3

Supportive action

Cooperation

As stated, the epidemiologist's goal, as a member of a multidisciplinary emergency response team, is:

- to prevent or minimize the adverse health consequences associated with an incident;
- to optimize the decision-making process in the management of the response; and
- to minimize the risk of such incidents in the future.

The response will be adequate and appropriate only when all those participating in incident management accept that they are members of a team and that their roles and responsibilities within it will alter with the nature of the incident and the phase of the response. During an incident, epidemiologists are members of the public health team handling the implications of the event for human health. This is only one group within the total structure of response management. The managers of the emergency response team should appreciate the contribution that epidemiology can make, particularly in establishing priorities for action, and proper decision-making based on timely and appropriate information.

Once the epidemiological team has been designated, certain key requirements need to be met. The team leader must rapidly identify those with whom the group has to cooperate to fulfil its allocated tasks and the person within the management structure to whom it should report, as well as the frequency of such reports.

The emergency services may ask the public health team urgently to address several types of question:

- the toxicological nature of the released substances (or combustion products in a fire) and the likely health effects;
- advice on clinical management, such as the prediction of health effects as a basis for patient monitoring;
- the types of casualty to be expected;
- the risk of health effects to emergency personnel;
- the risk of environmental contamination and its possible effects on human health;
- the potential effect on public health of the emission, including the identification of sensitive populations; and
- in a continuing incident such as a chemical fire, advice to emergency officials on the health criteria for evacuating sectors of a community.

The public health team should have access to external expertise in clinical toxicology, occupational hygiene, environmental chemistry and occupational medicine, as well as epidemiology. The team may have either a local or a national base, but it is important that the members have met before the incident (during the preparatory phase) and are able both to come to the scene of the event, if necessary, to provide direct advice, and to arrange for environmental sampling and health data collection. The team should include health scientists and practitioners from the chemical industry, who may have considerable expertise and resources in dealing with major incidents. The epidemiologists have a key role in ensuring the quality of the data collected by the team.

The team needs expertise in hazard identification, exposure estimation, dose–response assessment and risk characterization. The team's work includes identifying the community's health needs and responding to them. Examples include attending to the psychological effects of chemical disasters, with the public health team playing a leading role in ensuring that the appropriate preventive health response is made.

The active participation of representatives of industry – from either the enterprise directly associated with the event or other companies or expert organizations – facilitates the management of an incident. These bodies may have a range of experts with unique skills and immediate access to information essential to appropriate health risk assessment. Their role within the team

must be clearly defined, however, and potential conflict between their professional contributions and their organizational responsibilities must be recognized.

Public opinion tends to assume that industry's legal defaults and/or products are responsible for an incident. The correctness of this assumption is usually determined later. after rigorous investigations. Epidemiologists should be cautious in their evaluations; in not doing so, they would not only fail to adhere to a scientific behavioural code but might also impair the collaboration needed to identify precise causal associations (and sometimes legal responsibilities). It is essential, for example, that the public health sector manage the studies, and not delegate the task to industry.

Epidemiologists work in support of public health agencies. Whether epidemiologists are employed in the public or health sectors, academic or national institutes or industry, their knowledge, skills and data should be available to all of these in the response to an incident. To fulfil this role, the epidemiologist needs to take advantage of the skills and knowledge of the colleagues who will help to amass and analyse relevant data and thus to determine the response needed. These tasks require the cooperation of a range of different professionals, including primary care workers, specialists in referral centres, local environmental health officers or hygienists, and staff and specialists in laboratories and toxicology centres. As well as participating in the design, implementation and analysis of the epidemiological studies, all contributing professionals need to feel ownership of them, agree the findings and take part in their dissemination.

In many countries, poison information centres provide information needed for health-related responses to major chemical incidents. These centres possess relevant data on the diagnosis, treatment and rehabilitation of people affected in an emergency, as well as on the features of prolonged exposure and potential long-term effects. They provide ready (ideally, round-the-clock) access to advice on acute and chronic poisoning by chemical, biological and/or radioactive agents. The annually updated listing of the poison centres registered by WHO is included in the INTOX computer database of the International Programme on Chemical Safety (IPCS).

Public authorities at the regional and national levels have the major responsibility for protecting the health of the population. They therefore take the lead in developing health-related components or preparedness plans as part of overall emergency planning. Each country needs to have the means to organize the collection, collation and dissemination of information for use during both the planning for and the response to an environmental incident. This information is essential for improving decision-making and minimizing the adverse public health consequences of incidents. Appropriate epidemiological, laboratory and toxicological skills are required for the rapid evaluation and assessment of risks. Such capacities may not be available locally and a team of experts with the appropriate expertise, including expertise in environmental monitoring, needs to be available for rapid deployment, especially in large or unusual incidents. Such groups need regional, national or even international planning and development. Public health officials at the local level should be aware of the skills of such teams, their location and the means of rapidly calling for their assistance at any time.

Dissemination of Information

In incident management, the importance of keeping the public informed tends to be underestimated. Coordinated public relations should be part of the management of the event itself and are important for political reasons. Confused and controversial messages have a negative influence on both the public and the personnel dealing with the incident, and may cause panic. An information strategy with certain rules and procedures should be implemented as soon as an incident happens. It should be based on a plan, and the people implementing the strategy should already be acquainted and have established good working relationships. In such a situation, the vehicles and channels to be used should already have been defined and the roles of the different collaborators in the event recognized.

In the acute phase, the most important task is adequately to explain the results and limitations of the risk assessment performed by the people managing the event. The areas to be covered include hazard, dose–response estimation, exposure assessment and risk characterization. This risk assessment has to

be communicated in a way that enables the target audience to understand and interpret the information supplied. Clinicians working in both primary care and hospitals must be informed of this appraisal. A correct understanding of the risk levels reduces the anxiety caused by overestimating the risk and helps to reduce the significant exposure caused by underestimating the risk.

As well as receiving information on risk assessments, other public health professionals and those involved in direct patient care should know how they can contribute to the epidemiological assessments that are under way. Effective communication should be maintained with everyone involved in incident response. They will need technical information and advice on specific epidemiological aspects of the management of the incident, and information on the outcome of surveillance and other activities. Response personnel should be briefed on the role of epidemiology in the response and how they can contribute to the epidemiologist's work. Specific health data will be required, and these can be gathered by the emergency and post-emergency health teams. It should be remembered that, in the midst of an incident, responding staff may not receive adequate updates on the crisis as a whole, and may have less opportunity to receive information from the mass media than the exposed population. Such staff may also be residents of the affected area and need briefing on both personal and community risks.

Effective communication can be accomplished through public meetings or groups of key individuals. Public meetings, at which epidemiologists present information and answer questions from the exposed population, are the ideal, but these may not be feasible in view of geographical conditions or the characteristics or knowledge of the potential audience. As an alternative to public meetings, results can be reported to local opinion-formers or elected representatives, assuming they have the population's confidence. Media statements and subsequent interviews can be used to reach as large an audience as possible.

Ideally, the lines of communication and an ethos of mutual trust will have been established before the incident. This requires the acceptance and involvement of the public, the press and co-workers in incident management as legitimate partners. In

addition, communications should be carefully planned, and evaluated for effectiveness. The people managing the incident must:

- listen to the concerns expressed;
- be willing to be honest, open and frank;
- have an understanding of the role of and constraints on the media; and
- have the ability to avoid jargon and show understanding and empathy.

The effect of the communications strategy should be continuously evaluated throughout the incident; if needed, the strategy should be modified.

The maintenance of an atmosphere of cooperation, particularly with the local community, is essential. To retain public confidence in the impartiality of the study team, the affected population should be the first recipients of the results of this work. Ideally, the information will be correct and unambiguous. This may be difficult where available data are limited and different interpretations are possible. People expect certainties and definite answers from both officials and scientific studies. Unfortunately, uncertainty is not a fixed quantity or always reduced by scientific research.

Critical situations result when the groups potentially affected do not trust the people managing the response or those advising them. Messages to the public must use simple language that is intelligible to people without a technical or scientific background. In particular, the public needs to understand and accept that epidemiological studies examine populations rather than individuals, and that their results reflect this. For example, although an incident may affect the health of a small number of people, the epidemiological evidence might be not strong enough to show a statistically significant effect in the entire exposed population.

To ensure that the public understands the information provided, its presentation may need to be repeated or changed over a period of days or weeks. Widely distributed, clearly written information bulletins may be useful. The people exposed and their relatives should have the chance to ask questions about the potential dangers and to discuss their individual risks of present or future health effects with experts. Further, those managing the

public information response must identify and address any misconceptions within the community. This process is complicated when information about the hazards is limited, if not nonexistent.

Problems of communication between epidemiologists and the public may arise at different points: the first-hour prediction of risk (including the choice of mathematical models and size of statistical errors considered to be acceptable), interpretation of early clinical events, evaluation of the need for ad hoc epidemiological studies, and assessment of potential bias in the results. Ethical guidelines for risk communication have not been defined, but measures for converting an "arrogation of wisdom" into a "stewardship of wisdom" were suggested to scientists about 20 years ago *(32)*. A whole range of situations lies between two extremes: circumstances in which the prediction of risk is reliable and the implementation of preventive measures is feasible, and cases in which the measurement of risk is uncertain, there are no alternatives to continued exposure and there is no treatment for the relevant condition *(33–35)*.

Those who study the health consequences of an incident must disseminate the results to fellow professionals. This is both to alert them to the identified health effects on the exposed population and to reassure them where effects are absent. The results should be communicated directly, either in writing or orally, as agreed with the local public health officials. Making the information available to the whole scientific community is equally important. Such studies may produce invaluable knowledge for people confronting a similar event. Ideally, studies will be exposed to peer review and published in readily accessible journals. Peer review may help to ensure that an epidemiological study is well designed and properly conducted, and may complement the epidemiologist's inferential process. Further, in the eyes of the public and political authorities, peer review may provide credible support for a decision not to carry out a study, which is likely to be unpopular.

Researchers should always insist on the publication and unlimited dissemination of the results. It is unethical to perform such work and not to make the findings available to colleagues, to enable them to make risk assessments and respond appropriately when confronted with similar public health emergencies. Negative as well as positive findings are invaluable. To reduce the problems of publication bias, papers should be lodged with the

clearing-house that is being established within the WHO collaborating centre at the Cardiff Institute of Higher Education in the United Kingdom (see Box 11). This will permit the results of such investigations to be collated and thus made easily available.

Box 11. Terms of reference of an international clearing house for major chemical incidents at a WHO collaborating centre

The terms of reference are:

- to investigate the possibilities of international collaboration and cooperation;
- to investigate methodologies for the establishment of national surveillance programmes for major chemical incidents;
- to develop guidance materials and standardized documentation for the reporting of major chemical incidents, including what to report, to whom and by what mechanisms;
- to collate and analyse the data received on such incidents and prepare reports in a form that will be useful to countries in planning their response to such incidents in the future;
- to disseminate such information to the regional offices of WHO for onward transmission to WHO Member States;
- to make such information available to other WHO collaborating centres;
- to develop an international database on the problems encountered in dealing with major chemical incidents;
- in collaboration with WHO regional offices and other collaborating centres, to develop training materials and methods, to hold training courses, workshops and seminars, and to participate in personnel development programmes for the management of major chemical incidents; and
- to develop a multidisciplinary team that can be deployed to provide advice on both dealing with a major chemical incident and conducting short-, medium- and long-term follow-up.

The WHO collaborating centre for an international clearing-house for major chemical incidents is the University of Wales Institute, Western Avenue, Cardiff CF5 2YB, United Kingdom (telephone: +44 1222 506852; fax: +44 1222 506983; e-mail: gcoleman@uwic.ac.uk).

Further, the results of epidemiological studies should be circulated to policy- and decision-makers and regulators at the local and national levels. The scientific and health information gained from the incident and any lessons learned about management may need to be incorporated into local incident management plans. They may also highlight the need for changes in the regulatory or legislative framework to prevent the occurrence of future events that may affect public health.

Information is the critical element in all phases of the response to a public health incident. In the planning phase, information and communication needs should be established and the means of obtaining and disseminating information should be determined. The people involved in managing the incident, the health care professionals and the public have different needs. For effective dissemination of information once an incident has commenced, identified chains of communication are essential. These must be established in advance among all appropriate groups; the people tackling this task should remember both the range of potential events and that normal means of communication may not be functioning during an incident.

The simplest approach in selecting the method of communication is to be open, to be honest and to avoid gimmicks. Ideally one spokesperson should speak on behalf of the team managing an incident, or at least the team should issue public statements based on consensus. Team members should speak solely on their areas of expertise and then only within the context of the agreed position. There is always the risk that spontaneous remarks may cause distress to the exposed population and difficulty for the people managing the incident. Possible communication opportunities and constraints should be identified, such as the scheduled time of news broadcasts, newspaper deadlines, etc. To do this requires the definition of communities that may be affected and the creation of an inventory of existing contacts during the planning phase. The appropriate local contacts – community leaders and opinion formers, public health officials and health care professionals – should be documented. Draft information sheets should be prepared for the public and professionals. Before any information is disseminated, the target audience must be defined. Experts like to use statistics, but other people may have a fundamental distrust of them and base their

perceptions of risk on a wide range of values, philosophies, concepts and calculations.

Decision-makers and scientists often become frustrated with the mass media. They expect journalists to report risk information accurately and assign the media some of the blame for public confusion. Journalists are trained to report events that relate to well known topics of current interest and that can easily be described in visual terms. Stories that do not fit these criteria are rarely used. Nevertheless, the media are an important source of hazard and risk information for many people and will play a crucial role in providing balanced perspectives. Researchers should spend time with media representatives to explain the main findings of their research and the main messages to convey to the people.

Training

It is impossible for public health authorities to be completely prepared for environmental incidents. Much of what can be done after an incident depends on the rapid, systematic collection of both routine and non-routine data under difficult conditions. Factors affecting the ability to collect such information include the training, expertise and ability of personnel such as environmental epidemiologists. Teaching still centres on major incidents or disasters with multiple casualties, and the use of immediate death and injuries to judge the severity of the events. There is not enough emphasis on smaller incidents that, owing to their frequency, may have important effects on public health.

Public health practitioners need to be trained to deal with chemical emergencies in the community and to take a leading role in coordinating the response of the health sector. It is essential that this role be planned and well organized in advance of any emergency. To achieve this, public health practitioners need to collaborate with emergency planners and hospitals to ensure that the emergency response automatically includes the public health sector with its predefined role. Further details on the role of the public health sector in preparing for and responding to major chemical incidents are given in a document by WHO, IPCS, the Organisation for Economic Co-operation and Development and the United Nations Environment Programme *(36)*.

The training of epidemiologists should include issues related to the unique aspects of an acute incident, including exposure assessment and risk characterization. Training is needed in both the appreciation of the potential contribution of epidemiology to the management of an incident and in the skills needed by medical practitioners and epidemiologists to make this contribution. An epidemiological perspective is useful to the wide range of professionals concerned with the adverse health effects provoked or exacerbated by environmental factors. The organizational skills of communicable disease epidemiology are useful in the response phase, and the skills of chronic disease epidemiology are essential in examining long-term effects.

Decision-makers need timely and appropriate information. They must appreciate that epidemiologists play a vital role in developing reliable information on the health consequences of an incident, conducting surveys and investigations where necessary, providing advice on health problems that may arise and establishing priorities for action. Decision-makers need to understand the contribution that epidemiology and epidemiologists can make to the successful management of an incident or disaster; this demands an appreciation of epidemiological methods. While some theoretical knowledge is required, an exposure to practical epidemiology is essential. Decision-makers can best acquire these from case studies of incidents and from simulation exercises. The leaders of various professional groups that may be involved in the different phases of an incident need a similar appreciation of epidemiology.

A cadre of epidemiologists with knowledge of and skills in environmental epidemiology is essential. Depending on the local public health system, it may comprise public health officers with additional training or regional, national or international experts able to respond rapidly to incidents. Such people must be trained in the public health management of incidents, risk assessment and environmental epidemiological methods, including devising a plan for a descriptive epidemiological study of an environmental health problem and a basic analysis of the data. Such epidemiologists are able to understand and apply to environmental health the basic principles of epidemiology. In particular, they are able:

- to understand:
  - the adverse health effects of common chemical, physical and biological risk factors;
  - the concept of exposure routes and issues related to measuring environmental exposures;
  - issues related to epidemiological study design;
  - issues related to exposure and health effects surveillance;
  - the roles of and the need to cooperate with other professionals when studying or managing environmental health problems;
  - the principles of risk, risk assessment and risk communication;

- to plan and implement a descriptive epidemiological study;
- to perform a basic analysis of data; and
- to suggest areas for health care development based on the assessed health needs of an affected population.

Full-scale, complex, ad hoc environmental epidemiological studies are collaborative endeavours involving epidemiologists, statisticians and other specialists. Skills systematically developed through studying common environmental exposures and their health effects are essential for the assessment of the health effects of environmental incidents.

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