WATERBORNE DISEASE SURVEILLANCE: GOALS AND STRATEGIES

Report on a meeting of a working group

Budapest, Hungary
29-30 November 2001
Waterborne Disease Surveillance: Goals and Strategies

A. BACKGROUND

The Protocol on Water and Health to the 1992 Convention on the Protection and Use of Transboundary Watercourses and International Lakes was signed by 36 countries of the WHO European region. This unique instrument will become legally binding as soon as 16 signatory countries ratify it. Establishing an effective surveillance system of waterborne diseases (WBD) is important to reach the Protocol goal of reducing and controlling water related diseases in Europe.

The Working Group on Water and Health was created at the First Meeting of the Signatories to the Protocol (Budapest, Hungary, 2-3 November 2000). Signatories agreed that the National Institute of Environmental Health of Hungary would convene a workshop to review the achievements and problems of waterborne disease surveillance systems and to elaborate recommendations to accelerate progress.

Following up on the meeting, the National Institute of Environmental Health of Hungary organized the workshop "Waterborne Disease Surveillance: Goals and Strategies" (Budapest, Hungary, 29-30 November 2001). 20 individuals from 12 countries took part in the workshop besides experts from the WHO Collaborating Center for Health Promoting Water Management and Risk Communication (at the Institute for Hygiene and Public Health, University of Bonn) and WHO Rome Office.

B. OBJECTIVES AND EXPECTED OUTCOMES OF THE WORKSHOP

The meeting aimed to provide scientific input to surveillance of waterborne diseases into: (a) the process of evidence base; (b) the 5th International Congress and Trade Fair, ECWATECH 2002 (Moscow, Russian Federation, June 2002); and (c) the Forth Ministerial Conference on Environment and Health (Budapest, Hungary, 2004).

More specifically, expected outcomes are:

- To select priority diseases for surveillance.
- To identify surveillance methods and coverage.
- To identify an approach to surveillance?
- To enhance effectiveness in communication and data processing.
- To seek possibilities for facilitating countries' adoption of appropriate legislation, improving organizational arrangements, identifying roles and responsibilities of stakeholders their mutual association, etc.
- To exchange information and experiences in different national waterborne disease surveillance programs for success stories, lessons learned, and for the identification of common needs and agendas.
- To identify areas in need of international cooperation and assistance.
C. SUMMARY OF THE MEETING

1. Selection of priorities and identification of approaches

1.1 Priority diseases

Priority waterborne diseases (WBDs) are defined as ‘dangerous diseases with severe health consequences and with high tendency for secondary spreading’. The following diseases are recognized: cholera, bacillary dysentery, Enterohemorrhagic E. Coli (EHEC), viral hepatitis A, shigellosis, and typhoid fever.

1.2 Other diseases of microbial origin

WBD of secondary importance are those caused by sporadic outbreaks of pathogens, or infrequent acute gastro-intestinal syndrome (AGI) of undetermined etiology. Amongst the typical pathogens of this group are: Campylobacter, Cryptosporidium, Giardia Intestinalis, and Calici virus.

1.3 Diseases of chemical origin

Contrary to common believe, diseases due to chemicals in water supply are still endemic in many parts of the WHO European region. Amongst the elements of major concern are: NO\(^{-3}\)/NO\(^{-2}\), Fe, As, Mn, F, I, Sr, Pesticides. Also excess turbidity with its associated impact on disinfection efficiency is an important indicator in this regard.

2. Surveillance Methods

2.1 Current surveillance situations

♦ Nearly all countries can report on WBD, although many countries have no legal obligation to report specifically on WBD but cover this subject as part of other reporting programs, for example reporting on infectious diseases.
♦ Surveillance systems are mostly passive.
♦ There is a consensus that the current reporting system underestimates the level of WBD, especially of microbial origin.
♦ There is likewise a consensus that the disease burden caused by chemicals is even more under-reported.
♦ A very considerable number of people in the EURO region receive water that does not meet one or more criteria of WHO drinking water quality guidelines.

2.2 “Classical” and “advanced” surveillance methods

♦ The classical methods are mostly simple and cheap tests based on microbial growth on selective media. They are often time consuming and focus mainly on enteric bacteria (indicators of fecal contamination).
♦ The new molecular methods based on biochemistry, genetics and immunology are often more sensitive, more selective and faster than the classical ones, and allow detection of specific pathogens. Although improvements are possible in terms of cost-effectiveness, robustness, and standardization, molecular techniques represent promising tools for the future.
2.3 **Serological methods - Cryptosporidium**

- Serological methods can help public health officials better understand the prevalence of *Cryptosporidium* and *Giardia* infections associated with water sources and treatment.
- Seroprevalence studies are now being conducted in the United States and in the United Kingdom. Results reported from the United States consistently show a greater frequency of response to *Cryptosporidium*-specific antigens in populations using surface water sources compared to populations using ground water sources. However, few studies have been conducted in the continental Europe. Additional data are needed to determine whether background response levels in the continental European populations are similar and whether seroprevalence studies can help assess waterborne risks of *Cryptosporidium*.

2.4 **Coverage**

- In many countries, surveillance originated in, and is still primarily focused on, drinking water. However, surveillance of recreational water including swimming pools and recreational waters is gaining in importance.

3. **Risk Assessment**

- The meeting endorsed a holistic approach to surveillance ‘from source to tap’.
- Amongst the risk factors, participants stressed the need for resource protection, particularly from animal husbandry and pasture farming in the catchment area.
- Several countries differentiated risk by centrally managed water supply services, where the extend and upkeep of the distribution system might be a major risk indicator, from the risk posed by local or private supplies, where source protection might be a major issue. The latter were found to be a significantly increased risk.
- In so far as recreational waters are concerned, coastal recreational waters seem to pose a smaller risk than enclosed recreational waters. In the latter category, fill-and-drain pools were found to be especially risky.

4. **Enhancement of Efficiency**

Several options were discussed to increase efficiency of current surveillance systems:

- Better integration in data collection relevant to WBD surveillance: outbreaks, meteorological conditions conductive to outbreaks: different types of data elucidate different types of risks
- Better communication systems (internet) – in many countries, the current surveillance system is a mix of paper and computer data management.
- GIS is to be recognized as an important tool.

5. **Legislation**

- Clarification is required how to choose between WHO guidelines set on toxicological basis, and EU directive values potentially set on the basis of economic considerations – especially for the non-accession countries to the EU.
- WHO guidelines, while recognized, are not always followed – for example, one member state reported that while 90% of salt ought to be iodized in accordance with WHO guidelines, only 16% is in reality.
Food quality guidelines were recognized as highly relevant in the fight against water related diseases.
Member States reported a very variable level of implementation of international legislation.

6. Improved Methodology

Participants recognized the need to improve the current diagnostic tools for assessing the etiology of WBD outbreaks. In particular, serological methods and molecular methods as presented during the meeting were considered valuable tools.

7. Success Stories

A number of speakers presented success stories in the fight against WBD. Particularly impressive were the historical review of the abatement of As in drinking water in Hungary, the metal pollution in wells in the Ukraine, and the impact of pesticides used in a local industry on abortion in Hungarian villages. It was felt that these achievements, while never written up in the formal, peer-reviewed scientific literature should be brought to the attention of a wide audience, possibly during the forthcoming Ministerial Meeting on Environment and Health (Budapest, Hungary, 2004).

D. RECOMMENDATIONS

1. Topics for surveillance

Participants agreed on the surveillance of the following

1.1 Diseases of undefined etiology, possibly linked to water:

Acute gastrointestinal syndrome (AGI)

1.2 Diseases of defined etiology - top priority.

Dangerous diseases with severe health consequences with severe health consequences and with high tendency for secondary spreading: Cholera, bacillary dysentery, EHEC, viral hepatitis A, shigellosis, and typhoid fever.

1.3 Diseases of defined etiology - secondary priority

Secondary priority relates to diseases whose impact on the EURO region is as yet less important than those identified under 1.2., but who are recognized to have potentially an important impact on health, and who may well emerge as important health threats in future. Examples of this group include diseases caused by the following pathogens: Campylobacter, Cryptosporidium, Giardia Intestinalis, and Calici virus.

1.4 Diseases of chemical origin

Diseases caused by chemical concentrations deviating from the WHO guidelines, particularly the following parameters: NO\textsuperscript{3}, Fe, As, Mn, F, I, Sr and pesticides.
1.5 Choice of surveillance methods

In routine monitoring, it is not practical to test for a great number of pathogens. It is, therefore, advisable to concentrate on certain fecal indicators and at the most to search for a limited number of pathogens known to cause problems frequently.

In outbreak investigations, a combination of classical and molecular methods may be useful as advantages and shortcomings can be found in both techniques. Ideally, diagnostic tools for the identification of etiological agents in waterborne outbreaks should be embedded in a holistic approach covering the complete spectrum “from the source to the tap” thus combining information from a number of fields; e.g. water resource, weather and climate, epidemiological studies, water treatment, purification and distribution, risk assessment, etc.

Epidemiologists and water regulatory officials of the countries represented in the meeting should consider conducting seroprevalence studies. Analytical costs are modest, and if serum can be obtained from blood samples that have already been collected for other purposes or from blood donors, the studies will be relatively inexpensive way to assess waterborne protozoan risks.

2. Geographical detail

While surveillance should in principle be homogenous throughout the EURO region, the above diseases are likely to show sub-regional relevance. One possible neutral way to organize the information would be to organize the countries in accordance with their ranking in other development studies such as the UNDP Human Development Report.

Participants recognized the issue of increased water stress and water scarcity in the WHO European region, but felt that, as the recording systems are based on national territories and not on river basin, it would at present not be possible to take stress on water resources into account when reporting in water related diseases.

The participants felt that the large gap between the actual occurrence of waterborne infections and the relatively infrequent reported outbreaks may not only be attributable to ineffective reporting schemes but also to the immunity developed among the population from regular exposure to the pathogens. Funding is therefore requested to study the effectiveness of the current reporting systems.

3. Gender and age specification

Participants reviewed the current surveillance systems, and noted that such systems are at present generally not capable of providing age or gender-specific information on water related diseases.

4. Needed reviews

Participants recommended that the following reviews be undertaken:

♦ Information on the current reporting systems, including organigrams showing the linkages with organizations outside the health system proper.
♦ Information on the current notifiable disease systems in all countries.
5. **Training and education**

Participants recognized a need for training and assistance in logistic development. With the assistance of participants, WHO undertook to:

- Make literature reference on relevant published material available on the web. Particular attention to be paid to joined OECD/WHO efforts.
- Make the formal Waterborne Disease Outbreak Report developed by the US CDC available.

6. **Follow-up Activities**

Participants recommended that:

- Existing materials for outbreak reporting and investigation be reviewed and that these materials be either circulated widely or that appropriate WHO guidance be provided.
- A monograph on lessons learned in the fight against water related diseases be published.
- The Group initiate compiling a questionnaire for the countries of the WHO European region to make an assessment of national WBD reporting schemes and on water related health problems.
- WHO office in Rome to set up an electronic discussion forum to facilitate communication and exchange of information and views in between formal meetings.

The WHO Collaborating Center in Bonn undertook to develop the risk analysis for water supply enterprises.