Safety of community drinking-water and outbreaks of waterborne enteric disease: Israel, 1976–97

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Waterborne disease remains a major public health problem in many countries. We report findings on nearly three decades of waterborne disease in Israel and the part these diseases play in the total national burden of enteric disease. During the 1970s and 1980s, Israel's community water supplies were frequently of poor quality according to the microbiological standards at that time, and the country experienced many outbreaks of waterborne enteric disease. New regulations raised water quality standards and made chlorination of community water supplies mandatory, as well as imposing more stringent guidelines on maintaining water sources and distribution systems for both surface water and groundwater. This was followed by improved compliance and water quality, and a marked decline in the number of outbreaks of waterborne disease; no outbreaks were detected between 1992 and 1997. The incidence of waterborne salmonellosis, shigellosis, and typhoid declined markedly as proportions of the total burden of these diseases, but peaked during the time in which there were frequent outbreaks of waterborne disease (1980–85). Long-term trends in the total incidence of reported infectious enteric diseases from all sources, including typhoid, shigellosis, and viral hepatitis (all types) declined, while the total incidence of salmonellosis increased. Mandatory chlorination has had an important impact on improving water quality, in reducing outbreaks of waterborne disease in Israel, and reducing the total burden of enteric disease in the country.

Keywords: drinking water, standards; water microbiology, standards; enterobacteriaceae infections, transmission; water pollution, legislation; disease outbreaks, history; Israel.

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Introduction

Israel is a small country in transition from a developing country to an industrialized one; it has limited water resources to meet the needs of a growing population and a strong agricultural sector. The early decades of the country's public agenda for infrastructure development focused on the quantity of water, especially for agricultural purposes, rather than on the quality of water supplied to communities (*1*). In the 1980s, public attention turned to water quality and issues of supplying water to urban communities because of population growth and the evolution towards an urbanized, industrialized society.

In Israel water quality is the responsibility of the Ministry of Health, which must ensure the health, safety (microbiological and chemical), and aesthetic quality (appearance, taste, and odour) of water for drinking and household purposes. The ministry's emphasis has been on microbiological quality because of the immediate impact of contamination on health (*2*). The quality of drinking-water is monitored by mandatory testing for total coliforms as well as chemical contaminants, according to the ministry's regulations.

High rates of waterborne enteric disease and numerous instances of water failing to meet the quality standards then current were documented between 1975 and 1992 (*3–6*). In early 1989, new and more stringent regulations, including mandatory chlorination of all community water supplies, came into effect. We review the microbiological quality of water supplies, outbreaks of waterborne disease, and the total burden of diseases in the country. The purpose of this article is to examine the secular trends and ecological associations between these factors.

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Systems used and measures taken

The National Water Carrier of Israel (NWC), constructed in the mid-1960s, carries unfiltered water from the Kinneret (Sea of Galilee) to the central and southern parts of the country to supply both communities and agricultural needs. This supply is augmented by groundwater from sources belonging to the Mekorot National Water Company (Mekorot). The NWC is primarily a covered system that spans some 400 km, but it has two areas of open canals and reservoirs, which are in the process of being covered to protect water from agricultural waste and other pollutants. The network includes several points of chlorination for disinfection to maintain a background concentration of chlorine sufficient to prevent the regrowth of organisms and cross-contamination within the lengthy network.

Community water supplies in Israel are regulated by the Ministry of Health. This includes water supplied by Mekorot and local governments, as well as water from cooperatives or unions of local authorities, which operate mainly in rural areas; the regulations also apply to all public and private wells. Supervised community water systems supply close to 100% of the population (*1, 2*).

Non-community sources of water include rivers, springs, or wells not recognized as sources of drinking-water by the Ministry of Health. Use of water from such sources receives attention only when there are outbreaks of gastroenteritis among hikers, campers, or tourists who ignore warnings that the water is not safe for drinking.

The Department of Environmental Health of the Ministry of Health receives the results of tests carried out at municipal water distribution systems as specified in the Water Regulations in the Public Health Ordinances. These data are collected by the local public health offices of the Ministry of Health. Routine testing of water is carried out in accordance with the ministry's regulations, using the total coliform count as an indicator of faecal contamination. Higher standards of water quality have been adopted over the years, and routine testing of community water supplies is based on a schedule that takes the size of the community into account (Table 1). In the past, when total coliform counts exceeded the mandated upper limits, re-testing was required. If the counts were confirmed, public health interventions were carried out including warning residents to boil their water, implementing a sanitary engineering investigation, and introducing mandatory disinfection by chlorination and follow-up testing (*2, 6*).

The Epidemiology Department of the Ministry of Health defines an outbreak of waterborne enteric disease as an incident in which two or more people have a similar illness after consuming or using water intended for drinking and where epidemiological evidence implicates water as the source of the illness (*3–8*). Surveillance and investigation of outbreaks in Israel are based on the mandatory reporting of enteric diseases by physicians to local public health offices. These reports may identify outbreaks of enteric diseases, including waterborne diseases. The results of such investigations are reported by the District Public Health Offices to the Department of Epidemiology. Diseases that must be reported include salmonellosis, shigellosis, hepatitis, campylobacteriosis and other enteric diseases. These data are

Table 1. **Regulations for testing community water supplies by coliform count, community population size and frequency of testing, Israel, 1974–2000**[a]

Year (standard)	Treated water entering community distribution system		Treated water within community distribution system	
	Population size	Frequency of testing (No. of samples)	Population size	Frequency of testing (No. of samples)
1974	<1000–20 000	Monthly (2–6)	<5000	Monthly (1)
Total coliforms	<50 000	Biweekly (12)		
<10/100 ml	<100 000	Weekly (24)	<20 000	Weekly (1)
	<200 000	Every 2 days (48–100)	>20 000	Every 4 days (1)
	>200 000	Daily (100)		
1989	<1000–20 000	Every 4 weeks (2–8)	<20 000	Every 4 weeks (1)
Total coliforms				
<4 /100 ml	<30 000–50 000	Every 2 weeks (10–14)		
	<70 000–90 000	Weekly (16–24)	<50 000	Every 2 weeks (1)
	<110 000–140 000	2 days/week (32–40)	<100 000	Every 4 days (1)
	<170 000–200 000	3 days/week (48–60)		
	>250 000	5 days/week (80–160)	>100 000	Daily (1)
Proposed for 2000 (total coliforms 0/100ml in 95% samples)	Same as 1989	Same as 1989	Same as 1989	Same as 1989

[a] Source: Department of Environmental Health, Ministry of Health (*1*).

published weekly and monthly, and summarized periodically. All enteric diseases are also reported by causative organism.

New regulations were implemented in March 1989 as a result of problems with water quality in the 1980s, the numerous outbreaks of waterborne diseases, and the total burden of enteric diseases. The frequency of mandatory water testing remained unchanged under the new regulations, but the minimum acceptable quality standard for drinking-water was raised from <10 coliforms/100 ml to <4 coliforms/100 ml. These regulations also mandated continuous disinfection by chlorination of all public water supplies from both surface and groundwater sources. This replaced the previous practice of waiting for contamination to be detected by testing before introducing chlorination (*2*).

The 1989 regulations require re-testing within 24 hours after positive laboratory findings identified during routine testing if the results are not clearly indicative of water contamination. The response to obvious contamination requires the local authority to investigate the cause of contamination and take appropriate action on the basis of the initial findings (*2*).

Results

Table 2 shows the incidence of reported cases of enteric disease occurring from 1976 to 1997. Over this period, there was a marked decline in outbreaks of waterborne diseases from community water supplies, with the last outbreak reported in 1991. There were similar declines in the incidence of outbreaks from non-community sources, outbreaks of foodborne diseases, and outbreaks for which the source was unknown.

From 1976 to 1980, 25 outbreaks of waterborne disease from community water sources were reported, with a total 7619 cases. Between 1981 and 1985, 27 such outbreaks were identified, with a total of 10 880 cases. This included a large outbreak in 1985 caused by contamination from a construction accident. A bulldozer broke a sewage pipe, contaminating an unchlorinated source of groundwater that provided a large proportion of drinking-water to a number of suburbs near Haifa. The outbreak included about 9000 cases of shigellosis in which the causative organism was identified as *Shigella sonnei*; this was followed a week later by a secondary outbreak of *Salmonella typhi*, which included 77 cases and 75 hospitalizations (*1, 3–8*).

Between 1986 and 1990, nine outbreaks of waterborne disease from community sources were identified: a total of 1779 cases. This included two outbreaks each in 1986, 1987, and 1988; these outbreaks were caused by contamination of a water storage facility and the failure to flush with chlorine after repairs. In 1989, three outbreaks, totalling 1534 cases, were associated with community water sources. One of these occurred in western Galilee (with 1268 reported cases) when a chlorinator failed during a strike by NWC workers and there was simultaneous contamination of the water source by cattle. Two smaller outbreaks in the same year were associated with inadequate flushing and disinfection after repairs to water pipes. No outbreaks were reported in 1990. In 1991, one outbreak occurred (260 cases), and both salmonella and shigella were identified (*6*). No outbreaks have been reported since 1991.

The number of cases of waterborne enteric disease, the total number of cases of enteric disease in the country, and the proportion of the total incidence of disease that was identified as waterborne from community and non-community sources of water is shown in Table 3. The cases of waterborne disease constituted 17.6% of all reported cases of enteric diseases from 1976 to 1980, increasing to 18.2% from 1981 to 1985, and then declining subsequently to 0%.

Table 4 shows that the average number of communities with contaminated water supplies in each district was declining before the 1989 regulations came into effect. A sharp increase in the number of communities classed by the new standards as having contaminated water occurred between 1988 and 1989; this was followed by a decline in the average number of communities classed as having contaminated water from 202 in 1989 to 10 in 1996–97.

The causes of contamination in communities that had $\geqslant$25% of samples classed as contaminated immediately before and after implementation of the new regulations are shown in Table 5. Most of these communities received water from contaminated sources. There was a sharp decline in most categories in 1990–91 and in 1994–95, but there was an unexplained increase in 1996–97.

Fig. 1 shows time trends from 1951 to 1997 in the incidence of shigella, salmonellosis and typhoid fever. Rates of salmonellosis have increased, particularly since the 1980s, primarily in the category of foodborne disease. Cases of typhoid fever have decreased steadily with a small increase in 1985 associated with a waterborne outbreak in the Haifa area. The incidence of shigellosis increased steadily until the mid-1980s, with large peaks in 1975–85 and a steep decline after. Fig. 2 shows that the overall incidence of viral hepatitis declined but peaked in the late 1970s and early 1980s.

Discussion

Waterborne diseases accounted for a substantial part of the total incidence of enteric diseases in Israel, but since the late 1980s they have declined as a proportion of the total number of cases of enteric disease. Improved water standards and implementation of mandatory disinfection have made an important contribution to this trend. Between 1975 and 1985, a large number of outbreaks of waterborne diseases occurred at a rate 18 times higher than that in the United States during the same period (*4*).

During the 1980s, a growing awareness of the problem and anticipation of the introduction of more stringent mandatory standards for water quality brought about an increased responsiveness to findings of contamination at the local level. Changes in water management and regulation since 1989 have led to substantial improvement in the quality of water supplied to communities. As a result of the increasing routine use of chlorination in the 1980s and mandatory chlorination since 1989, which has been accompanied by the introduction of more stringent water safety standards, outbreaks of waterborne diseases have become rare. There has also been an overall reduction in the burden of enteric disease in the country with the exceptions of salmonellosis, which is primarily foodborne, and shigellosis, which occurs in situations of person-to-person contact, such as kindergartens.

Background levels of waterborne enteric disease or infectious hepatic disease may be undetected and if they are identified they may be seen only as isolated cases. Low levels of water contamination may contribute to the total burden of disease. A 1998 Swedish study used a school-based survey of passive reporting to identify an outbreak of waterborne disease in the absence of microbiological and epidemiological data (*9*). Payment et al. studied gastrointestinal illness among drinkers of tap water and estimated that 35% of the gastrointestinal illnesses reported was caused by community water supplies that met current water standards (*10*).

We observed a marked secular rise and fall in outbreaks of waterborne disease in Israel which occurred parallel to a decline in the total burden enteric diseases. The ecological association between waterborne disease and the total incidence of enteric disease may not indicate causality but the link is both biologically and epidemiologically plausible. Changes in reporting or investigation may explain some of the

Table 2. **Outbreaks of gastroenteric disease — waterborne, foodborne and cause unknown, Israel 1976–97[a]**

Outbreaks	Years				
	1976–80	1981–85	1986–90	1991–95	1996–97
Non-community waterborne					
Outbreaks	45	19	4	0	0
Cases	2465	577	207	0	0
Cases/outbreak	55	30	52	0	0
Community waterborne					
Outbreaks	25	27	9	1	0
Cases	7619	10 880	1779	260	0
Cases/outbreak	305	403	261	260	0
Total waterborne					
Outbreaks	70	46	13	1	0
Cases	10 084	11 457	1986	260[b]	0
Cases/outbreak	144	249	153	260	0
Foodborne enteritis					
Outbreaks	262	251	83	80	79
Cases	12 355	9855	3381	2978	2031
Cases/outbreak	47	39	41	37	26
Enteritis from unidentified sources					
Outbreaks	147	183	134	93	20
Cases	5137	4211	3616	2532	601
Cases/outbreak	35	23	27	27	30
Total No. outbreaks (foodborne, waterborne, and unidentified)					
Outbreaks	479	480	230	174	99
Cases	27 576	25 523	8983	5770	2632
Cases/outbreak	58	53	39	33	27

[a] Source: Epidemiology Department, Ministry of Health, 1999.

[b] Total number of waterborne cases of enteric disease in 1991–95 does not match total in Table 3 because both shigella and salmonella were identified.

Table 3. **Reported cases of waterborne enteric disease, total number of cases of enteric disease, and proportion of total disease identified as waterborne in community and non-community water sources, Israel 1976–97[a]**

Disease	Year				
	1976–80	1981–85	1986–90	1991–95	1996–97
Shigellosis					
Waterborne	6557	10 180	1524	260[b]	0
Total (%)	32 839 (20)	44 152 (23.1)	29 070 (5.2)	25 874 (1.0)	7274 (0)
Salmonellosis					
Waterborne	979	157	244	260[b]	0
Total (%)	10 101 (9.7)	12 386 (1.3)	17 127 (1.4)	28 986 (0.9)	11 481 (0)
Typhoid					
Waterborne	112	76	0	0	0
Total (%)	596 (18.8)	629 (12.1)	216 (0)	0	0
Total all causes					
Waterborne	7648	10 413	1768	520	0
Total (%)	43 536 (17.6)	57 167 (18.2)	46 413 (3.8)	54 984 (0.9)	18 788 (0)

[a] Source: Epidemiology Department, Ministry of Health, 1999.

[b] See footnote b Table 2.

Table 4. **Average number of communities with contaminated water in >25% of samples by district, Israel 1985–97**[a]

District	Years						
	1985–87	1988[b]	1989[c]	1990–91	1992–93	1994–95	1996–97
Jerusalem	2	0	10	4.5	0	0.5	0
North	47	29	125	77	24.5	13	8
Haifa	7	7	15	7	0	0.5	0
Central	10	6	31	17	5.5	3	1
Tel Aviv	0	0	0	0	0	0	0
Ashkelon	2	4	16	5.5	5	3	1
South	1	0	5	1.5	0	0	0
Total	**70**	**46**	**202**	**112.5**	**35**	**20**	**10**

[a] Source: Department of Environmental Health, Ministry of Health, 1999.

[b] Includes all of 1988 and the first 3 months of 1989 when the standards changed.

[c] Includes the 9 months from 1 April to 31 December — that is, the first period governed by the new regulations.

Table 5. **Contaminated community water supplies by cause of contamination in communities with ⩾25% of samples contaminated, Israel 1987–97**[a]

Cause of contamination	Year				
	1987–88[b]	1990–91	1992–93	1994–95[c]	1996–97
Source contaminated					
Untreated water	27	62	6	9	3
Untreated surface water	0	19	13	10	12
Untreated Mekorot water	16	46	17	1	3
Total	43	127	36	20	18
Maintenance failure					
Faulty distribution network	17	30	10	6	12
Failure of disinfection	36	58	31	12	17
Contamination of reservoir or tower	19	17	7	2	5
Interrupted supply or repair without adequate chlorine flush	0	3	3	3	0
Total	72	108	52	23	34
Unknown	22	14	1	2	1
Total No. communities affected	**137**	**249**	**89**	**54**	**53**

[a] Source: Department of Environmental Health, Ministry of Health, 1999.

[b] Data not available for 1989 during which standards were changed.

[c] In some cases there was more than one cause of contamination.

differences, but the increasing incidence of confirmed cases of salmonellosis suggest that reporting is not declining and that these changes are unlikely to explain the observed patterns.

Another potential confounding variable may be access to health care. More than 90% of the population in Israel had access to medical care between 1970 and 1990. Since the introduction of National Health Insurance in 1995, medical care has been available on a prepaid basis for 100% of the population. Larger numbers of trained public health personnel are available in field offices to investigate clusters of enteric disease so that detection and reporting of incidents of waterborne disease is likely to have improved over the past four decades (*11*). A study of infectious diseases reported in kibbutzim in Israel showed that the number of cases of enteric and other infectious diseases were similar to those reported to the Ministry of Health (*12*). Thus, changes in reporting patterns by physicians and in identification of outbreaks are unlikely to have played a substantive part in the patterns observed (*1, 12*).

Implementation of more stringent regulations for drinking-water along with mandatory chlorination almost certainly contributed to the observed reduction in waterborne disease. These policy changes were debated among the public health and sanitary engineering communities for nearly a decade. The gradual shift towards a mandatory chlorination policy probably resulted from a number of factors: increased public and media awareness of problems with the quality of drinking-water, persuasive documentation of the impact of contaminated supplies on the burden of infectious disease in the country, improvements in professional standards in the sanitary engineering field, and an increased emphasis on the importance of prevention and environmental factors in disease (*1, 6*).

A more environmentally conscious public has raised questions about the health impact and possible carcinogenicity of chlorinating water supplies with an agent that combines with organic material to produce trihalomethanes. Changes in the type of disinfection used by the NWC from chlorine gas to chlordioxide and chloramines reduced concentrations of trihalomethanes to levels within internationally accepted safety standards (<100 μg per litre) (*2*).

When mandatory chlorination was implemented, priority was placed on wells deemed to be at greatest risk from contamination from adjacent sewage pipelines and other sources. All wells operated by local authorities were required to establish permanent disinfection using chlorination from 1 January 1990. In 1991, new regulations called for gradual improvements in the quality of source water from 5 nephelometric turbidity units to 1. In the mid-1990s, filtration plants were installed by some local authorities, and a central filtration plant is planned for the NWC during 2000–01.

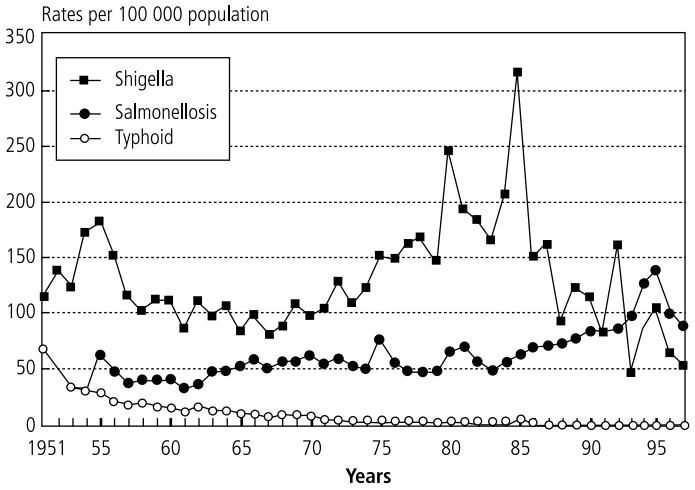
In 1995, new regulations from the Ministry of Health required groundwater sources to be protected and fenced. Protected areas of up to several kilometres were to be established to control potential sources of pollution such as farm animals, sewage treatment plants, solid waste dump sites, industry, fuel storage or pipes, and major sewage lines. New water regulations to be adopted during 2000 will continue the previous provisions for monitoring water sources by gradually lowering the acceptable total coliform count to 0. These regulations will focus on the chemical contamination of source water by testing for contaminants such as pesticides and industrial organic chemical compounds and by increasing the number of compounds for which water is routinely tested from 30 to 75.

Globally, more than 1000 million people are without ready access to adequate supplies of safe water; and waterborne disease is a major cause of illness and premature death, especially among children in developing countries. One of the primary goals of WHO is to ensure that all people have access to an adequate supply of safe drinking-water, and to this end WHO has codified guidelines for the quality of drinking-water, first in 1958 and then again in 1993 and 1998 (*13*).

WHO has emphasized the importance of this issue by promoting the Water Decade and updating its water quality guidelines. Requirements for the management of safe community water supplies will vary according to the quality of the source water. Other measures to be implemented include: introducing higher standards for water from both surface and underground sources, physically treating surface water with coagulation and filtration, disinfecting (chlorinating) all drinking-water, maintaining and monitoring residual chlorine, constructing good quality water distribution systems and maintaining them, monitoring enteric disease, and investigating all suspected outbreaks of waterborne disease (*13*). The cholera epidemic in the northern parts of South America, which has been ongoing since 1991, is sustained and transmitted through contaminated drinking-water. This emphasizes the potentially explosive nature of waterborne disease and the cost of failing to maintain standards of water treatment (*14, 15*).

In industrialized countries, which have long had well-developed systems for supplying water to communities, waterborne disease has become comparatively well controlled (*16–18*). However, new pathogenic organisms have emerged that are not being detected by current testing, and they are resistant to water treatment methods. These organisms include *Cryptosporidium parvum*, *Giardia lamblia* (*19–23*), and some viruses (*24, 25*). Cryptosporidium, first recognized as a human pathogen in 1976, was reported in a number of small outbreaks of enteric disease in the 1980s. In 1993, a large outbreak of waterborne gastroenteritis was reported in Milwaukee, Wisconsin; this outbreak consisted of over 400 000 cases, and redirected the attention of public health workers to the potential threat of waterborne pathogens, particularly since the new pathogens were especially dangerous to people who were immunocompromised (*19–21*). A number of outbreaks of waterborne cryptosporidiosis were reported after the episode in Milwaukee, mostly in communities where the standards for drinking-water quality had been met (*18, 26*). In 1988–91, *Cryptosporidium* oocysts were identified in 65–97% of surface water tested in the United States. In 1998, the Centers for Disease Control and Prevention stated in its listing of newly emerging infectious diseases that "a new group of waterborne pathogens has emerged that is unaffected by routine disinfection methods" (*20*). In June 1999, the United Kingdom adopted regulations for monitoring drinking-water for *Cryptosporidium* (*22*).

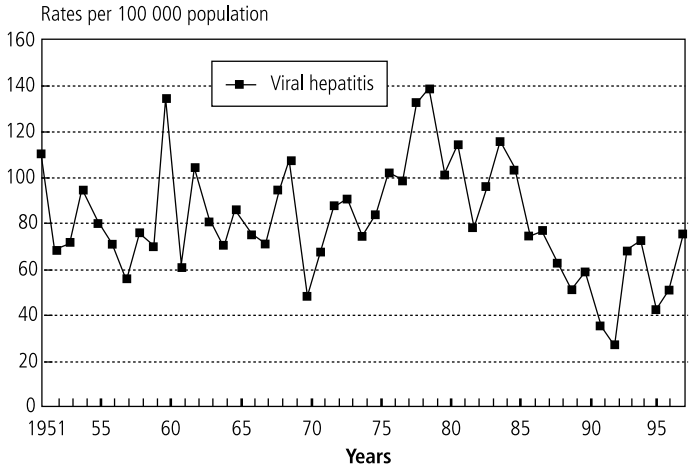
Fig. 1. **Shigella, salmonellosis and typhoid fever rates, Israel, 1951–97**



Source: Epidemiology Department, Ministry of Health, Israel.

WHO 00285

Fig. 2. **Viral hepatitis[a] rates, Israel, 1951–97**



[a] Includes all viral hepatitis.

Source: Epidemiology Department, Ministry of Health, Israel.

WHO 00286

Outbreaks of waterborne disease have become rare in most industrialized countries because safe water management practices have been widely implemented. In the United States, in 1995–96, 22 outbreaks of enteric disease associated with drinking-water were reported with an estimated total of 2567 cases. Organisms were identified in 14 of these outbreaks, and another seven outbreaks were of chemical origin. *Giardia* was the organism identified in the largest outbreak (1449 cases) (*17*, *27*). Outbreaks in the United Kingdom are very uncommon; between 1992 and 1995, 26 outbreaks of enteric disease were reported and were attributed to waterborne transmission. There were 1756 laboratory-confirmed cases; *Cryptosporidium* was the probable causative organism in 14 outbreaks that were associated with public water supplies and swimming pools (*18*, *28*). *Helicobacter pylori* is also widespread in water supplies and is more resistant to standard water treatment strategies than most organisms (*29, 30*).

The surveillance of water quality to ensure microbiological and chemical safety are vital public health functions especially in developing countries (*31*). The dramatic progress that has been achieved in reducing waterborne disease has been an important factor in controlling infectious disease in the past century. The Israeli finding of a strong ecological relation between long-term trends in the total burden of enteric disease and the incidence of waterborne disease reconfirms long-standing public health traditions that support the idea that water quality is one of the most basic community health issues in society (*32*). Improving water quality is an essential public health priority for national development. ■

Disclaimer

The views expressed in this article are those of the authors and not necessarily those of the Ministry of Health.

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Résumé

Salubrité de l'eau de boisson communautaire et flambées de pathologies entériques : Israël, 1976-1997

Les pathologies gastro-entériques d'origine hydrique continuent d'être un problème de santé publique important dans les pays en développement. Dans les pays industrialisés, on s'est à nouveau intéressé à ces maladies à la suite de l'émergence de protozoaires et de virus qu'il est impossible de détecter ou d'éradiquer avec les méthodes classiques de surveillance et de traitement des eaux. La mise en œuvre d'une désinfection et d'une filtration des réserves d'eau communautaires reste la principale méthode permettant d'assurer la salubrité de l'eau et elle a grandement contribué à améliorer la santé publique au cours des 100 dernières années. Dans les années 70 et au début des années 80, Israël a été le théâtre d'un grand nombre de flambées de maladies d'origine hydrique, provoquées par des insuffisances des systèmes de désinfection et des erreurs humaines, ou par l'absence de chloration systématique. A l'examen, l'expérience de ce pays montre que ces flambées ont été responsables d'une proportion importante du nombre total de cas de maladies entériques notifiés, notamment de typhoïde, de shigellose et peut-être d'hépatite virale. Le pic d'incidence de la shigellose, et dans une moindre mesure celui de la typhoïde et de l'hépatite virale, a été observé au cours des années durant lesquelles se sont produites les grandes flambées de maladies d'origine hydrique. L'incidence des cas de ces maladies a diminué, tandis que l'incidence de la salmonellose, qui est principalement une toxico-infection alimentaire, a augmenté régulièrement. En 1989, la mise en œuvre de la chloration obligatoire a entraîné une chute brutale des signes de contamination hydrique et de la charge de morbidité totale des pathologies gastro-entériques en Israël. Des améliorations du traitement de l'eau, notamment la filtration de la principale source nationale d'eau de surface, sont prévues pour 2000-2001. La chloration obligatoire des eaux de surface et des nappes phréatiques, la protection des nappes phréatiques contre la contamination et l'introduction de normes de surveillance de l'eau plus strictes sont des mesures qui ont permis d'améliorer sensiblement la santé publique en Israël. Une telle expérience pourrait être utile aux responsables de l'élaboration des politiques d'autres pays et conforte l'idée selon laquelle les politiques de santé nationales devraient s'occuper en priorité de l'approvisionnement en eau saine.

Resumen

Salubridad del agua de bebida pública y brotes de enteropatías transmitidas por el agua en Israel, 1976-1997

Las enfermedades transmitidas por el agua siguen siendo un problema grave de salud pública en los países en desarrollo. Los países industrializados están nuevamente preocupados por estas enfermedades, debido a la aparición de protozoos y de virus que no pueden ser detectados o erradicados con los métodos convencionales de tratamiento y de vigilancia de la contaminación del agua. La desinfección y el filtrado del agua con que se abastece a la comunidad siguen siendo los principales métodos empleados para garantizar la salubridad del agua y han contribuido en gran medida a mejorar la salud pública en el último siglo. Durante los años setenta y a principios de los ochenta, hubo en Israel numerosos brotes de enfermedades transmitidas por el agua, a veces por fallos en los sistemas de desinfección y por errores humanos, y en otros casos por falta de una cloración sistemática. El examen de esta experiencia demuestra que los brotes de enfermedades transmitidas por el agua explican muchas de las enteropatías notificadas, como la fiebre tifoidea, la shigelosis y, posiblemente, la hepatitis vírica. La máxima incidencia de shigelosis, y en menor medida de fiebre tifoidea y de hepatitis vírica, coincidió con los años en que hubo grandes brotes de enfermedades transmitidas por el agua. La incidencia de los casos de estas enfermedades ha disminuido, pero la salmonelosis, una enfermedad de transmisión principalmente alimentaria, ha aumentado a un ritmo constante. La implantación de la cloración obligatoria en 1989 provocó un descenso acusado de los indicios de contaminación del agua y de la carga total de morbilidad

por enfermedades gastrointestinales en Israel. Está previsto proseguir la mejora del tratamiento del agua, incluido el filtrado de la principal fuente nacional de aguas de superficie, en el periodo 2000-2001. La cloración obligatoria de las aguas de superficie y de las aguas subterráneas, así como la protección de las minas de aguas subterráneas de la contaminación y la introducción de medidas de vigilancia del agua más estrictas, han contribuido a mejorar ostensiblemente la salud pública en Israel. Esta experiencia puede ser relevante para las instancias normativas de otros países, y las autoridades israelíes son partidarias de que el abastecimiento de agua salubre sea una prioridad de las políticas sanitarias nacionales.

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