabuleeta P. Environmental health among the Masai of southern Kenya: the effect of water supply changes. Prog Water Technol 1979;11(1-2):45-8

This is a preliminary report on a pilot study of environmental health among the Masai of southern Kenya and of the effect of different sources of water supply changes. Water was very scarce in the region. Flies are abundant, and grazing mobility is the key to survival. In 1975, an agreement was reached under which the Amboseli Masai would remove their cattle from their dry season grazing areas inside the Amboseli National Park, and in exchange, they would be provided with a system which would pipe the abundant and clear water from Amboseli's springs out of the park to grazing areas around it. Thus the abundant clear water would be brought within a few kilometers of the majority of the local folk. It was assumed that it would result in changes in the prevalence among them of water-related diseases, if they used more water. Unfortunately, the water pipeline project progressed faster than did the funding. They all used very little water domestically and had very little sense of quantities. Most people could make use of 2 or 3 different sources

during a year because of migration. The quantity of water used was 5l/person.day. Water was used for cooking maize when milk ran short. A rain pond was also used by both man and beast. The piped water was exceptionally of good quality. About 49% of the people complained about headaches, 32% had cough, 7% had diarrhoea, and 13% of the under-5 children had Ascaris in their stools. There was no correlation between quality of water sources and morbidity findings. The poor sanitary environment has been discussed. The Masai may eventually provide one with a new perspective on the interrelationship between water, hygiene, food, and health.

Shahid NS, Samadi AR, Khan MU, Huq MI. Classical vs El Tor cholera: a prospective family study of a concurrent outbreak. J Diarrhoeal Dis Res 1984 Jun;2(2):73-8

In 1973, the classical biotype of Vibrio cholerae was replaced entirely in Bangladesh by the El Tor biotype. Since then, El Tor has been responsible for endemic and epidemic cholera in this country. Still, a few classical isolates were detected in 1979, 1980 and 1981. Then, unexpectedly, in an outbreak in 1982, the El Tor biotype was displaced by a new strain, which was designated "classical" by traditional markers, but had different biological properties. This phenomenon presented a unique opportunity to study simultaneously the epidemiology of both biotypes. It was shown that the hospitalization rate of family contacts was higher, if they acquired the new classical biotype. This suggested that the disease due to the newly emerged classical strain was more severe. Similar age attack rates for both the new classical and El Tor strains suggested equivalent immune protection to both strains in the population. Infection rates were higher in children than in adults, for both the new classical and El Tor. Infection rates with the new classical V. cholerae were higher in females than in males among family contacts. Although isolates of V. cholerae from water sources were similar in both biotypes, the handwashings of family contacts of cases infected by El Tor were positive more often than for contacts of classical infection. These observations do not explain the biologic advantage of the new classical strain, an advantage which enabled it to displace the entrenched El Tor biotype. However, the greater transmission of the new classical strain to close contacts and the strain's low presence in handwashings suggest that it is transmitted more efficiently, with a lower infective dose. Although the old classical strains also produced more severe disease, they did not transmit as well as El Tor and were displaced.

Shahidullah M see Khan MU

Sharma S see Parekh P

Shaw PK, Brodsky RE, Lyman DO, Wood BT, Hibler CP, Healy GR, MacLeod KIE, Stahl W, Schultz MG. A communitywide outbreak of giardiasis with evidence of transmission by a municipal water supply. Ann Intern Med 1977 Oct;87(4):426-32

An epidemiologic investigation, which established municipal water as the principal vehicle of transmission of giardiasis, is discussed. Some 350 residents of Rome, New York, USA had laboratory-confirmed cases of giardiasis between November 1974 and June 1975. A random-household survey showed an overall attack rate of giardiasis of 10.6%. Attack rates by age were uniform; the attack rate in females did not differ from that in males. A significant association was discovered between the actual incidence of giardiasis and using city water and also between having the illness and drinking one or more glasses

of water a day. Twenty-two (3.4%) of the 645 stool specimens contained Giardia lamblia cysts. The presence of human settlements in the Rome watershed area suggested that the water supply could have been contaminated by untreated human waste. The infectivity of municipal water was confirmed by producing giardiasis in specific pathogen-free dogs, who were fed sediment samples of raw water obtained from an inlet of a city reservoir. The study indicated that the municipal water was the vehicle of transmission. Further research is needed to devise more appropriate methods that will help protect communities from outbreaks of waterborne protozoan diarrhoeal diseases.

Shearer EJ see Green DM

Shields DS, Nations-Shields M, Hook EW, Araujo JG, de Souza MA, Guerrant RL. Electrolyte/glucose concentration and bacterial contamination in home-prepared oral rehydration solution: a field experience in northeastern Brazil. J Pediatr 1981 May;98(5):839-41

Electrolyte concentrations and bacterial contamination in oral rehydration solutions (ORS), prepared by traditional healers, village health volunteers and parents of children in rural, north-eastern Brazil, were investigated. No participants prepared a hypernatremic solution. Traditional healers prepared ORS with the smallest standard deviation and the narrowest range in sodium concentration (mean 75±11, range 61-94 mEq/l), while the other groups also prepared ORS with safe sodium concentrations (village health practitioners: mean 97±15, range 80-125 mEq/l, and parents: mean 78±22, range 25-100 mEq/l). River water consistently was more contaminated with fecal coliform bacteria than was well water, by approximately 4 logs. However, ORS prepared from either source, when incubated at 37°C, supported growth to $>10^7$ fecal coliform/dl within 16 h. Participants, lacking running water in their homes, prepared more contaminated ORS samples ($p<0.05$). It is suggested that consideration should be given to modifying the WHO ORS formula to inhibit bacterial growth when ORS is used at the village level.

Shiffman M see Schneider RE

Shiffman MA, Schneider R, Faigenblum JM, Helms R, Turner A. Field studies on water, sanitation and health education in relation to health status in Central America. Prog Water Technol 1979;11(1-2):143-50

A policy research project on the relationship of water-related diseases and health benefits was undertaken in rural Guatemala. A conceptual scheme for pathways and linkages between water supply improvement, health behavior, and economic changes has been presented. The results present, with reference to individual variables and their relationships, indicate that: (a) more facts need to be learned on the water supply/diarrhoeal disease/malabsorption linkage and (b) losses from malabsorptive food wastage in a population do not lead to the loss of large amounts of food. The field study, over a limited 4-year period, did not demonstrate that a safe and available water supply leads to a decrease in diarrhoeal morbidity. This study has helped in delineating the operational details of the difficulties in isolating the numerous variables involved and has revealed new concepts, strategies, experimental designs and methods, which may be used in future studies.

Shiffman MA, Schneider R, Turner AG, et al. Seasonality in water related to intestinal disease in Guatemala. Int J Biometeorol 1976 Oct;20(3):223-9

Shiffman MA see Rajagopalan S

Shigehara S see Harada K

Shillam P see Hopkins RS

Shrivastav JB. Prevention and control of cholera. In: Barua D, Burrows W, eds. Cholera. Philadelphia: Saunders, 1974:405-26

Shrivastav JB see Pandit CG

Shukla NK see Trivedi BK

Shum H, Sum CY, Chan-Teo CH. Water-borne dysentery due to Shigella sonnei in Hong Kong. Southeast Asian J Trop Med Public Health 1971 Jun;2:180-5

Shura-Bura BL, Slavin NI, Verkholomov EE, et al. [The occurrence of dysentery of water origin, caused by Shigella boydii-10]. Voennomed Zh 1967 Nov;11:54-7

Shuval HI, Tilden RL, Perry BH, Grosse RN. Effect of investments in water supply and sanitation on health status: a threshold-saturation theory. Bull WHO 1981;59(2):243-8

Sikorska J see Gawronowa H

Sinclair S see Dykes AC

Sinclair SP see Black RE

Sinclair SP see Lopez CE

Singh N see Ryder RW

Singh R see Kumar P

Singh SD see Parekh P

Singla PN see Bhatia BD

Sircar BK see Deb BC

Sircar BK see Niyogi SG

Sircar BK see Saha MR

Siroko IA see Verkholomov EE

Skaliy P see Eden KV

Skaliy P see Merson MH

Skoda JD, Mendis JB, Chia M. The impact of sanitation in Bangladesh. In: Pacey A, ed. Sanitation in developing countries. Chichester: Wiley, 1978:33-4

Skoda JD, Mendis JB, Chia M. A survey in rural Bangladesh on diarrhoeal

morbidity, water usage and related factors; first report. Dhaka: United Nations Children's Fund, 1977. 47 p.

Slavnin NI see Shura-Bura BL

Small EB see Huq A

Smiley LE see Georgi ME

Smilowitz M see Djerassi L

Smit P see Isaacson M

Sokolovski B, Arsic B, Dordevic D, et al. [Our experiences with water-induced epidemics of bacillary dysentery]. Vojnosanit Pregl 1977 Mar-Apr;34(2):83-8

Solodovnikov IuP, Turchinskaia MV, Ioirish AN, et al. [Study of food and other routes of transmission of dysentery on river ships]. Zh Mikrobiol Epidemiol Immunobiol 1974 Mar;51:90-3

Solodovnikov IuP see Sultanov GV

Sommer A, Woodward WE. The influence of protected water supplies on the spread of classical/Inaba and El Tor/Ogawa cholera in rural East Bengal. Lancet 1972 Nov 11;2(7785):985-7

This report describes the influence of protected water supplies on the spread of classical Inaba and El Tor Ogawa cholera in rural East Bengal in India. The study, carried out at a rural village during 1968-1970, included 102 children as subjects during the first cholera outbreak and 194 in the second outbreak. In the first year of the study, all isolations of cholera vibrios were of the classical biotype and Inaba serotype, and all infections were confirmed by rectal swab. In the 2 study zones, only 20 of the 102 subjects were infected. In the second year of the study, the epidemic was caused by Vibrio cholerae biotype El Tor serotype Ogawa. Of the 194 individuals, 30 had bacteriologically confirmed infections, while 23 others showed serological conversions. The combined zonal infection rates of 29.6 and 26.4 per 100 were not significantly different. The results of the first study indicated that contaminated non-tubewell drinking water was the major route of transmission. Unlike the first year's epidemic, in the second year, drinking water was not the major route of transmission of Vibrio. This study indicated that the relatively simple technique of providing safe supplies of drinking water found so useful in controlling the spread of classical strains of the disease, might prove ineffective against the El Tor biotype.

Sommer A see Mosley WH

Songonuga OO. Sanitary quality and health implications of well waters in Ile-Ife, Nigeria. Niger Med J 1979 Apr;9(4):493-7

Sorvina LE. Water-borne epidemic of dysentery. Vrach Delo 1946;26(10):743-6

Southal H see Feachem RG

Spindler LA see Otto GF

Spira WM, Aziz KMS, Verwey WF. Environmental epidemiology. II. Ecological studies on Vibrio sp. in canal and tank environments. In: Proceedings of the 10th Meeting of the Scientific Review and Technical Advisory Committee of the Cholera Research Laboratory, 1976:160-84

To determine the seasonal variation in Vibrio sp. population and to assess the role of various micro-environments (water, sediment, plants, phyto- and zoo-plankton) in the maintenance of these organisms, water samples, collected from selected tanks and canal points of a Bangladeshi village, were examined during 1976. The samples were analyzed for Vibrio sp. and for some physico-chemical properties. There was very strong tendency for a dissolved oxygen tension (DOT) gradient to form in the stationary tank water as the day progressed. The well-mixed canal water column failed to develop a significant DOT gradient. The seasonal influence on DOT was apparent in this system. The concentration was somewhat lower in January than in November and lower in the canal than in the tank. The seasonal change in total heterotrophic aerobe concentration showed a similar decrease with colder weather, particularly at the center of water sources. The coliform count showed no layering effect, but demonstrated the effect of season. E. coli concentration varied widely between samples and showed some effect of edge vs center, the edge having a higher concentration. A statistically significant decrease in the frequency of isolation of NAG vibrios occurred during December-January. However, the concentration of NAG vibrios in positive water sample showed no significant seasonal trend. Vibrio sp. were not isolated from sediment, phyto- or zoo-plankton specimens taken at any time since November. A significant association was, however, found between Group V NAG vibrios and water hyacinths collected at the sampling points. This association may be a maintenance factor for these organisms and may act for other vibrios as well. Such association with a surface plant may play a role in the dissemination of the cholera Vibrio during outbreaks, and it may provide a means by which the organism can maintain itself for longer periods than in the water column.

Spira WM, Khan MU, Saeed YA, Sattar A. Environmental epidemiology. I. Environmental and prospective epidemiological investigation of cholera outbreaks. In: Proceedings of the 11th Meeting of the Scientific Review and Technical Advisory Committee of the Cholera Research Laboratory, 1976:148-59

The outbreaks of cholera in rural Bangladesh were studied by using techniques of environmental microbiology and prospective epidemiological surveillance. Both methodologies were used to pinpoint potentially critical points in the transmission of cholera, to ascertain the significance of risk factors, like contaminated water, foods, and fomites and to quantitate the cholera vibrios present in each vehicle involved. This is a preliminary analysis based on partially tabulated data on 13 sites, covering 695 individuals in 118 families. Forty-seven (6.7%) persons were infected with Vibrio cholerae biotype El Tor. The serotype in all cases was Inaba. There was a pronounced shift in the peak incidence when the infection rate was distributed as a function of exposure to various sources of infection, particularly cooking jars. This shift may be indicative of a significant role played by these sources in the transmission of cholera at the study sites. There was virtually no possibility that foods and fomites were significant vehicles in the transmission of cholera. The role of water as a vehicle in these outbreaks was incontrovertible, and bathing and cooking water appeared to be leading vehicles of transmission.

Spira WM, Khan MU, Saeed YA, Sattar MA. Microbiological surveillance of

intra-neighbourhood El Tor cholera transmission in rural Bangladesh. Bull WHO 1980;58(5):731-40

Results of a microbiological surveillance of intra-neighborhood transmission of El Tor cholera in rural Bangladesh are given. The study was conducted during the 1976 post-monsoon cholera season (October-January) in the rural study area of the Cholera Research Laboratory (now International Centre for Diarrhoeal Disease Research, Bangladesh) Matlab, Bangladesh. Vibrio cholerae were isolated from rectal swabs of the cholera-like diarrhoeal patients, attending the Cholera Research Laboratory Hospital. Surveillance was maintained for 12 days. All persons in each household were interviewed regarding diarrhoeal diseases. Water samples from jars, tubewells, and surface water points were collected for bacteriological studies. Left-over foods were sampled for V. cholerae. From 19 neighborhoods, 792 people of the 149 families were placed under the study. The results showed that the transmission of cholera was via contaminated surface water, particularly water taken into households for cooking or drinking. Fifteen neighborhoods were classified as 'cholera positive' and the remainder 4 as 'cholera negative'. Sixty-five infections with V. cholerae biotype El Tor serotype Inaba were detected. The median duration of infection was 3 days. About 11% of the persons had infection, and 57% of the surface water sources were contaminated, while 39% of the infections were early among tubewell users. The contamination rate of tubewell water stored in the house was lower than that of surface water ($p=0.004$). Infections resulted from a daily dose not exceeding 10^5 organisms and the frequency of exposure appeared to be a major determinant of the infection rate. Persons of any age with an 'early' infection were likely to have diarrhoea. Vehicles other than water played no role in transmitting V. cholerae.

Spira WM, Huq A, Ahmed QS, Saeed YA. Uptake of Vibrio cholerae biotype eltor from contaminated water by water hyacinth (Eichornia crassipes). Appl Environ Microbiol 1981 Sep;42(3):550-3

Natural surface waters appear to be closely associated with the epidemiology of endemic cholera, and special attention is being directed to the interaction between Vibrio cholerae and indigenous aquatic life forms, since some V. cholerae 01 - the serotype traditionally associated with epidemic cholera biotypes - are being found in estuarine and other brackish waters. These environmental V. cholerae 01 isolates may differ in important ways from the V. cholerae traditionally responsible for human epidemics. While studying the transmission of epidemic cholera in rural Bangladesh, the authors found, in 1966-1967, the first evidence that the virulent V. cholerae biotype El Tor can associate with the water hyacinth (Eichornia crassipes), a ubiquitous surface plant in the country's waterways. In early and later (1980) testing of plants and associated water (by streaking on TTGA plates, followed by incubation and then agglutination testing of suspicious colonies), V. cholerae El Tor biotypes were isolated. All produced cholera toxin. Moreover, concentrations of vibrios were significantly higher on positive plant samples than on positive water samples. In the current work, this association was examined under more controlled conditions. Into a pair of 100-liter, stone tanks open to the air, proven non-contaminated water and water hyacinths were inserted. The water in one tank then was inoculated with an El Tor strain isolated from a cholera case. Within 4 h, there was a greater concentration of V. cholerae on hyacinth roots than in the surrounding water; and, over the next 5 days, the Vibrio concentration on plants was manifold higher than in water samples. By day 5, the difference was 300-fold. Water hyacinth is not routinely eaten by humans

in Bangladesh, but is used as animal fodder. However, the plants are ubiquitous and free floating, and it is possible that they, and perhaps other surface plants, may provide a vehicle for transmitting El Tor vibrios through waterways in cholera endemic regions in a country, such as Bangladesh. It is possible too that these plants may be able to support low numbers of El Tor vibrios, for extended times, and may serve as an environmental reservoir for cholera during inter-epidemic periods. Either way, associations of V. cholerae biotype El Tor with surface water plants could be an important determinant of epidemiology of cholera in endemic regions.

Srivastava RN, Verma BL, Saran M. The study on the health benefits of water supply in a rural area of Uttar Pradesh; baseline survey report, 1981. Jhansi: Department of Social and Preventive Medicine, M L B Medical College, 1982. 49+135 p.

The study was undertaken to measure quantitatively the health benefits accruing from the provision of safe piped water in a rural area in Uttar Pradesh, India. The study was carried out following the conventional methods of a controlled-field trial in which a community with traditional water supply served as controls and constituted the baseline for the measurement of health benefits. The nutritional status of population, condition of drinking water sources, water use patterns in terms of quantities and behavioral aspects, and personal hygiene, are described for both the study and control villages prior to intervention. Baseline status of the 2 study villages was also compared with that of the controls. The weights and heights of children, aged under 10, were recorded to assess their overall nutritional status. Stools of a selected number of stool samples collected from those found ill showed the presence of enteric pathogens, such as Salmonella (between 4 and 25%), Shigella (between 36.8 and 57.1%), and intestinal parasites (57%, mostly Giardia lamblia). Analysis of sociodemographic characteristics of the population of 3 villages revealed that they were homogeneous in terms of age, sex-ratio and religion, but differed significantly in other characteristics. The 3 villages showed similar features for aspects, such as the prevalence of diseases, like diarrhoea, dysentery, gastroenteritis, and infectious hepatitis. They, however, showed highly significant differences among them for enteric fever, trachoma, conjunctivitis, and scabies. Further analysis of the prevalence of these diseases, according to various sociodemographic characteristics of the population, did not reveal any distinctive pattern. In each village, all the available water sources were not used for drinking. A cost-benefit study of the provision of piped water supply and the resultant socioeconomic and environmental benefits thus reaped has been initiated. Results of the study suggest that improved water supply brings about an enhancement of overall sanitary status of the community and thus leads to a lessened possibility of transmission of infectious diseases.

Stahl W see Shaw PK

Steckler A see Merson MH

Sterky G see Freij L

Stevenson WJ see Koomen J, Jr.

Stewart WH, McCabe LJ, Jr., Hemphill EC, DeCapito T. Diarrheal disease control studies: the relationship of certain environmental factors to the prevalence of Shigella infection. Am J Trop Med Hyg 1955 Jul;4(4):718-24

The relationship of certain environmental factors to the prevalence of Shigella infection is reported. The areas under observation in Georgia, USA were divided by city blocks, parts of blocks, or premises into groups with similar sanitational features. The infection rates for each of the groups were calculated. Patterns of disease spread between families occur differently than it does within a family. The infection rates showed a rise from the group of blocks with good sanitation to the group with poor sanitation. There was an appreciable infection rate present for households represented in the groups with the poor and fair sanitation ratings. There were too many environmental differences between the groups to establish an association between the Shigella infection rate and any one environmental characteristic. The availability of water for washing purposes on shigellosis rates was focused. No real difference was observed in the rates found at premises with well water and those premises with city water, but rates were significantly higher for premises with water sources "far from the house", regardless of whether or not it was well or city water. The results assumed that the amount of personal washing varied directly with the availability of water and that with individuals who washed frequently, fecal contamination of the hands and body was minimized and transmission of enteric organisms lessened. The bacteriological purity of water, as measured by type, city, or well, did not influence the infection rates. This finding was supported by other studies done in 1952. Easy accessibility of water and also the purity of water should be considered in the control of diarrhoeal diseases.

Stoll B see Khan MU

Stone DE see Gracey M

Stone RL see Nakamura M

Stoopler M see Eden KV

Strudwick RH. The Zaina Environmental Sanitation Project. East Afr Med J 1962 Jun;39(6):311-31

This paper describes the Zaina Environmental Sanitation Project in Africa in which a single plant supplies all the water to a whole rural community, both for domestic and agricultural purposes and for a complete environmental health program. WHO and UNICEF are the two international bodies who financially assisted the scheme. A weir was built on a tributary of the Zaina river, and a pipeline was laid to Aberdare forest. A 20,000-gallon storage tank was constructed on the forest edge. Each of 558 farms was supplied with a 100-gallon storage tank installed at each village, and markers were supplied from 10,000- or 5,000-gallon storage tanks. The location of the Zaina scheme was at 6,500 feet above sea level in the north-west corner of Nyeri district. It was decided that the evaluation of the scheme to be undertaken in the form of surveys to be conducted once before and again 2 years after the completion of the water supply and environmental sanitation work. A housing and sanitation survey, a personal health survey, a pathological survey, a nutrition survey, and a socioeconomic survey were carried out. About 75% of the illnesses were of respiratory nature, and 23% of the illnesses were of gastrointestinal origin. In Zaina area, 78 positive stools for Taenia saginata were found from 4,117 examinations. Results of other surveys are also discussed.

Subrahmanyam DV see de Araoz J

Subrahmanyam DV see Pineo CS

Subramanian M see Velimirovic B

Sugi M see Lewis JN

Sulaiman Z see Matulessy PF

Sultanov GV, Solodovnikov IuP. [Role of the aqueous factor in the epidemiology of dysentery]. Zh Mikrobiol Epidemiol Immunobiol 1977 Jun;(6):99-101

Sum CY see Shum H

Sundaresan TK, Grab B, Uemura K, Cvjetanovic B. Comparative epidemiological analysis of sanitation and immunization in the control of typhoid and cholera. Am J Public Health 1974 Sep;64(9):910-2

Sunoto. Diarrhoeal problems in Southeast Asia. Southeast Asian J Trop Med Public Health 1982 Sep;13(3):306-18

In south-east Asia, diarrhoeal diseases are associated with high morbidity and mortality, particularly among under-5 children. The magnitude of the diseases in some south-east Asian nations (Indonesia, the Philippines, Thailand, Malaysia, Singapore, and Bangladesh) was evaluated by analyzing data from these countries. In Indonesia, morbidity rates were 430 per 1,000 population per year, of which 70% were under-5 children. It was estimated that Indonesia, in 1974, had about 50 million diarrhoea cases, and 60 million episodes in 1981 with 300,000-500,000 deaths. In the Philippines, diarrhoea ranked as the second morbidity cause for all age groups in 1974 (600 per 100,000), and as the second infant mortality cause (5 per 1,000). In Thailand, 93,786 diarrhoea cases were hospitalized in 1980. Forty percent of these were under-5 children. Among these patients, the morbidity rates associated with acute diarrhoea, cholera, and dysentery were, respectively, 458.03, 9.09 and 56.44 per 100,000 people. In Malaysia, there were outbreaks of El Tor cholera and poliomyelitis in 1971 and 1972, and in 1976, diarrhoea was the number 5 cause of total hospital admissions and the number 9 cause of deaths in Malaysia. In Singapore, comparing 1975 to 1964, infant, perinatal and neonatal mortality rates dropped, respectively, from 31.2, 26.2 and 19.1 per 1,000 births to 13.9, 16.6 and 10.2 per 1,000 births. Also during this period, there was a marked reduction in deaths due to pneumonia and diarrhoea, respectively, from 3% and 23% to 14% and 4%. In Bangladesh, morbidity rates were highest among children and declined with age. In urban areas, the attack rate for under-5 children was 11-fold higher than for adults, but the difference was only 3-fold in rural areas. The overall attack rate implies a prevalence of 2.0% for the entire population, with the highest prevalence 4.5% for the under-5 groups. In a rural population of 100,000, the diarrhoeal attack rate was 85,000 (85.4%) episodes annually, of which 37% were cholera in the under-5 group. Mortality was highest in infants, followed by toddlers and old people. The commonest pathogens found in these countries were rotavirus, followed by enterotoxigenic Escherichia coli, Vibrio cholerae, Salmonella sp., Shigella sp., and Campylobacter sp. In addition to socioeconomic, sociocultural and poor environmental sanitation, malnutrition and a decline in breast feeding also played vital roles in causing high diarrhoeal disease morbidity.

Suskind R see Cvjetanovic B

Sutejo see Gracey M

Suthienkul O see Vathanophas K

Sutoto, Mochtar MA, Karyadi, Wasisto. B. Morbidity and mortality study on diarrhoeal diseases in North Jakarta — an urban area. Southeast Asian J Trop Med Public Health 1982 Sep;13(3):405–11

Diarrhoeal morbidity (40%) and mortality in 1973 in a semi-urban community in Ujung Pandang, Indonesia, an El Tor endemic area, were compared with the prevalence of diarrhoeal disease in 1980-4 in North Jakarta, reputedly the site of the country's highest incidence of diarrhoeal disease. The two areas are on different Indonesian islands, and the survey populations differ with respect to socioculture, education, income, environmental sanitation, water supply, excreta disposal, housing, and population density. The study was a prospective, longitudinal, community-based one; and this paper presents a preliminary report of the first 6 months. Its aim was to qantify the problems and to have comparison data with the results of other diarrhoeal surveys in Indonesia and other developing countries. The survey population (5,115) lives in a relatively good area, neither rich nor poor. In the past decade, their city has improved significantly due to an active government program. The incidence of diarrhoea in the survey area was 149:1,000 a year, mortality was 0.2:1,000, and 1.8% of the diarrhoeal cases needed hospitalization for dehydration. The case fatality rate of diarrhoea was 0.3%, and diarrhoea alone constituted 11.1% of all deaths. The incidence of diarrhoeal disease was far lower than it had been in Ujung Pandang in 1973 (15% vs 40% of the population respectively had diarrhoea once a year). In Ujung Pandang, 70% and, in Jakarta, 47% of the diarrhoeal episodes occurred in under-5 children. Peak incidence was for 6–12-month-olds, and the incidence increased in the rainy season. Of the episodes, 30% were due to enteropathogenic bacteria and 15.4% due to rotavirus, while for 50%, no origin could be determined. Other statistics are given. It is thought that significantly lower incidence rates of diarrhoeal diseases in Jakarta are due to improved socioeconomic and environmental realities and to oral rehydration therapy, which has been used to control mortality.

Sutoto see Gracey M

Szita J see Lanyi B

Szmuness W see Gawronowa H

Taliafero MO see Mackie TT

Tameim O, Jobin W. Impact of safe water supply and sanitation on diarrhoeal disease prevention. In: Khan A, Rowland MGM, Aziz KMS, eds. Proceedings of the First African Conference on Diarrhoeal Diseases, Arusha, 13–17 November 1984. Harare: International Steering Committee, 1986

Preliminary findings of an ongoing project on the impact of providing safe water supply and modern sanitation facilities on the incidence of diarrhoeal diseases at Gezira in Sudan are given. Some 800 villages in the Gezira region irrigation scheme of central Sudan are being covered through this project. The

project's objectives are to: (1) measure the change in the prevalence of diarrhoeal disease after the introduction of safe water supply; (2) evaluate the cost of installing piped water supply and latrines; (3) determine if the addition of latrines to safe water supply significantly enhances the prevention of diarrhoeal diseases; and (4) suggest strategies for prevention of diarrhoeal diseases to be adopted in all unregistered villages of the Blue Nile Health Project. The project comes as part of a comprehensive strategy to deal with the outbreaks of disease within the purview of the Blue Nile Health Project. The project strategy, methodology and the research plan are outlined. When completed, the exact role, played by safe water supply and modern excreta disposal facilities in preventing the transmission of disease, will be elucidated. Information on cost of such improvements, consumption of water per capita and sanitary behavior of the people of the study villages will also be available.

Tayback M see Pournadeali E

Taylor A, Jr., Craun GF, Faich GA, McCabe LJ, Gangarosa EJ. Outbreaks of waterborne disease in the United States, 1961-1970. J Infect Dis 1972 Mar;125 (3):329-31

This report describes the outbreaks of waterborne diseases in the USA, occurring from 1961 to 1970. During this period, 130 outbreaks of diseases or poisoning, attributed to contaminated drinking water, involved 46,374 individuals and 20 deaths. Information on the outbreaks of waterborne disease were obtained from state health departments, newspapers, sanitary engineers and by reviewing relevant medical and engineering literature. The most commonly identified pathogen was Salmonella typhi responsible for 14 of the 23 outbreaks. Nineteen waterborne outbreaks were attributed to Shigella. Shigella sonnei was the most common serotype. There were 30 outbreaks of hepatitis and 39 outbreaks of gastroenteritis of undetermined etiology. In Houston, Texas, the viral concentration in a stream receiving treated sewage effluent varied from 130 to 820 pfu per gallon. Echovirus 7 and poliovirus 1, 2, and 3 were commonly isolated. Five outbreaks were due to organic phosphate poisoning. Most waterborne outbreaks (73%) resulted from contamination of private individual water systems. About 86% of the cases resulted from contamination of public systems. Untreated or inadequately treated water from private and public systems resulted in about 43,000 illnesses (92% of the illnesses) and 13 deaths. A survey of 969 public water supply systems showed that 12% exceeded the allowable coliform density limits of the drinking water standards of the Public Health Service. The maintenance of safe water supplies was emphasized to protect against outbreaks of waterborne diseases.

Taylor I. Toilet paper and spread of infection [letter]. Br Med J 1978 Oct 7;2(6143):1024

Taylor JW, Gary GW, Jr., Greenberg HB. Norwalk-related viral gastroenteritis due to contaminated drinking water. Am J Epidemiol 1981 Oct;114(4):584-92

An outbreak of Norwalk-related viral gastroenteritis, initiated by contaminated drinking water in an elementary school in Washington, is described. Some 170 children coming to the school had gastrointestinal illness on 4 May 1978. An investigation was begun by the epidemiology section of the Washington State Health Service Division. Seroconversion by radioimmunoassay to the Norwalk antigen was noted in 2 of the 3 ill persons, but no viral particles were

identified in their stools. Illness developed in 72% of the students and teachers at the school and 32% of the household contacts of these ill persons. Epidemiologic investigation implicated water as the mode of transmission. The school water source was a well 51.4 meters deep. Average consumption of one or more glasses of water per day was strongly associated with the illness. Careful examination revealed that drinking water was contaminated by backsiphonage through a cross-connection between the school's well and an adjoining septic tank. This contamination occurred about 24 to 36 h before the outbreak developed. Data of this study were sufficient to suggest a route of transmission of the secondary cases. There was no attempt to measure the incidence of gastroenteritis in the community beyond the study population described.

Taylor PR see Black RE

Taylor RH see Geldreich EE

Teng PH. The role of foods in the transmission of cholera. In: Proceedings of the Cholera Research Symposium, Honolulu, Hawaii, 24-29 January 1965. Washington, D.C.: U S Department of Health, Education, and Welfare, 1965:328-32.

Cholera is in nature a disease of the intestinal tract of man only, the mouth being the portal; the epidemiology of cholera is basically, therefore, the various possible combinations of the 4 F's — feces, fingers, fluids, and foods. There is a possibility that, at least in some instances, food assists in the onset of disease by a change of the intestinal environment. This is observed more conspicuously during the increase in gastroenteritis and diarrhoeal diseases, following festivals when more than the usual quantity and variety of foods are consumed. It is shown that generally food after cooking offers a more favorable medium for the survival of Vibrio than in the raw state, the main exceptions being leafy vegetables, such as cabbage and spinach. This bears significance in an urban community, where comparatively prolonged storage of prepared food is a common practice. In 1964, in Kowloon, Hong Kong, the spread of diarrhoeal illness was traced to consumption of contaminated water from a restaurant's flushing well. Studies of possible connection between consumed water and foods, which were contaminated and the spread of cholera Vibrio, indicated that consumed food can act as a carrier of cholera Vibrio and can transmit the disease. It is probable that the organism spreads widely following its introduction into the home by either a frank or an inapparent case via food or utensils. The author notes that on occasions fish can be the vehicle of transmission, and this had been referred to through an observation made in Hong Kong. It is concluded that cholera is mostly spread by water.

Tenney JH see Merson MH

Thacker SB, Music SI, Pollard RA, Berggren G, Boulos C, Nagy T, Brutus M, Pamphile M, Ferdinand RO, Joseph VR. Acute water shortage and health problems in Haiti. Lancet 1980 Mar 1;1(8166):471-3

This paper focuses on problems arising out of water shortage and its health implications in Haiti. A total population of 40,000, living in 2 urban residential areas, were included for the study. A 10%-sample (400 households in each area) was randomly selected. The mean family size was 5.2 and 5.4 for

the 2 selected study areas. The head of the household was employed in 37.2% of the families in area A and 39.3% in area B. The primary sources of water in the 2 zones differed. Residents of study area B were without municipal standpipes, but they were using rain and purchased water. In area A, municipal standpipes and water taps in homes were the common sources of water. In both areas, 4 variables appeared to be related to morbidity: unemployment of the head of household, low-socioeconomic status of family, large family size, and availability of water in quantities less than 18.9 l/person.day. In families of low-socioeconomic status, which used less than one can of water per person per day, 39.6% of the children had one or more illnesses; in those which used more than one can of water per person per day, 19.5% of the children had been ill. This difference was not statistically significant. In large families (>4 persons), illness rates among children, aged under 6, were higher in families which used less than one can of water per person per day (51.6%) than in those which used more than one can (33.0%). This relationship was statistically significant ($p<0.02$). Diarrhoeal rates were higher for children from homes using less than one can of water per person per day (28.7% vs 25.5%), as were rates of scabies (8.4% vs 5.0%), conjunctivitis (8.0% vs 7.2%), febrile illness (32.5% vs 27.4%), and malnutrition (8.5% vs 4.7%). These patterns, although not statistically significant, were seen in both areas. A major determinant of illness in this study was the non-availability of adequate quantities of safe water supplies. Educational status correlated inversely with water-related morbidity and mortality. The planning departments of developing countries must make provisions for adequate supplies of safe water to households to meet health needs without wasting scarce resources.

Thane-Toe see Khin-Maung U

Thompson JM see Green DM

Thompson WV see Gehlbach SH

Tiehan W, Vogt RL. Waterborne Campylobacter gastroenteritis - Vermont. MMWR 1978;27:207

Tieranu E see Birzu I

Tilden RL see Shuval HI

Tin-Aye see Khin-Maung-U

Tira T see McIntyre RC

Tisdale ES. The 1930-1931 drought and its effect upon public water supply. Am J Public Health 1931;21:1203-15

Torun B. Environmental and educational interventions against diarrhea in Guatemala. In: Chen LC, Scrimshaw NS, eds. Diarrhea and malnutrition; interactions, mechanisms, and interventions. New York: Plenum, 1983:235-66

This paper presents the experiences of 2 studies done in Guatemala. One examined the effect of improved water supply on intestinal absorption, and the other examined the relationship between sanitary education, environmental contamination and the incidence of diarrhoea. The studies demonstrated that changes in behavior, associated with improvements in water supply or

environmental sanitation, will have a favorable impact on the incidence of diarrhoeal disease and on the absorption of nutrients in populations of developing countries. This, in turn, will aid and enhance other measures tending to ameliorate the population's nutritional status. The implementation of sanitary or educational measures as isolated interventions will usually have a small impact or none at all. Conversely, the association of these interventions may have a synergistic effect.

Tripathi AM see Agarwal DK

Trivedi BK, Gandhi HS, Shukla NK. Bacteriological water quality and incidence of waterborne diseases in a rural population. Indian J Med Sci 1971 Nov;25:795-801

Tsukidate S. Pollution of drinking water and parasitological infection of Japanese in tropical countries. Jpn J Trop Med Hyg 1985 Mar;13(1):42-3

The diseases from which the Japanese, living in tropical countries, suffer are infectious hepatitis, especially type A, amebic as well as bacillary dysentery, typhoid fever, various kinds of intestinal protozoa and helminth infections. These diseases are thought to be orally transmitted, and among sources of infection, drinking water is considered to be most important. To know the influence of the degree of pollution of the drinking water upon the orally infected diseases, worldwide surveys studied the relationship between the pollution of drinking water and the infection rate with intestinal helminths and protozoa of Japanese people using the drinking water. Water samples were checked for parasite eggs and protozoa in the stool samples of Japanese, who used the water samples in the tropical countries. Eggs of Ascaris lumbricoides, Trichuris trichiura, Taenia saginata, Giardia lamblia, and Entamoeba coli were found among Japanese. The infection rate of intestinal protozoa and helminths was highest among Japanese living in south-east Asia, especially in Indonesia. The relationship between the infection rate of intestinal helminths and the pollution of drinking water was then studied. Significant relationship ($p<1.5\%$, 1980; $p<2.5\%$, 1983) was observed between the infection rate of intestinal parasites of Japanese inhabitants and the rate of water containing 10^2 or more per ml of coliform bacilli. However, no relationship between the infection rate of Enterobius vermicularis among the Japanese children, living in tropical countries, and the degree of pollution of the drinking water, was found. (Modified author's abstract)

Turchinskaia MV see Solodovnikov IuP

Turner A see Shiffman MA

Turner AG see Shiffman MA

Uemura K see Sundaresan TK

Umra M see Aziz KMA

U S Agency for International Development. Interim report of the Task Force on Cholera. Washington, D.C., 1971. 149 p.

Usenko EG. [D.K. Zabolotnyi on the sanitary and hygienic aspects of cholera]. Zh Mikrobiol Epidemiol Immunobiol 1978 Oct;(10):127-8

van Damme JMG. The essential role of drinking water and sanitation in primary health care. Trop Geogr Med 1985 Sep;37(3):S21-32

The important role of safe drinking water supplies and the provision of sanitation facilities in the prevention of disease and in the primary health care programs are highlighted. The world situation regarding the availability of drinking water and sanitation facilities is outlined. More than 1,500 million people lack proper facilities; the implications in terms of health and cost are stupendous. Though the situation is grim, the proclamation of the International Drinking Water Supply and Sanitation Decade (1981-1990) has created a worldwide awareness calling for the necessary changes. The paper discusses water and sanitation-related diseases, laying emphasis on the established experience that water and sanitation programs can only have a health impact, if they are jointly developed, and when integrated with health education. Operational implications of such programs as an element of primary health care have been reviewed. A need for community participation at all stages has been stressed. The paper also focuses on the use of women in their key role as acceptors, users, managers, and educators in matters of water and sanitation and in the upkeep of a healthy home environment.

van Zijl WJ. Studies on diarrhoeal diseases in seven countries by the WHO Diarrhoeal Diseases Advisory Team. Bull WHO 1966;35(2):249-61

Major findings from studies on diarrhoeal diseases done in 7 countries and the association of the ready availability of water and other related factors, like modern sanitation with their incidence, have been demonstrated. The study was carried out by the World Health Organization's Diarrhoeal Disease Advisory Team in Ceylon, Bangladesh, Iran, Mauritius, Sudan, the United Arab Republic, and Venezuela. The child population was examined in communities of various countries who differed in such respects as religion, race, socioeconomic standards, sanitation, personal habits and in many other ways. Sanitation systems were inadequate and remained below the level at which the incidence of diarrhoea cannot be controlled in many countries. Sudan had only basic sanitation. In Ceylon, the water-supplied regions had better sanitation. In the water-supplied areas, the reported rates for diarrhoea were always lower than those without a piped-water supply. Similar reductions in the rates of detection of Shigella had been observed in all countries. Ceylon, Bangladesh, and Venezuela showed some similarity in the rates of infestation with helminths. Ceylon was free of protozoa. In Iran, 70% of the children were free of helminths. Iran had the highest infestation rate of protozoa, while the rates in Bangladesh and Venezuela were similar. Shigella sp. were the most common enteric pathogen. Shigella from Iran contained larger number of resistant strains than those reported from Venezuela. In Ceylon, the action of sulfa drugs and antibiotics was found to be limited within hospitalized patients only. Diarrhoeas were more difficult to combat than other diseases among pre-school children aged under 6. In Ceylon, 10% of the hospital beds were occupied by diarrhoeal patients. Errors introduced during the survey are highlighted. Nutritional status of diarrhoeal patients in Venezuela was also studied. Studies on local statistics, health education surveys and surveys on pediatric aspects were also carried out.

van Zijl WJ see Wolff HL

Varavithya W see Vathanophas K

Vargas-Mendez O see Moore HA

Vasquez MA see Kourany M

Vathanophas K, Indrasuksri T, Bunyarathapan P, Suthienkul O, Varavithya W. The study of socioeconomic and environmental factors related to diarrhoeal disease in children under 5 years in congested areas of Bangkok metropolis. In: Programme, papers and abstracts of Third Asian Conference on Diarrhoeal Diseases, Bangkok, 10-14 June 1985:280

The study was carried out during December 1984-February 1985 in 21 congested areas in Bangkok, Thailand among families with children, at least one of whom was aged under 5. The objectives were to study the knowledge, perceptions and beliefs on symptoms, etiology, susceptibility and severity of diarrhoea and to analyze factors affecting diarrhoeal prevention and cure. The household mothers were interviewed. The results revealed that most mothers, aged 20-29 years, could read and write. Two-thirds knew about watery and liquid stool, one-third knew about vomiting and abdominal pain, but only 18.3% knew about mucus and bloody stool as symptoms of diarrhoea. About 89% of the mothers considered that watery and liquid stools were the symptoms of the disease. In relation to the etiology of childhood diarrhoea, food poisoning, uncleaned, uncooked, contaminated (fly) food, contaminated drinking water, allergy to milk and child development were mentioned by the majority of mothers. About 58% and 91% could comprehend mild susceptibility and high severity of diarrhoea respectively. More than 80% of the respondents knew of oral rehydration solutions (ORS), most of them knowing it from nurses and doctors, but only 31.7% had used it. Only 50% of the mothers believed in treatment of diarrhoea by ORS. More than half knew of how to prevent the disease through the conventional interventions. (Modified author's abstract)

Vaughn CM see Mackie TT

Veldee MV. An epidemiological study of suspected water-borne gastroenteritis. Am J Public Health 1931;21:1227-35

Velimirovic B, Subramanian M, Sadek F. Socio-economic and environmental factors and human health example of cholera El Tor in Manila. Zentralbl Bakteriol [Orig B] 1975;160(1):1-27

Verkholomov EE, Siroko IA. [Microbiological substantiation of the role of the water factor in the epidemiology of dysentery]. Voennomed Zh 1967;5:39-42

Verkholomov EE see Shura-Bura BL

Verma BL see Srivastava RN

Vernon TM see Morens DM

Vernon TM see Schroeder SA

Verwey WF see Spira WM

Vilkovich VA see Ioirish AN

Voelcket J. [Improving sanitation and cholera prevention]. Med Trop (Mars) 1971 May;31:133-4

Voelker E, Sr. see Baine WB

Vogt R see Harter L

Vogt RL see Tiehan W

Wachsmuth IK see Rosenberg ML

Wadstrom T see Freij L

Wadstrom T see Jiwa SFH

Wagle PM see Godbole SH

Wagner EG, Lanoix JN. Excreta disposal for rural areas and small communities. Geneva: World Health Organization, 1958. 187 p. (WHO monograph series, 39)

Wagner EG, Lanoix JN. Water supply for rural areas and small communities. Geneva: World Health Organization, 1959. 337 p. (WHO monograph series, 42)

Wahed SANM. Water supply and sanitation. In: Islam AS, Haque MM, Ameen M, Ahmed N, Haque S, eds. Proceedings of the Regional Seminar on Protecting the Environment from Degradation, South Asian Association for Regional Cooperation, Dhaka, 13-16 May 1985. Dhaka: Science & Technology Division, Ministry of Education, Government of Bangladesh, 1985:183-91

One of the severe environmental problems of the member countries of South Asian Association of Regional Cooperation is the impairment of health due to (a) pollution of soil, water, or air and (b) lack of basic community facilities, including drinking water supplies and sanitation. The need for proper water supply and sanitation is emphasized. National targets for Bangladesh, detailed in the country report for achieving the objectives of the International Drinking Water Supply and Sanitation Decade, are given in the paper. Urban water supply in Bangladesh covered 38% of households in 1985 and is expected to rise to 58% by 1990, whereas rural water supply covered 49% in 1985 and may increase to 77% by 1990. Effects of unsafe water and sanitation on health are discussed. The children in south Asian countries are mostly affected by the unavailability of safe water supplies and safe disposal arrangements of excreta. The infant mortality rate is 150 per 1,000 live births in Bangladesh. About 15 million under-5 children die in the developing countries every year. According to World Health Organization, 80% of all sickness and diseases are due to inadequate water and poor sanitation. Activities relating to water supply and sanitation in Bangladesh are highlighted. The supply of water in Dhaka city of Bangladesh is 85 million gallons per day as against a demand of 140 gallons per day. The improvement of water supply in Dhaka will be brought about by a surface water treatment plant on the Lakhya river and in Chittagong city by a plant on the Halda river. A joint Government-UNICEF Advisory Group (JGUAG) to work out a 5-year country program (1980-1985) has been established. For rural water supply and sanitary latrines, the JGUAG will produce 450,000 units of water-sealed latrines. An appropriate technology for water supply and sanitation has been analyzed. Rigorous measures to protect the catchment areas and reservoirs from extraneous pollution are required. Field studies are required on the mechanics of underground pollution in different soil conditions.

Wall JW, Keeve JP. Water supply, diarrheal disease, and nutrition: a survey of the literature and recommendations for research. Washington, D.C.: Public

Utility Department, International Bank for Reconstruction and Development, 1974. 30 p.

Wall S see Freij L

Walmus BF see Bertrand WE

Wang C see Hung T

Warford JJ see Saunders RJ

Wasif IM see Weir JM

Wasisto B see Sutoto

Watanabe Y. Epidemiology of water-borne diseases. Geneva: World Health Organization, 1973. (WHO/DANIDA/L19/1-15, 1973)

Waterborne disease outbreaks in the United States - 1978. MMWR 1980 Feb 1;29(4):46-8

Waterborne giardiasis. Wkly Epidemiol Rec 1980 Sep 5;55(36):275-7

Waterborne giardiasis - California, Colorado, Oregon, Pennsylvania. MMWR 1980 Mar 21;29(11):121-3

Water-related disease outbreaks in the United States - 1980. MMWR 1982 Jan 1; 30(50-51):623-34

An account of outbreaks of water-related diseases in the USA in 1980 is given. The Centers for Disease Control and the Environmental Protection Agency, USA, maintain a passive surveillance system for outbreaks of water-related diseases. In 1980, 66 reports were received of outbreaks of acute water-related diseases associated with drinking water, non-potable surface water, and recreational water. Fifty of these outbreaks, affecting 20,008 people, were caused by water intended for human consumption. In 22 (44%) of the 50 outbreaks, the causative organisms found were: Giardia lamblia (7), a chemical agent (7), Norwalk agents (5), Shigella (1), Campylobacter jejuni (1), and hepatitis A (1). An agent was not determined for the illness associated with 28 outbreaks, which were characterized by upper and lower gastrointestinal tract symptoms with an incubation period of 12-48 h. The water system in the study area was divided into 3 types: (1) community system that had 15 service connections or served 25 people, (2) non-community systems that did not meet this criteria, and (3) individual systems, which served single private households. The Environmental Protection Agency estimated that 180 million people used the community system, 20 million used the non-community system, and another 30 million used the individual water systems. The average number of cases per community system-related outbreak (818) was 16 times that per non-community system-related outbreak (51). Individual water supplies accounted for 10% of the outbreaks. Of the 23 outbreaks related to community water supplies, treatment deficiencies, implicated in 11 outbreaks, were the single largest cause. Of the 22 outbreaks related to non-community supplies, 10 (45%) were caused by untreated water. In addition to the outbreaks related to water intended for drinking, 3 reported outbreaks were due to the consumption of untreated surface water not meant for drinking. Recreational water was the

cause of several outbreaks, involving illness in more than 500 persons. Other gastroenteritis outbreaks, outbreaks of conjunctivitis caused by adenovirus found in a swimming pool, and a single case of Vibrio cholerae were noted. The 1980 surveillance data highlighted several points of public health interest, especially that of the close association of piped-water supplies with lessened risk of contracting diarrhoeal diseases.

Watkinson AM see Watkinson M

Watkinson M, Lloyd-Evans N, Watkinson AM. The use of oral glucose electrolyte solution prepared with untreated well water in acute non-specific childhood diarrhoea. Trans R Soc Trop Med Hyg 1980;74(5):657-62

This study investigates the use of oral glucose-electrolyte solution, prepared with untreated well water, in acute nonspecific diarrhoea in children. Forty-eight village children, aged between 3 months and 4 years, at Kanton Kunda in the Gambia, were examined during July-October 1979. At the study site, a 20-m deep well supplied the drinking water. When untreated and contaminated well water was used to constitute an oral glucose-electrolyte solution, bacterial multiplication was significantly greater in this solution than in the well water. The intake of potentially pathogenic organisms from the well water solution was small, compared to that from the local weaning foods. Seven samples of well water were examined in the 12-week period. Coliform counts ranged from 10^3 to $5x10^5$/100 ml; Escherichia coli counts were between 10^2 and $2x10^4$/100 ml. Klebsiella were isolated from all samples. Salmonella and Pseudomonas were also isolated. Giardia lamblia was found in stools of 63% of the children, all aged over 18 months. The patients were initially treated with metronidazole, until their stools were negative, but by the end of the study, the parasite reappeared in 31% of those so treated. No child showed signs of dehydration. In remote areas of developing countries, where general and food hygiene is poor, it may be worthwhile to use such untreated water in the preparation of therapeutic glucose-electrolyte solutions.

Watt J, Hollister AC, Jr., Beck MD, Hemphill EC. Diarrheal diseases in Fresno County, California. Am J Public Health 1953 Jun;43(6):728-41

Webber RH. Cholera on Lake Tanganyika (south). In: Khan A, Rowland MGM, Aziz KMS, eds. Proceedings of the First African Conference on Diarrhoeal Diseases, Arusha, 13-17 November 1984. Harare: International Steering Committee, 1986

This study is a historical evaluation of the outbreaks of cholera around Lake Tanganyika (south), since the first reported case of April 1978. The subsequent cholera reports in this region have been chronologically gathered and analyzed. Specific outbreak periods were determined, and the possible transmission modes ascertained. Deaths due to cholera in this region were also noted. It is suggested that transmission is aided by improper use of water from the lake, while it was also possible that the commonly traded fish called "Dagaa" was a vehicle of transmission. Improper defecation practices are also responsible, since the stools left on the shores of the lake are washed into the water body of the lake, thus contaminating the water, which is most often used for drinking, cooking, and washing. The outbreak of epidemics during the rainy season showed this association. It is recommended that household water be boiled before any use, and all visitors be screened for cholera cases. Health education for the rural folk has been emphasized.

Weibel SR, Dixon FR, Weidner RB, et al. Water borne disease outbreaks 1946-1960. J Am Water Works Assoc 1964 Aug;56:947-58

Weidner BL see Arbab DM

Weidner RB see Weibel SR

Weinberger J see Schlesinger L

Weir JM, Wasif IM, Hassan FR, Attia S-E-DM, Kader MA. An evaluation of health and sanitation in Egyptian villages. J Egyptian Public Health Assoc 1952;27: 55-79

An evaluation of health and sanitation status among residents of Egyptian villages is reported. An area near Cairo in Calyube Province was chosen for the program in March 1948. Villages of Sindbis, El Barada, Quaranfil, Aghoru El Sughra, and Aghour El Kubra - 5 in total - had a population of 26,698. The educational status of the population was determined, and their socioeconomic status reviewed. In the population, among those aged over 15, 62% of the males and 92% of the females had no education. Information relating to the status of environmental sanitation were gathered through a survey for scoring individual homes on the basis of 12 basic components of environmental sanitation. The low level of sanitation was apparent from the study. The fly problem had assumed alarming proportions. A study of defecation habits was also carried out. The provision of a potable sanitary water supply was necessary. Simple hand-pumped wells, distributed on the basis of one well for 200 population, were installed. The bored-hole latrines were best suited for all and were well accepted among the people. Effective measures were undertaken to control any increase in the fly population in the study villages; a resurvey and analysis were made in 1951 after the completion of all sanitary improvements. Nutritional status had also been reviewed. Results showed marked improvements in several health-related criteria after the improvements in sanitary systems and water supply introduced to these villages.

Weissman JB, Craun GF, Lawrence DN, Pollard RA, Saslaw MS, Gangarosa EJ. An epidemic of gastroenteritis traced to a contaminated public water supply. Am J Epidemiol 1976 Apr;103(4):391-8

An epidemic of gastroenteritis, traced to a contaminated public water supply, is reported. Between 1 January and 15 March 1974, 1,200 cases of acute gastrointestinal illnesses occurred at Richmond Heights in Florida, USA, at a residential community of 6,500. County records from 1970 to 1974 for cases of shigellosis were reviewed, and for a survey, 75 (5%) households were chosen. Over one-third of all families had at least one member affected. Epidemiologic investigation showed that consumption of tap water was associated with illness in the early illness cases of affected families. Evaluation of the public water supply of Richmond Heights disclosed numerous inadequacies in both design and operation. One of the wells providing water to the community was contaminated showing excessive levels of fecal coliforms from a nearby septic tank and a breakdown in the chlorination unit. This was followed by supply of one million gallons of inadequately chlorinated water from the contaminated well to be distributed to the community 48 h before the epidemic began. Correction of deficiencies in the water plant was undertaken by the utility company, while the residents of Richmond Heights were instructed to boil their drinking water or to use commercially bottled water. A full-scale study is planned for all similar public water supplies in the entire region in Florida.

Weissman JB see Rosenberg ML

Welch SF see Schliessmann DJ

Wells JG see Baine WB

Wells JG see Black RE

Wells JG see Boyce JM

Wells JG see Eden KV

Wells JG see Lawrence DN

Wells JG see Merson MH

Wells JG see Rosenberg ML

Werner SB, Jones PH, McCormack WM, Ager EA, Holm PT. Gastroenteritis following ingestion of sewage-polluted water: an outbreak at a logging camp on the Olympic Peninsula. Am J Epidemiol 1960;89(3):277-85

An outbreak of gastroenteritis in the USA, traced to sewage-contaminated drinking water, provided a more opportunity to investigate the etiologic agent through extensive laboratory and epidemiologic investigations. The epidemiologic investigation was launched on 4 October 1965. Information were obtained from 439 individuals; 171 reported a total of 269 attacks of gastroenteritis. Despite thorough bacteriologic, parasitologic and viral studies of the 15 initial stool specimens, only one known pathogen, enteropathogenic Escherichia coli 0126:B16, could be recovered. The extensive survey of rectal swabs at the logging camp and neighboring control communities showed no evidence that E. coli 0126:B16 was casually related to this outbreak. There were no significant differences in the frequencies with which this pathogen was recovered from ill and normal people of the various groups. Moreover, the frequency of recovery of enteropathogenic E. coli from camp water-drinkers was no greater than that of persons unexposed to the contaminated water. Thus, the etiology of another outbreak of sewage poisoning remained obscure, despite exhaustive, but traditional laboratory methods; the possibility that the responsible agent was a delicate virus requiring more special handling has been discussed. It is suggested that, in similar investigations, the diarrhoeal stool specimens should be frozen at the time of collection to enhance the recoverability of viral agents.

West PA see Huq A

White AU see White GF

White GF, Bradley DJ, White AU. Drawers of water; domestic water use in East Africa. Chicago: University of Chicago Press, 1971. 306 p.

White PC see Schroeder SA

Wilcomb MJ, Jr. see Schliessmann DJ

Williams FP, Jr. see Hopkins RS

Wilson R, Anderson LJ, Holman RC, Gary GW, Greenberg HB. Waterborne gastroenteritis due to Norwalk agent: clinical and epidemiologic investigation. Am J Public Health 1982 Jan;72(1):72-4

This report describes an outbreak of gastroenteritis due to Norwalk agent at a Pennsylvania summer camp in July 1978. Symptoms included abdominal pain (81%), nausea (72%), vomiting (53%), and upper respiratory tract infection (35%). Diarrhoea occurred in 38% of the campers. There was no significant association between any food eaten and illness. It was found that illness was associated with consumption of 5 or more glasses of water or water containing beverages. Stool cultures from affected persons were negative for bacterial pathogens. A 4-fold or greater rise of Norwalk agent was demonstrated in serum samples of 3 ill persons tested, but in none of the 8 controls ($p<0.02$). Findings showed that short-term immunity to Norwalk agent occurred naturally. A waterborne mode of spread is supported bacteriologically and epidemiologically. The prominence of upper respiratory symptoms in younger children suggests that, under certain circumstances, respiratory transmission may be likely. Further investigation of outbreak should be carried out to understand the role of gastrointestinal pathogens.

Wojtyniak B see Rahman M

Wolfe JC see Brady PG

Wolff HL, van Zijl WJ, Roy M. Houseflies, the availability of water, and diarrhoeal diseases. Bull WHO 1969;41(6):952-9

The role of houseflies and the availability of water on the incidence of diarrhoeal disease are described. The study was carried out by a group of field workers in cooperation with a World Health Organization advisory team in Venezuelan villages during 1965-1966. The study area included regions, where poor quality water was made available to the population from a few distribution points in each village. Village Monay had a tank-truck water supply system, while in Pampanito, most houses were served by a piped-water system. All the villages lacked an organized system of refuse disposal and garbage collection. An exception was seen in Pampanito, where people used oil drums as garbage containers. In a house-to-house survey, most diarrhoeal cases were found in the lower age groups (0-7 years). Fly counts were made by a modified Scudder grill method. The fly density was high in the La Ceiba area. DDT spraying of the houses did not influence the fly population. Seasonal differences were in agreement with the values for precipitation. In Monay, the fly density was high, and there were seasonal differences. The incidence of diarrhoea peaked at the end of the rainy season. In the 'Vivienda rural', fly density increased in August, and the incidence of diarrhoea had risen from 10 to 17.4% during July. In Pampanito, the fly indices tallied with the precipitation rate. Fly-index values were higher in Rio Caston. There was no correlation between fly-index values and diarrhoea cases. It is recommended that the possible breeding sites for flies should be eliminated, and flies should be prevented from gaining access to contaminated materials. The availability of good water is important in controlling diarrhoeal diseases.

Wolman A. Environmental sanitation in urban and rural areas: its importance in the control of enteric infections. Bull Pan Am Health Organ 1975;9(2):157-9

The state of environmental sanitation in urban and rural areas in Central South America and its importance in the control of enteric infections are discussed.

Endemic and epidemic enteric diseases have been reported from countries of Central and South America. Epidemiologic studies had revealed that all these infections had usually a common source. It was emphasized that, in the first place, excreta must be removed from direct contact with people; second, it should be made possible for people to wash, so that personal hygiene is both recognized and practiced; third, preparation and handling of food must be carried out in sanitary surroundings; and fourth, public comprehension of these elementary essentials must finally be achieved. These measures are difficult and complex to implement, but less costly than many other alternative approaches. A vast educational process is essential to raise personal understanding of cleanliness and to arouse official motivation and will. This program has to be accompanied by provision of adequate and safe water supplies to both rural and urban areas. The basic environmental causes of enteric diseases are clear. The prevailing conditions have been aggravated by rapid population growth and urbanization. Basic corrective measures have already been postponed long enough and need to be introduced immediately, especially in rural areas.

Wolman A. [Importance of environmental sanitation in urban and rural areas of the control of intestinal infections]. Bol Of Sanit Panam 1975 Apr;78(4):343-5

Wood BT see Eden KV

Wood BT see Merson MH

Wood BT see Morens DM

Wood BT see Shaw PK

Woodward WE see Sommer A

World Health Organization. International standards for drinking-water. 3d ed. Geneva, 1971. 70 p.

World Health Organization. Diarrhoeal Diseases Control Programme. Environmental health and diarrhoeal disease prevention; report of a Scientific Working Group, Kuala Lumpur, 3-6 Jul 1979. Geneva, 1980. 33 p. (WHO/CDD/80.5)

World Health Organization. Diarrhoeal Diseases Control Programme. Guidelines for cholera control. Geneva, 1980. 14 p. (WHO/CDD/SER/80.4)

World Health Organization. Diarrhoeal Diseases Control Programme. Use of locally available drinking water for preparation of oral rehydration salt (ORS) solution. Geneva, 1981. 5 p. [CDD/SER/81.Rev.1 (1985)]

The growth and survival potentials of 4 enteric pathogens (Escherichia coli, Shigella, Salmonella, and Vibrio cholerae) in an oral rehydration solution (ORS), made of sterile, distilled water, are reported. In a study, conducted at the Centers for Disease Control, USA, sterile, distilled water was used to prepare ORS, which was inoculated with 10^6 viable cells of the 4 pathogens. The organisms survived in decreasing number up to 48 h. River water and distilled water were used after boiling at the University of Maryland, USA to prepare ORS. The viable counts of V. cholerae and E. coli increased at 48 h. In another study at the Centers for Disease Control, surface water and

dechlorinated tap water were sterilized and used to prepare ORS. E. coli grew 2-3 logs in 24 h, and V. cholerae grew 1-2 logs in 24 h. In a study in Brazil, 50% of the water samples to prepare ORS from homes without running water had concentrations greater than 10^3 coliforms/ml as compared with about 19% of samples from homes with running water. In Gambia, well water at 23-30°C was used to prepare ORS. There was an increase in bacterial counts of coliforms and E. coli at 12/24 h. At the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B), ORS was prepared with water from tank and wells (28°C). Samples contained increased counts of coliforms and E. coli 2-3 logs at 24 h. Results showed that ORS, prepared with both untreated surface water containing organic matter and solutions made from water that is distilled and boiled or autoclaved, might support the growth of enteric bacteria. The possibility of growth of Shigella was found less in oral solution than other enteric pathogens. The risks associated with the use of ORS that is not bacteria-free are described. Possible methods of decontamination of water and the ORS, such as by chemical methods, boiling, and sunlight, and the known disadvantages in implementing these methods are discussed. Aluminium potassium sulfate, at a concentration of 0.05 to 0.1%, could prevent bacterial growth in the ORS as found in a study done at the ICDDR,B.

Wright AM see Feachem RG

Yao H see Hung T

Yap KL, Sabil D, Muthu PA. Human rotavirus infection in Malaysia. II. A study on the influence of living standard on the prevalence of rotavirus-associated gastroenteritis in children hospitalized with diarrhoea. J Trop Pediatr 1984 Oct;30(5):269-71

The association between different living standards and the prevalence of rotavirus diarrhoea was examined in infants and children, aged up to 6 years hospitalized with diarrhoea in Kuala Lumpur, Malaysia. Stool specimens were tested for rotavirus by an enzyme-linked immunosorbent assay. Prevalence of rotavirus-associated gastroenteritis was higher in children from lower socioeconomic classes. Prevalence of the disease was higher in large families. Hygienic home circumstances reduced the risk of rotavirus diarrhoea, but the source of water supply used for drinking and washing and methods of human excreta disposal seemed not to be important factors in influencing the prevalence of the disease.

Yashuk JC see Lawrence DN

Ye W see Hunt T

Zacha EA see Koomen J, Jr.

Zafir SA. Health education aspects in the control of diarrhoeal diseases. Regional Meeting on Cholera and Diarrhoeal Diseases, Alexandria, 1-5 June 1978. Alexandria: Regional Office for the Eastern Mediterranean, World Health Organization, 1978. 7 p. (EM/MTG.CHL.DHL.DIS./9.2)

Zaharia C see Birzu I

Zaheer M, Prasad BG, Govil KK, Bhadury T. A note on urban water supply in Uttar Pradesh. J Indian Med Assoc 1962 Feb;38:177-82

Zbijowski AG see Burr ML

Zebec M see Bantic Z

Zhang DL. [A water-borne outbreak of diarrhea]. Chung Hua Liu Hsing Ping Hseueh Tsa Chih 1984 Aug;5(4):209-11

Zhang J, et al. Study on preventing bacillary dysentery with magnetized drinking water. Chin J Epidemiol 1985 Aug;6(4):203-5

Being treated in a magnetic field, drinking water may have significant effects in preventing bacillary dysentery. In this experiment, 567 cases were observed over 2 years. Bacillary dysentery fulminated 2 times in the control group, and 55 victims were seen. During the same time, no victim was found in the experimental group. It is believed that magnetized drinking water possesses higher osmotic pressure and can stimulate the human body to absorb the nutrient materials and raise the immunological level of the human body. This is the basic reason showing how bacillary dysentery was prevented in the experiment. This may also work as a new method to prevent bacillary dysentery. If a repeat experiment is successful, the sanitational significance of the magnetized drinking water can fully be comprehended.

Zoha MS see Rahaman MM

Zweighaft RM see Morens DM

INTERNATIONAL DIARRHOEAL DISEASE INFORMATION SERVICE AND DOCUMENTATION CENTRE

The International Diarrhoeal Disease Information Service and Documentation Centre (DISC) was set up in May 1982 by the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B). DISC is based at the Library and Publication Branch of the ICDDR,B. For a period of five and a half years, DISC operations have been supported by a grant from the International Development Research Centre (IDRC), Canada. Policies for DISC are guided by an international Advisory Board, consisting of 25 members, the majority of whom are from developing countries.

DISC has been concentrating on publications that are produced in or about Asia. The subject scope covers information on diarrhoeal diseases which emerge from, or are useful to biomedical research; development of control and treatment procedures; establishment of programs for introducing control and treatment procedures. The aims of DISC are: to collect, organize and disseminate information; to encourage free flow of information; to help avoid duplication of research efforts; and to speed the application of improved practices.

PUBLICATIONS AND SERVICES:

** **Journal of Diarrhoeal Diseases Research:** A quarterly journal containing original research articles, review articles, short communications, letters, and editorial perspectives dealing with all aspects of diarrhoeal diseases. An international Editorial Advisory Board, comprised of working scientists from Asia and other parts of the world, advises on the publication of the journal.

** **Bibliography of Asian Literature:** An annotated bibliography (a special section of the journal) covering current published and unpublished papers on diarrhoeal diseases, produced in or about the Asian region.

** **Specialized Bibliographies:** A series of annotated bibliographies of important papers from sources worldwide with each issue covering a current important topic within the field of diarrhoeal diseases.

** **Directory of Asian Scientists and Practitioners:** A directory containing the address, telephone, telex, etc., institutional affiliation, and identification of the individual's field of work or specific interest in diarrhoeal diseases.

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