

## 5 *Disaster Emergency Planning\**

### 5.1 INTRODUCTION

Communities which have made disaster preparedness plans well in advance of the time of the actual event can achieve quicker and better organized responses when an emergency arises. The plans can provide guidance to limit the scope and severity of the effects of chemical exposure. Such plans can also help to ensure that action will be taken during the acute emergency phases to monitor exposed people in order to provide necessary clinical services and to initiate research at a future time.

### 5.2 ESSENTIAL ELEMENTS OF EMERGENCY PLANNING

The purpose of planning is preparedness. Means cannot be improvised once the accident has occurred; the possible type, magnitude and severity of the accident, the implications for health and safety, and the practical requirements of intervention must be foreseen. The plan should take into consideration the size, nature and distribution of the population at risk and the quality of the medical facilities available. It should also take into consideration the possible health effects by focusing on the chemicals released, the routes of exposure, and the relevant organ systems affected, i.e. lungs, neuromuscular, skin, etc. Finally, the plan must be able to deal with the actual events as they unfold.

It is essential to identify a central authority that will take responsibility for coordination of the activities of various responders at the time of disaster, e.g. health authorities, Emergency Medical Service (EMS), hospitals, police, fire brigade, civil defence, transport, etc. It is essential that responders at the time of disaster are fully informed on their respective roles and are properly trained in fields relevant to the potential effects of the accident. They should undertake routine rehearsals at periodic intervals.

The plan should include both on-site and off-site features: the former a duty of the plant owner, and the latter a responsibility of the local/regional/national authorities. Public health planning for disasters is especially important to

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ensure cooperation among all hospitals and medical care facilities that are involved. Awareness among the population potentially exposed must be fostered. The discussion that follows is organized around these different aspects of emergency planning.

### 5.3 ON-SITE PLANNING

On site there must be comprehensive knowledge about the chemicals likely to be released, especially regarding their nature, flammability, reactivity, toxicity, metabolism and any special effects of the chemicals on human and non-human systems. First-aid measures and antidotes to be used must be known. This information must be properly classified, stored and easily retrievable.

There is a fairly direct parallel with safety planning although possibly allowing for more 'top of the range' events and requiring periodic updating. On-site emergency planning may seem easier, at least in large complexes, since intervention methods (fire fighting, shelters, respirators, etc.) are available, and exposed staff are acquainted with plant and practices. However, the quality of their preparedness needs regular verification (drills, simulated alarms) as well as ensuring availability of competent decision makers and interveners during nightshifts. The emergency planning must account for plant aspects also (emergency shutdown, interrupting flows, etc.) and for the preservation of a degree of control of the operations (bunkerized control rooms, protection of links, availability of electrical power and water). Actually, the issue is complex; since large factories may feature many diverse units, escalation cannot be ruled out, and many people may be simultaneously involved and at great risk. Mutual assistance schemes between neighbouring factories in 'chemical aggregates' have been devised. The interface with off-site emergency planning is obvious, and this involves external teams (firemen, police, first-aid units) who need to be aware of the multiple hazards at hand in the event. Information on the nature of likely hazards and their containment, remedial and therapeutic measures must be made available by the manufacturing unit to off-site civic authorities, especially those concerned with fire fighting, environmental health, water supply, and public transport, and this information must be updated periodically. A disaster control plan must be evolved by the manufacturing unit, wherein interface between the unit and off-site agencies is laid out and discussed with those agencies, and a final approved disaster control plan made available to all the concerned agencies. To ensure that integration is effective, periodic drills must be organized and the plan should be revised to remove the deficiencies found from these drills. The disaster plan should be kept updated periodically with feedback from incidents (see Henry Falk, this volume, Chapter 7).

#### 5.4 OFF-SITE (COMMUNITY) PLANNING

Off-site emergency planning first involves local/regional authorities and those intervention teams mentioned above. There, too, a host of technical and practical information is required in advance: type and location of the hazards, means of intervention and their appropriateness (i.e. knowledge of substances involved), key persons in charge and means of communication, location and extent of emergency control, geological and meteorological information on likely run-off and dispersion pathways, etc. Decision must be anticipated: evacuation of non-essential staff, fencing off the area, warnings to be issued to other authorities downstream, call for assistance, and much more.

Off-site planning covers neighbouring populations at greater or lesser risk during the acute phase of the event. Here, too, proper behaviour cannot be expected without preparedness. Guidance issued in the United Kingdom (Health and Safety Executive, 1985) distinguishes three categories – immediate individual neighbours, small communities (workplaces, schools), people in transit nearby (cars, visitors, etc.) – and grades the feasibility of preparedness accordingly. For the first, more obvious, category, arrangements should be made for providing sufficient, explicit, simple-to-understand information as to what to do in the event of a chemical emergency next door. There are various schemes: mailing of brochures, holding of public meetings, etc., to be carefully balanced against the likelihood of raising irrational fears. For the other categories, as well as if evacuation is needed, decision rests with the authorities in charge. Ways and means must be anticipated (loudspeakers, police teams, army units, perhaps) to ensure swift removal and avoid panic. The issue is not at all simple. (Who decides when and how to avoid conflicting or parallel moves? How many people require temporary accommodation?) Parallels drawn from precedents (floods, earthquakes, etc.) form one facet of overall disaster preparedness in any region or country.

Good plans will include information about the community's risk of experiencing chemical accidents stemming from the manufacture, use, transportation, or storage of chemicals. Information should be available about the equipment, facilities, supplies, and knowledgeable personnel available at the local, regional, national, and international levels to respond to chemical emergencies. Most important of all, good preparedness includes plans and practice drills to mobilize resources for best use. Effective utilization of resources requires coordinated efforts by public and private emergency response organizations (such as police and fire departments), relief agencies, medical services, government executives, mass media, and the producers and transporters of chemical materials. A background of formal and informal communication among the involved organizations can increase their ability to work together effectively. Such questions as who will take charge, who will

carry out tasks, and what lines of reporting to follow should be decided upon before the event, in order to avoid confusion, delay, and unnecessary duplication of efforts. It is important to recognize that issues of leadership, authority, jurisdiction, and task performance may arise repeatedly during an emergency and in the period that follows. These potential sources of conflict must be explicitly resolved beforehand. Plans must be flexible so that changes can be made as necessary.

## 5.5 PUBLIC HEALTH PLANNING

Planning for industrial chemical disasters involves several different types of activities by public health agencies. Health authorities should take the lead in ensuring that their plans adequately meet the demands on public health services that are identified in both the on-site and off-site plans.

The public health plan includes the development of toxicology databases with information on specific chemicals of interest. Information in the toxicologic database should include the specific properties of each chemical, human and animal toxicologic data, diagnostic information, general and specific treatment, and specialized sources of expertise. In addition, the database should include information on the appropriate antidotes and other medications that should be stockpiled for emergency use. See Appendix in Part A of this volume for additional resource documents.

An organized function unit needs to be established to develop plans for the public health response in an emergency. A structure should be established which identifies who is in charge, the chain of command, and lines of communication. The general outline of the plan must be applied to the particular situations of concern, based on the chemical, and to the particular hazards identified in the on-site and off-site plans, and taking account of the toxicological information on the chemicals of concern. All relevant groups (e.g. physicians, toxicologists, environmental scientists, public information experts, and community and media representatives) need to be involved.

These different planning efforts interact with each other. For example, knowledge about local industries will affect priorities in development of toxicologic databases and community disaster plans. Regarding toxicologic information, public health authorities have to guarantee that the following activities are started and that they are updated regularly:

1. Well in advance, information must be immediately available in case of an accident. This information should include:
  - toxic action of the substance;
  - routes of exposure;
  - target organs;
  - symptomatology (including acute and possible late effects);
  - treatment (general and specific).

This information should be adapted to the 'level' at which it will be given and the training and knowledge of those who will be using it.

2. At the plant or for those involved in transport vehicles, etc., this information should be available in the form of safety data sheets, transport emergency cards, etc. Responsibility for this should be with the plant manager, the transporter, etc.
3. The rescue personnel, i.e. first responders, as well as medical personnel, should be provided with information on first-aid measures, and when appropriate, scientific emergency measures that ought to be taken.
4. Health personnel should be provided with specific toxicological information for each toxic substance. Detailed information should be compiled before an accident. For example, poison centres (or equivalent organizations, see Appendix in Part A of this volume) have a great responsibility in this matter by:
  - starting inventory activities of possible toxicants;
  - compiling detailed information on toxicity data, including symptomatology and treatment;
  - disseminating this information:
    - making it directly accessible in the acute situation by telex, telefax, or computer on a 24-hour basis. Enormous amounts of toxicology data are now becoming readily accessible by use of personal computers linked to toxicology databases; the local potential of using such systems should be explored;
  - providing guidelines to local, regional, and national planners in their development of emergency plans, preparation of antidote stores, etc.
    - Inventory activities and compiling information will need significant resources and will take a great deal of time.
5. A close collaboration should be established and regularly updated between occupational health departments and local hospitals for:
  - inventory of toxic agents in the plants;
  - providing local hospitals with adequate information on hazardous substances.
6. A centralized body (bodies) should exist that reviews available resources in the country (region). For example, poison centres should have details of where existing antidote stores are situated and how large they are; some other authority should have lists of experts in different fields of toxicology, chemistry, etc.
7. It is essential for public health authorities to work closely with environmental and other appropriate agencies (e.g. transportation) to assemble and assess all potential hazards within a community. Often, the available data will not be known to the health department and can only be assembled by collaboration with other agencies.
8. In public health planning for chemical accidents, education on all levels is of

- crucial importance. First responders should be included here, as well as all types of medical personnel. The presentation of the disaster plan for the purposes of training and education should be geared to the needs of each group being trained.
9. It is important that key trained personnel gain practical experience in disaster and emergency situations. Participation in, or observation of, such situations is of crucial importance in gaining such experience.

## 5.6 PUBLIC AWARENESS

Because few communities have experience with chemical accidents, local authorities may not be interested in making extensive preparedness plans. Regional or national government authorities may have to take the initiative, include local authorities in planning efforts, and offer resources for local use as necessary.

In some instances, accidents may affect more than one country, as with the chemical release into the River Rhine from the Sandoz plant, or the magnitude of the disaster may be such as to require international assistance and, correspondingly, preparedness. (This may be the case in earthquake-induced mixed disasters, catastrophic spillages, etc.) Close coordination among different countries and international groups, as well as with the chemical industry and various professional organizations, can encourage and improve sharing of knowledge and experience.

The public in communities likely to experience chemical emergencies may not be convinced that planning is worthwhile if they have not yet experienced such an event. Programmes of community education through the schools, religious organizations and the media should be considered. The goals of such programmes are to make the public aware of the necessity for preparedness, and to alert them to the specific ways they must act to protect themselves, as well as the ways that community agencies will respond in the event of chemical disaster.

## 5.7 RECOMMENDATIONS

1. Every community's plans for responses to emergencies should include plans for chemical emergencies. All possible responders should be very familiar with the action plans. Leadership, authority, jurisdiction, and formal lines of communication are issues that must be decided upon in the plan. There should be recognition of the necessity for flexible changes as required in the acute stages of an emergency. It should be clearly understood what specific conditions will initiate the implementation of the disaster plan.
2. There is a need to evaluate thoroughly potential environmental hazards in each community to identify situations of potential concern. Both fixed and

- mobile sources of potential chemical releases should be considered.
3. Plans for chemical disasters should specifically address on-site, off-site and public health features. Provision of adequate information to the population potentially exposed should be ensured.
  4. The on-site plan should be prepared by the plant owner, taking account of the nature and scale of potential accidents.
  5. The off-site plan should be prepared by the local/regional/national authority as appropriate to the scale of the potential accident. It should be integrated with the on-site plan.
  6. The public health plan should provide for emergency medical and essential public services needs to be prepared at each organizational level. Public health authorities should ensure that activities are started to identify hazardous substances and that toxicological information is compiled and made available. If sufficient information is lacking, initiatives must be started in this field. The plan should be readily accessible and ready for implementation at the time of the accident. The plan should be self-sufficient, describing in detail all aspects needed for implementation.
  7. All plans should be subject to periodic exercises and should be revised to take account of any deficiencies revealed.

#### REFERENCE

Health and Safety Executive (1985). *The Control of Major Accident Hazards Regulations 1984 (CIMAH): Further Guidance on Emergency Plans*. Guidance Booklet HS(G)25, HMSO, London.

