

**INTERNATIONAL PROGRAMME
ON CHEMICAL SAFETY**



GUIDELINES ON THE PREVENTION OF TOXIC EXPOSURES

**Education and public
awareness activities**



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the International Labour Organization**

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¹ The IPCS is a cooperative venture of the World Health Organization (WHO), the International Labour Organization (ILO) and the United Nations Environment Programme (UNEP). WHO is the executing agency for the programme, which aims to provide the internationally evaluated scientific data basis for countries to develop their own chemical safety measures, and to strengthen national capabilities to prevent and treat harmful effects of chemicals and to manage chemical emergencies.

Preface

“Prevention is the best antidote.”

Exposure to toxic chemicals represents an important public health problem worldwide. According to a WHO estimate (WHO, 2000), unintentional poisonings led to 300 000 deaths in the year 2000. Over 70 000 deaths occurred in children up to 14 years old. Certain populations and groups are more vulnerable to the effects of chemicals. Children under five years of age tend to touch, test and explore their surroundings, getting in contact with toxic chemicals unsafely used or stored. They may grow, live, and learn in unsafe environments where chemicals threaten their development. Rural and industrial workers use sometimes with no protection large volumes of chemicals, some of which are extremely hazardous. Pregnant women may expose themselves and the developing fetus to the effects of chemicals in their environments at crucial development periods of their life. Elderly people are, due to physiological change, more susceptible to the toxic effects of some chemicals. Illiterate people, unable to follow written instructions or inappropriately trained people, may be prone to use chemicals unsafely. Lack of information and education often results in people ignoring or neglecting simple measures that could help to prevent the toxic effects of chemicals. As a result, a large number of poisoning cases result from human carelessness, negligence and ignorance, all of which could be avoidable.

In addition, in some countries, health and other authorities may be unaware of the magnitude of the problem of toxic exposures. Why? Firstly, because they are overwhelmed by other health priorities, such as infectious diseases. Secondly, because the burden imposed by poisonings on the public health system has not been fully recognized or assessed. In fact, existing registration systems do not reflect the real morbidity and mortality due to poisoning, as toxic exposures are sometimes diagnosed as a cardiovascular, respiratory, renal or any other disease. These countries should become better able to assess their toxicological problems – through improved surveillance systems and also to comprehend the benefits offered by educational campaigns.

Whilst in some parts of the world there is ignorance about the value of preventive activities in the protection of public health, education campaigns, including prevention of toxic exposure, have proven effective in many others. Toxicovigilance is essential for planning prevention. It consists of the active observation and evaluation of toxic risks and phenomena in the community, their reporting to health authorities, and the promotion of actions aimed at reducing the risks. Toxicovigilance mechanisms, followed by health

education campaigns including prevention of poisoning, have proven effective in many communities. The experience gained by the professionals who developed these activities, their publications, brochures, educational campaigns and audiovisual materials, are a valuable source of information and reference for those that are ready to develop and implement preventive activities. The prevention materials prepared by the International Programme on Chemical Safety (IPCS), and those received from different centres around the world, have been effectively used as examples in training activities related to primary prevention. The IPCS has collected a large amount of information and experience on the subject through activities undertaken in cooperation with approximately 60 specialized information and treatment centres. Materials include reference publications, audiovisual materials, brochures, posters and examples of poisons prevention campaigns from different parts of the world.

A number of countries, especially developing ones, are concerned about unsafe exposure to chemicals and its impact on human health, and are deeply interested in developing educational and preventive activities at the community level. It is our aim to provide the basis to assist these countries in the promotion of the safe use of chemicals and prevention of poisoning through information and education campaigns.

Executive summary

A large number of people are injured or die each year as a result of exposure to both man-made chemicals and naturally occurring toxins. Furthermore, misuse of chemicals frequently leads to damage to the environment. For example, the high incidence of pesticide poisonings in developing countries is an important problem, and misuse of pesticides frequently leads to damage to the ecosystem. Toxic chemicals are also widely and unsafely used in a multitude of small-scale workshops and cottage industries, such as textiles, tanning and metalworking. Chemicals are inappropriately handled and poorly labelled or stored, such as kerosene distributed in soft drink bottles. A growing number of chemicals are used in the home and surrounding domestic environment, and contaminants or naturally occurring toxins are present in food (e.g. in fungi, plants and seafood). The storage and transport of highly dangerous substances such as chlorine, hydrocarbons and cyanide in urban areas create a potential for major chemical disasters, in addition to the chemical incidents which frequently occur at industrial sites.

Acute and chronic, individual and mass toxic exposures occur due to lack of awareness among the general public of risks of chemicals. These exposures are preventable.

The International Programme on Chemical Safety (IPCS) supports national programmes for prevention and treatment of poisonings due to chemicals of synthetic and natural origin. The potential benefits of successful national chemical safety programmes are:

- A reduction in the number of exposures and poisonings in the home, outdoor and indoor environments and the workplace.
- Detection and elimination of unusually hazardous commercial products through regulatory measures, repackaging or reformulation.
- Use of appropriate first aid measures in case of toxic exposure.
- Reduction in the inappropriate use of emergency departments and emergency medical transportation systems.
- Improved care for poisoning victims as a result of education for health care professionals in the management and prevention of poisonings, with a consequent reduction in disabilities and costly long-term medical care.

However, it takes time and effort to carry out national safety programmes and they may seem too complex and too costly to some decision-makers. These Guidelines have been prepared by IPCS to help governments, national agencies and urban and rural communities plan, carry out and evaluate education campaigns addressed to the public as well as other activities to promote safe use of chemicals and prevention of poisoning.

Chapter 2 defines prevention and summarizes the active and passive strategies that can be used to promote chemical safety, for example, emergency communication about chemical risks to communities; product labelling; regulation of chemicals by legislation, registration, licensing, standards and notification systems; international conventions and agreements; technological strategies to improve product safety (e.g. child-resistant packaging); changes to product formulations; and engineering controls to prevent exposure in the workplace. The effectiveness of all these strategies depends on education campaigns to inform and persuade people that the measures are effective and worthwhile, and increase their concern about improving chemical safety and preventing poisoning. Education strategies are important to raise awareness of problems among professionals, and policy-makers, and to influence priorities for action.

The stages in the process of planning an educational programme are outlined in Chapter 3: they include collecting information about exposures occurring in the community, deciding priorities, setting objectives and assessing the resources that will be needed.

Chapter 4 describes how to communicate safety messages and poisons prevention messages effectively, and reviews the methods for educating groups (e.g. formal lectures and presentations, workshops and discussion groups). Education of individuals can be undertaken by health professionals in hospitals, clinics or home visits as part of the delivery of health care, or can be a role for other community workers. Popular media, the mass media, videos, printed materials, displays and exhibitions and community events can all be effective in promoting safety and prevention messages to communities, and the Guidelines discuss how to make the best use of each method.

Chapter 5 reviews the organizations and individuals with a role in chemical safety programmes and outlines their responsibilities. The responsibility for poison prevention is shared among a large number of partners: international organizations, regulatory agencies, local authorities, educational institutions, commercial and industrial organizations, trade associations, public safety officials, organizations concerned with child safety, health care providers and others. Social workers, religious organizations, community and voluntary organizations, the media, groups concerned with the environment, and members of the target community also play a role in prevention activities. The combined expertise, effort and resources of a number of partners may be essential for effective campaigns for chemical safety and poisoning prevention.

Once a prevention activity has been launched it is important to assess whether it is effective, whether any changes could improve effectiveness and whether it should continue. Chapter 6 looks at methods for evaluating the programme, in terms of both how well it is operating, and how much it has cost in money, time, and effort. The evaluation should also assess whether the programme is achieving its objectives, whether the results and outcomes are as expected, and whether there are any unintended problems or collateral benefits.

The most convincing measure of the impact of a poison prevention programme is a change in the incidence and/or severity of poisonings, but other measures may have to be used if it is difficult to obtain data on number of poisonings, or if the programme is not expected to have a short-term impact on morbidity or mortality. In such cases it might be more appropriate to measure increase in knowledge of safety in the target community, or

changes in attitudes or behaviours associated with poisoning. For example, programmes aiming to teach the safe use of pesticides might conduct a survey of the use of protective equipment and personal hygiene measures, the methods used for waste disposal, and the cleanliness of the workplace. In general it is appropriate to look at more than one indicator, because programmes often have different impacts on apparently similar indicators. For example, a parent may be persuaded by a safety campaign to keep all medicines in a locked cupboard, but may keep dangerous household chemicals in accessible cupboards or dispose of pesticide containers unsafely.

Process evaluation of a prevention activity measures what was done, how it was done, who was involved, how it was organized, and the factors that hindered or facilitated activities. Such evaluations could, for example, count the number of activities undertaken and the numbers of people contacted or involved in the activities. Qualitative information could show what people in the target community thought of the programme, whether they understood the message. If the impact evaluation fails to show that the programme was effective, the process evaluation can show whether this was due to inadequate implementation or to the methods used.

Section 2 of the Guidelines describes in detail how the principles set out in Part 1 can be applied to programmes addressing poisoning in different environments such as the workplace, the home and the rural environment.

Annexes 1 and 2 illustrate what has been, and is being, done in some countries where toxic exposures have been recognized as a specific health problem. The examples of prevention programmes are based on materials presented by experts from several countries at the workshop “Prevention of Toxic Exposures: Public Education Activities” organized on behalf of IPCS by the Belgian Ministry of Social Affairs, Public Health and Environment, in coordination with the Belgian Poisons Information Centre, from 9–11 September 1996, at the Institute of Hygiene and Epidemiology. Annex 1 focuses on experiences of prevention from different organizations in a number of different countries, and includes examples of the range of activities implemented by poisons centres, government and nongovernmental bodies. Annex 2 focuses on specific chemical safety issues and poison prevention objectives, and describes the methods used to target particular hazards and communicate particular messages, and the roles of different partners in the programmes.

SECTION I

1. Background

1.1 Activities developed by the IPCS

One of the main objectives of the IPCS is to “support national programmes for prevention and treatment of poisonings involving chemicals”. Preventive activities developed by the IPCS in the last decades include the dissemination of posters and information materials on prevention of exposure to chemicals, meetings of experts on prevention of exposure to chemicals, and a number of training and awareness-raising activities developed in the context of the IPCS INTOX Project. The INTOX project aims at promoting the setting-up and strengthening of poisons control centres and related activities.

A Working Group on “Public Health Response to Acute Poisonings: Poisons Control Programmes” was jointly organized by the IPCS, the WHO Regional Office for Europe and the Commission of European Communities (Munich, December 1985).¹ The Working Group recognized and recommended that, in addition to an adequate response to poisonings, governments should promote, within the framework of national chemical safety programmes, awareness of the need for prevention and early identification of the health problems due to poisonings. The key role of poisons centres in this area of response to poisonings was acknowledged, as well as the need for their close collaboration with other partners in contributing to effective actions to prevent poisonings (IPCS, 1986).

A second working group was jointly organized by the WHO Regional Office for Europe, the Commission of the European Communities, and the International Programme on Chemical Safety, in cooperation with the World Federation of Associations of Clinical Toxicology Centres and Poisons Control Centres, and the European Association of Poison Control Centres, with the support of the Federal Republic of Germany in Munster (8 to 12 December 1986). The Group discussed the approaches to identifying high-risk circumstances of poisoning, possible options for the prevention of exposures, and the role of various partners in implementing poisons prevention programmes. The proceedings of the meeting were published as Environmental Health Series 28 (WHO, Regional Office for Europe, 1987).²

¹ *Working Group on Public Health Response to Acute Poisonings: Poisons Control Programmes*. Meeting organized by the IPCS, the WHO Regional Office for Europe and the Commission of European Communities (Munich, December 1985). IPCS, Geneva, World Health Organization, 1986.

² *Working Group on High Risk Circumstances of Poisoning*. Meeting organized by the WHO Regional Office for Europe, the Commission of the European Communities and the International Programme on Chemical Safety in cooperation with the World Federation of Associations of Clinical Toxicology Centres and Poisons Control Centres and the European Association of Poison Control Centres (8 to 12 December 1986). World Health Organization, Copenhagen (Environmental Health Series 28), 1987.

A Workshop on “Prevention of Toxic Exposures: Public Education Activities” was organized on behalf of the IPCS by the Belgian Ministry of Social Affairs, Public Health and Environment, in cooperation with the Belgian Poisons Information Centre (9–11 September 1996), at the Institute of Hygiene and Epidemiology, Brussels. Experts from over 15 countries reviewed the draft guidelines on prevention of poisoning prepared by IPCS to assist countries in the planning, implementation and evaluation of preventive activities and health education campaigns concerning chemical safety in the community. In addition to reviewing the draft guidelines, the workshop provided the opportunity for participants from different regions of the world to exchange experiences concerning the preparation, implementation and evaluation of prevention and educational campaigns in the area of chemical safety, and to discuss different methods and strategies for the identification and characterization of toxic exposures and for raising awareness on the safe use of chemicals. These discussions were particularly helpful to participants from India, for planning the organization of a prevention campaign in December 1996, to coincide with the anniversary of the Bhopal disaster.

The IPCS is in a strategic position to promote technical cooperation in prevention activities among Member States, with the support of regional offices, environmental health centres, NGOs and other partners, to help improve the capabilities of national authorities for primary prevention and provide the technical support required by national programmes for the prevention of toxic exposures.

1.2 International recommendations

Within the framework of the United Nations Conference on Environment and Development, held in Rio de Janeiro, Brazil, 2–14 June 1992, the environmentally sound management of toxic chemicals was selected as a priority topic for an international strategy. Among the six action programme areas identified, two make reference to the need for preventive activities: “establishment of risk reduction programmes” (area a) and “strengthening the national capabilities and capacities for management of chemicals” (area c). Specific programme objectives aimed at “the strengthening of national capabilities and capacities for management of chemicals” (programme area e) refer to the “establishment and strengthening of health protection and monitoring programmes, including positive approaches to the prevention of poisoning”.

The Intergovernmental Forum on Chemical Safety (IFCS), set up by the International Conference on Chemical Safety (ICCS) in Stockholm, Sweden (April 1994), is an international catalyst for global efforts on the prevention of toxic exposures. In 2000, its member governments and other partners revised the priorities for action, that include:

- (h) promote the strengthening of national programmes and international cooperation for the prevention of, preparedness for, and response to chemical accidents including major industrial accidents;
- (i) promote the strengthening of programmes for the prevention of and response to poisoning by chemicals.

At its fourth session in 2004, the IFCS considered strategies and actions to address a number of topics including chemical safety and vulnerable pop-

ulation groups – especially children, acutely toxic pesticides and occupational safety and health, and agreed on a broad range of recommended actions by national governments, intergovernmental and nongovernmental organizations to address these issues and contribute to the prevention of toxic exposures.

UN organizations, such as the United Nations Children's Fund (UNICEF), the United Nations Institute for Training and Research (UNITAR) and the International Labour Office (ILO) are involved in preventive and educational activities. The awareness and preparedness for emergencies at a local level (APELL) of the United Nations Environmental Programme (UNEP) is for example, a specific programme that aims at prevention of chemical exposures minimizing the occurrence and harmful effects of technological accidents and environmental emergencies.

1.3 Regulatory measures

Administrative or regulatory measures are, together with education and information, essential components of preventive activities. The measures may consist of simple informative actions or sets of rules and regulations, or the more complex codes of conduct or heavily sanctioning legislation, according to the type of chemicals addressed, health risks involved population group exposed, and extent to which specific chemicals are used.

Specific legislative measures may concern: manufacturing, processing, transport, storage and packing of products, or use (by the public or specific groups) and disposal of chemicals. In general, only broad requirements are referred to in laws, and the responsibility to meet requirements is left to responsible users, producers or transporters.

2. What is prevention?

2.1 Definition and purpose of prevention and toxicovigilance

Prevention is defined as the promotion of health by the individual and the community, and includes identifying departures from good health and intervening to correct them or to minimize their effects.

Prevention of toxic exposures is concerned with preventing chemicals of synthetic or natural origin from reaching people in amounts or at rates that exceed human tolerance to them. It includes identifying and evaluating the causes of poisonings, making predictions about their frequency, and putting into practice measures intended to mitigate or eliminate future exposures or to reduce the severity of health effects after an exposure.

Prevention of exposure is part of the dynamic process of toxicovigilance, which includes identification and evaluation of toxic risks and phenomena, and communication with the authorities in order to plan and take action.

2.2 Types of prevention

A toxic exposure occurs when a susceptible individual or population comes into contact with a chemical in a particular environment. The individual may be poisoned as a result.

Throughout these guidelines, the term “poisoning” should be understood to include all toxic exposures, including “suspected poisonings” and those that may not result in poisoning.

Prevention activities may intervene before, during, or after a “poisoning” event.

Primary poisons prevention activities intervene before the event, aiming to prevent it happening, either by controlling the victim’s access to the agent, controlling the action of an agent upon the victim, or controlling or changing hostile environmental factors. Primary prevention strategies may be active or passive.

- *Active strategies* seek to change attitudes, lifestyles and behaviours of individuals and groups, for example, by educating communities and individuals about poison awareness and safety practices, or campaigning for initiatives such as safer packaging, labelling and storage of chemical products.
- *Passive strategies* automatically protect people, by improving the safety of products and the environment where they are used. Once these changes are made, they require little individual effort from the beneficiary and can

have a far-reaching impact. The best example is given by the child-resistant packaging of pharmaceuticals, which has reduced poisoning in children (Rodgers, 1996). Although the safety of reclosable child-resistant closures (CRCs) is only maintained if the user remembers to re-close the container correctly, non-reclosable packaging provides protection without any cooperation from the user. The addition of bittering agents to dangerous liquids, such as ethylene glycol, is another passive strategy to prevent poisoning.

Secondary poisons prevention is the action taken after an exposure has occurred, to prevent the poisoning from progressing to a more serious, irreversible or chronic stage and to restore the victim to his/her former state of health. It includes the initial steps to minimize the effects of the toxic agent, the diagnosis, decontamination and first aid treatment, and specific antidote therapy.¹ This may include educating both the community and professionals about how to recognize and manage poisonings and how to give first aid after a toxic exposure by, for example, washing the skin and eyes immediately after contamination by a pesticide.

Tertiary poisons prevention deals with the diagnosis and treatment of poisoning victims who cannot be treated to full recovery, to prevent death or permanent disability. It is also concerned with educating victims and their relatives about how to make the most of the remaining potential for healthy living, including the avoidance of unnecessary hardships, restrictions and complications, i.e., rehabilitation and physiotherapy in cases of toxic polyneuropathy.

2.3 Benefits of prevention

The prevention of poisonings positively improves the quality of health, and thus the quality of life, of both the individual and the community as a whole.

Individuals benefit from information and education that gives them an increased awareness of accident risks, a greater control over their own health and their environments, and more freedom to choose a safe environment and an injury-free lifestyle. This supports personal and social development.

The community benefits from knowledge, skills and support in articulating their needs. They are enabled to define problems, set priorities, make decisions, and plan and implement strategies. At the heart of this process is the empowerment of communities, their ownership and control of their own endeavours and destinies.

There are *specific health and economic benefits*. Prevention activities save resources and contribute to the rationalization of medical care in public health systems. Benefits include, for example:

- reduced incidence of unintentional, intentional and occupational poisoning occurring in the home, outdoor and indoor environment, and the workplace
- use of appropriate first aid measures at the site of exposure in the home or in the field and a reduction in adverse effects resulting from use of outdated, hazardous first aid procedures

¹ World Health Organization. *Guidelines for Poisons Control*. Geneva, World Health Organization, 1997.

- reduction in the inappropriate use of emergency departments and emergency medical transportation systems
- Improved care for poisoning victims as a result of education for health care professionals in the management and prevention of poisonings, with a consequent reduction in disabilities and costly long-term medical care
- early detection and elimination of unusually hazardous commercial products through regulatory measures, repackaging or reformulation.

2.4 Barriers to prevention

Plans to introduce preventive measures must take account of factors that may influence the actions and behaviour of people at risk and others affected by the measures. For example, a person may not want to carry out the action if the negative influences seem to outweigh the positive advantages, or if there is a lack of resources to do it. Some of the negative factors that may influence people and set barriers to prevention are:

- *Difficulty*: the amount of effort needed to implement protection is a disincentive to carrying it out. People are more likely to modify their behaviour if the learned action is simple, non-repetitive, convenient and short term, than if it is difficult or inconvenient or has to be repeated.¹ For example, if it is difficult to open child-resistant containers, people are likely to leave the container open or use another container instead. Agricultural workers may find protective clothing uncomfortable and cumbersome for work, and abandon it.
- *Cost*: preventive measures may cost more than individuals or communities are able to pay or want to pay. For example, individuals may not have enough money to buy lockable cupboards for storing dangerous household products or containers with child-resistant closures for storing liquid fuel. Communities may not be able to pay for improvements that would make them safer.
- *Time*: time is needed to introduce safety measures, and to use safe practices at work or in the home. For example, to keep chemicals stored safely at work, workers need to allow time at the end of every day to replace the chemicals in the store. Women who have to work may not be able give enough time to supervising their children.
- *Human resources*: there may not be enough people with the time, expertise or motivation to carry out either some or all aspects of a prevention programme. For example, there may be insufficient trained educators to visit local communities.
- *Social pressures*: people are influenced by the beliefs and attitudes of others around them in the community or the workplace. For example, a worker may be discouraged from using protective clothing by the attitudes of his/her colleagues who do not use it.
- *Technical barriers*: technical difficulties of assessing accurately the safety of containers, storage and methods of use may hinder prevention. For example, it is difficult to assess the child-resistance of blister/foil pack-

¹ Schelp L. The role of organisations in community participation – prevention of accidental injuries in a rural Swedish municipality. *Social Science and Medicine*, 1988, 26:1087–1093.

aging, and there are technical difficulties in designing child-resistant closures for thick syrups.

- *Political, commercial and financial interests:* prevention strategies attempting social and environmental change may be contentious and politically sensitive. There may be powerful groups with interests which seem to conflict with the objectives of prevention, e.g. the costs incurred in supplying a product with a child-resistant closure may prevent it being commercially viable against its competitors on the market. Financial pressures may also influence individuals. For example, farmers continue to use toxic pesticides if they suspect that new, safer alternatives are less effective. Retailers may feel their business is threatened if the public are told their goods are toxic.
- *Absence of evidence of efficacy of the poison prevention initiative:* It is difficult to show that prevention activities have had an effect when there are so many other influences that affect attitudes or behaviour. For example, there is no evidence that disposal of unwanted medicines campaigns reduced the numbers of child or adult poisonings. The lack of positive results may deter some people from making any effort towards prevention.
- *Advertising:* advertising for household chemicals, medicines and alcohol, although directed at adults, may nevertheless encourage use by children, especially if the advertisements feature prominent people who are seen by children as role models.
- *Interventions attracting undue attention to unsafe behaviour:* some interventions can worsen the situation, e.g. by calling attention to the behaviour and encouraging people to try it. For example, plots about self-poisoning included in popular television dramas in order to deter people by showing them the consequences, may have the opposite effect and result in an increase in cases.^{1,2}
- *Confusing safety measures:* unclear messages may increase the risk of toxic exposures. For example, many people think that “child-resistant” packaging is completely “childproof” and do not understand that it is still important to store the product safely.
- *Individual rights:* the effectiveness of regulations intended to prevent poisoning may be reduced if they have to allow for individual rights. For example, because some people are unable to use child-resistant containers, regulations regarding their use have to allow individuals the right to have regulated products in a non child-resistant container.

2.5 Education to prevent toxic exposures

These Guidelines focus mainly on education and information activities, which are essential in any programme for preventing poisoning. Health education provides people with knowledge and training in skills, informing, motivating and persuading them to adopt health-promoting or safe behaviours. Health education directed at individuals helps them to make decisions about their health and acquire the necessary confidence and skills to put

¹ Veysey MJ et al. Effects of drug overdose in television drama on presentations for self poisoning. *British Medical Journal*, 1999, 319:1131.

² Hawton K et al. Effects of a drug overdose in a television drama on presentations to hospital for self poisoning; time series and questionnaire study. *British Medical Journal*, 1999, 318:972–977.

their decisions into practice. When directed to communities, professionals, and policy-makers, health education for prevention of poisoning is concerned with raising awareness of problems, influencing priorities for action, and persuading about the potential effectiveness of preventive measures. Without these activities, prevention strategies such as regulation and legislation will have little impact. A lack of resources need not be a barrier to community education if safety messages are integrated into existing health care programmes, particularly those concerned with the health of children, the elderly and specific vulnerable groups.

2.5.1 Education aimed at individuals or communities

Prevention of poisoning and chemical safety should be something people learn throughout life in school, home, work and community settings. Education should aim to:

- raise awareness
- increase knowledge
- change attitudes and behaviour.

Education should seek to persuade people to adopt a “poison prevention” oriented lifestyle by providing them with information and understanding of prevention issues so that they can make their own well-informed decisions, and act on them, assuming responsibility for their own health.

Rather than presenting a list of facts with “dos” and “don’ts”, the modern approach to education is to help people to explore their values and attitudes, to see the possible options, then make choices and take action.

Education campaigns might focus on issues such as:

- raising awareness of the hazard from chemicals and chemical products, and particular situations or circumstances, for example, agrochemicals stored in the home
- ways to prevent toxic exposures, for example by storing household products where they are inaccessible to children
- how to use safety devices, such as child-resistant containers, for hazardous household products or medicines
- when and how to contact the local poison centre and how the poison centre can help the community
- first aid measures, such as resuscitation or decontamination, when a person is exposed to a chemical
- the development of pre-school children, so that people who look after them have a better understanding of their abilities at different ages and potential for unsafe behaviour.

2.5.2 Education aiming at social and environmental change

The public, policy-makers, decision-makers and planners at all levels need to be educated about health hazards and potential health risks due to chemicals. They need information to convince them that problems exist and to persuade them that appropriate actions are possible and beneficial and should be a priority. For example, decision-makers in the health sector need

epidemiological data such as the number of people exposed to pesticides, or the number of hospital admissions due to snake bite or ingestion of kerosene. Communities need to know about the potential toxicity of chemicals such as solvents, carbon monoxide and pesticides.

When new laws are introduced, or environmental changes made, to promote safety, health education is important to inform people about the reason for the changes and about the expected benefits, so that they understand why the changes are worthwhile. Well-informed members of the community are more concerned about chemical safety, and are more likely to comply with the law and to play an active part in improving the community.

2.5.3 Education of professionals

Professionals who have a role as educators for the prevention of toxic exposures need to have a thorough knowledge of all potential risks to the community from chemicals, and all the possible strategies for prevention. They also need a good understanding of the scientific background and of the wider social issues involved in implementing prevention.

2.6 Other mechanisms for prevention of toxic exposures

2.6.1 Risk communication/alerts about chemical risks

An immediate and widespread alert is needed when large population groups (and the environment) are at risk of exposure, for example as a result of chemical spills, air, water and food contamination episodes, pharmaceutical tampering and other such incidents. In such cases, messages should quickly provide clear instructions about what to do, and information and education about prevention of poisoning. The messages have to be defined quickly, but carefully, so that they are truthful but do not give rise to panic, and have to be delivered quickly. For example, when toxic fumes from a chemical fire are approaching a highly populated area, the community needs to be alerted as to the measures to be taken. The same approach is needed when the tampering of medicines or contamination of food or beverages is identified as representing an immediate risk to the health of the community.

2.6.2 Labelling

Product labels are an essential part of hazard communication, providing the user with information about the chemical nature of the hazard, the identity of the substance, advice in case of exposure, instructions for storage and use, and cautions or warnings. Information may be given in words or presented in symbols or pictograms.

Requirements relating to the labelling of various products of anything from cargo to containers sold to consumers, exist in most countries and are controlled by regulations and standards. The importance of labelling is emphasized by a number of internationally approved conventions and recommendations, including the United Nations Conference on Environment and Development (UNCED, Rio de Janeiro, 1992) recommendation on harmonization of classification and labelling of chemicals (Agenda 21, Chapter 19, Programme area B). IPCS is promoting work on harmonization of these systems to establish an international system for hazard communi-

cation with easily understandable labelling symbols, a procedure for the selection of precautionary phrases for inclusion on labels, classification criteria for categories of hazard, and corresponding labelling classes.¹

How effective is labelling at controlling poisoning?

Appropriate labelling is essential, but it is ineffective if the print is too small to read easily or covered by stains, or if the label has been torn away. However, even good labels will be useless if the container has been discarded and the product has been decanted into another container, perhaps because it is easier to open. This is common practice in rural areas where traders buy pesticide or kerosene in bulk then sell in small amounts to individuals who bring their own containers, usually used soft drink bottles.

The effectiveness of labels also depends on how well the user understands the message. Words are usually clear and unambiguous to those who know the language well, but incomprehensible to those who do not understand the language or who cannot read (i.e. people who are illiterate or have a low level of literacy, who have poor eyesight, or are small children).

Those groups who cannot read text may more easily understand pictograms. However, symbols may mean different things in different cultures, and there is a danger that they may not be understood or interpreted accurately. For example, the skull and crossbones is not perceived as a symbol of danger in some remote areas of Asia. Symbols need to be tested to ensure that the majority of the population understands the message. The pictogram for corrosiveness may be interpreted as an instruction to “wash your hands”. The effectiveness of pictograms depends on how noticeable they are, which depends on their size and location on the package, and on how much other information there is on the packaging. (Figure 1: illustration of pictogram for corrosiveness)

Pictograms

Advantages:

- attract attention
- remind people of safety messages they already know
- can be understood by people who cannot read or understand text
- aid understanding of actions and methods that are difficult to describe in text

Disadvantages:

- may be misinterpreted due to different meanings in different cultures
- may not be understood



¹ IPCS. *WHO Recommended Classification of Pesticides By Hazard and Guidelines to Classification 1996–97*. Geneva, World Health Organization, 1996.

Research indicates that users are more likely to look for, notice, and act upon safety messages if they perceive the product to have the potential to cause severe injury.¹ Messages are more likely to be followed if it is easy to do so, in terms of time, money or effort.

Warning labels such as skull and cross bones and Mr Yuk are widely used in the USA to deter children. Although there is evidence that parents are familiar with them and may be encouraged to store products safely, there is no evidence that their use has led to a consistently significant reduction in the incidence of childhood poisoning. The US National Committee for Injury Prevention and Control recommends that such stickers should not be used because they tend to attract children rather than deter them.

Even when labels carry safety warnings, it is still important to educate users about the hazards of specific products.

2.6.3 Technology and design

Packaging

Packaging should be suitable for transport, storage and use and be adequately labelled. Many countries have regulations to ensure that dangerous goods are in good quality packaging that is constructed and closed so as to prevent any leakage that might occur under normal conditions of transport, and require packaging to be tested to ensure that it conforms to specifications. In some situations where exposure commonly occurs as a result of leaks or spills contaminating foodstuffs, improvements in packaging may significantly reduce or prevent exposure.

The appearance of a container is an important factor in childhood ingestions. Containers that resemble food or beverage containers are an obvious hazard, as are packages printed with brightly coloured cartoons or pictures likely to be attractive to children. Designers of packaging for products which children are likely to come into contact with, need to be aware of these dangers so that they can ensure that the appearance will not increase the risk.

Child-resistant closures (CRCs) are usually defined as closures that are difficult for children aged under five years to open, but not difficult for normal adults to use properly. They afford a degree of passive protection but only as long as they are used properly. Adults who find them difficult to use may fail to close the containers properly, but it is impossible to design a container that keeps all children out yet can be easily opened by the majority of adults.

Effectiveness of CRCs has been indicated by several studies that have looked at differences in frequency of poisoning with specific products before and after the introduction of CRCs. In the USA, the use of child-resistant packaging for 21 categories of household substances including oral prescription drugs was associated with a statistically significant decrease in the child mortality rate from oral prescription drugs, even after controlling for changes in the consumption of these drugs and for long-term safety trends. This was a reduction of about 45% from levels that were projected in the absence of child-resistance requirements.²

¹ Croft J, Harris F. *Writing safety instructions for consumer products*. London, Department of Trade and Industry, 1998.

² Rodgers GB. The safety effects of child-resistant packaging for oral prescription drugs. *Journal of the American Medical Association*, 1996, 275:1661–1665.

Some containers which are claimed to be child resistant, may not have been tested to a child-resistant packaging standard, or may fail to conform to the required standard because of design faults caused by, for example, use of inferior quality plastic, or slight changes in design. Although child resistant packaging standards often specify that resistance should be maintained for 100 openings and closings, some reclosable packages wear out as a result of contact with the chemical contents. Some chemicals corrode plastics, so that in time the container becomes easier to open.

The use and acceptance of CRCs depends on whether it is easy to use them correctly, and whether product manufacturers, retailers, consumers and health care workers are aware that CRCs are effective.¹ Cost is also an important factor: CRCs will be unacceptable if they make the cost of the product unacceptably high, if the pharmacist bears the cost of their use for dispensed drugs without adequate reimbursement, or if the price of the product is controlled and cannot be increased to cover the cost of the closures. Campaigns to promote introduction of CRCs are likely to meet with resistance from those who would be financially affected by having to use them. Particularly in developing countries, use might be affected by availability, if the supply of CRCs cannot be maintained in the long term.

Child-resistant containers

To be accepted and used, a CRC must:

- meet a standard for child-resistant packaging
- be easy to use and store
- be known generally to be effective
- be low cost or subsidized
- have a sustainable source of supply

In some situations, other factors may influence their acceptance. In South Africa, for example, it is considered essential that paraffin containers with CRCs are not only appropriately priced, but acceptable in size, design, pourability, and storage.²

Other attributes of containers may increase their protectiveness though not their effectiveness as a barrier. For example, opaque containers may be protective by concealing contents that might otherwise be attractive to children, such as tablets that look like sweets or liquids that look like soft drinks.

Tamper-evident packaging is designed to prevent poisonous materials being introduced into a container, the broken seal showing that the container has been opened.

Formulation

Taste deterrents have been added to dangerous liquids, such as ethylene glycol or methylated spirits, to prevent ingestion of toxic amounts by small children, but their effectiveness has not been proved.

2.6.4 Operational control

Engineering controls are a method for preventing poisoning in an occupational setting. Several measures are available to control, minimize or eliminate exposure. They usually require little compliance by the workers and offer passive protection. They include automation of a process to eliminate the need for workers to be exposed; replacing highly toxic chemicals with less toxic ones; use of ventilation systems to control the amount of

¹ Ellis JB et al. Paraffin ingestion – the problem. *South African Medical Journal*, 1994, 84:727–730.

² Yach D. Paraffin poisoning: partnership the key to prevention. *South African Medical Journal*, 1994, 84:717.

hazardous chemicals in the air. Engineering controls also include routine maintenance of equipment to ensure it is in good condition.

Personal protective equipment such as respirators, gloves, aprons, boots, and overalls, can provide a measure of protection in situations where engineering controls may not be feasible e.g. farm work. Such equipment must be appropriate for the specific task, since materials that provide appropriate protection from some chemicals may be inadequate protection against others. It is particularly important that gloves should be resistant to the effects of specific solvents, and that masks should have the appropriate filters.

Personal protective equipment may not be a feasible method for prevention if it impedes movement or is uncomfortable to wear; this is often the case in hot conditions, for example, in tropical climates some kinds of protective clothing are too uncomfortable for pesticide sprayers. Other constraints to use of protective equipment in developing countries are the high cost compared with income, scarcity of the equipment and lack of training in its use, repair and maintenance, and scarcity of replacements for disposable components such as filters. Whenever possible it is best to use chemicals that do not require the use of protective clothing.

Education and training are important for users of protective equipment and their supervisors. Both user and supervisor need to be trained in correct use of the equipment, the correct way to wear it, keep it clean, and store it safely, and how to test its adequacy each time it is used. This is particularly important for respirators. Those who select protective equipment need training to ensure that they choose items that provide the appropriate level of protection. Inadequate protective equipment is worse than none at all because it provides a false sense of security and may result in exposure and poisoning. Users need to be aware of the danger of taking contaminated equipment home and of washing contaminated clothing with household laundry.

Personal hygiene is important in preventing poisoning. Education for workers should stress the importance of keeping the body clean, avoiding inhaling or ingesting small amounts of chemical, covering as much of the body as possible with lightweight clothing or protective clothing even if protective clothing is not specified, and washing exposed parts of the body, particularly after work and at mealtimes.

In addition to providing information and training about use of protective equipment and the importance of personal hygiene, the objectives of education for workers should be to ensure that they understand the health hazards of the chemicals they are working with, are familiar with the work procedures and adopt proper work practices in order to minimize exposure, recognize early symptoms of poisoning or over-exposure, and are able to obtain first aid as soon as possible.

2.6.5 *Monitoring people and the environment*

Health surveillance consists of the regular assessment of health status, including medical surveillance and biological monitoring. Public and occupational health surveillance programmes:

- assess exposure to chemicals in the environment or workplace
- indicate the need for preventive actions to protect health

- evaluate how well people are complying with advice for reducing exposure
- assess the adequacy of protective measures.

Biological monitoring consists of taking measurements of chemicals and their metabolites and biomarkers (e.g. enzymes) in tissues and body fluids. It is a measure of individual exposure and therefore a more suitable method for estimating actual individual exposure than monitoring airborne concentrations of compounds. It is particularly useful when several routes of exposure may be involved.

Occupational health surveillance consists of pre-employment medical examinations, specific periodic medical examinations, and medical examination when returning to work after significant illness.

Pre-employment medical examinations determine a person's physical ability to do the job, and identify any medical conditions which may be worsened by exposure to particular chemicals, or make the person more susceptible. They also set a baseline evaluation before the worker is placed in specific operations against which follow-up measurements can be compared to see whether job-related exposures have occurred and have caused any changes. Periodic medical examinations are carried out to detect, as early as possible, any specific adverse health effects that may have been caused by exposures, and to detect changes in health status that may reveal excessive exposure or increased susceptibility to work-related exposures.

2.7 Legislation and regulation for prevention of toxic exposures

Legislation provides an act of law describing the areas covered under that law and the general way they are to be regulated, and designating an executive agency to write and enforce specific regulations. Legislation represents society's best estimate, at that moment, of the risks it is prepared to take and those it wishes to avoid, as well as the price it is prepared to pay.

Regulations are legal instruments made by governments to control various activities. They set standards, provide for enforcement, and impose penalties for those who fail to comply. In the area of chemical safety, regulations can define the different measures that help to prevent poisoning and ensure that the measures are carried out. Regulations should be clear and simple to understand, and must be possible to implement and enforce. This depends on having the necessary facilities, technical knowledge and expertise.

Law-enforcing authorities ensure that people comply with the law. It is essential to provide adequate resources for enforcement. In a large number of countries, especially developing countries, legislation often fails because there are insufficient resources to ensure that people comply with the law.

The implementation of legislation may take a long time to achieve. It may take many years of political lobbying to overcome objections and impart an understanding of the issues. In some countries, measures to promote chemical safety have been adopted by industries or professions on a voluntary basis. This is possible if there is a broad measure of agreement among all affected organizations or individuals, and a willingness to cooperate. Voluntary agreements are enforced by some mechanism set up within the industry or profession rather than by government legislation. They are more

quickly and cheaply implemented than legislation, are more flexible to react to change, and perhaps have a better potential for success, since they have been formulated and agreed by the parties that will be expected to comply with them. Examples of voluntary schemes are given in some of the following sections.

2.7.1 *Legislation and chemical safety*

Regulation and enforcement are important government actions for the promotion of safety and health in the manufacture, transport, storage, use and disposal of chemicals and chemical products. Many countries have legislation for chemical safety to control industrial chemicals, manufactured products such as medicines, food additives, pesticides and cosmetics, chemical contaminants such as those that occur in the environment and in food, and hazardous wastes. Legislation can be also used to control natural toxins. For example, in some Central Asian countries, poisoning by hepatotoxic pyrrolizidine alkaloids contained in weeds that contaminate edible crops represents an important public health problem. Legislation enforces the control of crops and the seasonal monitoring of alkaloids in order to avoid mass poisoning episodes.

The extent and type of chemical legislation varies considerably between different countries according to their historical, cultural and legislative background, so products that are rigorously controlled in one country may be subject to very little control in another. For example, the marketing of pharmaceuticals is controlled by complex regulations in Europe, but is subject to very little control in some developing countries.

2.7.2 *How can legislation be used to control poisoning?*

Legislation can be used to ban or restrict the use of chemicals that may be unsafe (e.g. certain pesticides), and to regulate the purposes for which a chemical is used and the conditions under which it is used. For chemicals and medicinal products, in addition to regulating safety, legislation may also regulate quality, use, packaging, and the provision of information to users, to ensure that they are given adequate information about hazardous chemicals.

The availability of chemicals can be restricted by legislation. For example, users may have to be registered, as with some pharmaceuticals such as methadone that can only be prescribed to registered users. Some products may be banned to certain sections of the community, for example in the UK, adhesives containing dangerous solvents cannot be sold to children; and certain pharmaceuticals can only be obtained on prescription from a physician. Amounts sold at one time may be restricted, for example, in some countries when analgesics are sold in shops where no pharmacist is present, the number of tablets per pack is restricted.

In the area of occupational health, legislation is the most effective way of ensuring that substances used at work are safe and without risk to health when properly used. Legislation can ensure that employers protect workers' health by using proper plants, systems of work, safe handling, storage and transport, and by providing information, instructions, and training. Legislation can control harmful emissions to the atmosphere.

2.7.3 How effective are legislation and regulation in preventing poisoning?

Effectiveness of legislation for chemical safety depends on the extent to which it is based on sound science, how well it is accepted by those directly involved or affected, whether it is free from political and economic influences, and how well the country's administrative systems are able to implement and enforce it. For example, the legislation mentioned above, designed to protect the population from poisoning due to pyrrolizidine alkaloids, failed during periods of political instability because the administrative mechanisms for carrying out quality control to detect crop contamination were no longer enforced. As a result, when harvests were poor because of drought, communities consumed non-edible crops. They knew there was a health risk but their need for food was greater than their fear of poisoning.

IPCS publishes authoritative scientific assessments that national authorities may use for planning and development of regulatory actions and control measures. These include environmental health criteria documents, health and safety guides, international chemical safety cards, pesticide data sheets, poison information monographs, reports and toxicological monographs of the Joint FAO/WHO Expert Committee on Food Additives and the Joint FAO/WHO Meeting on Pesticide Residues, and air and drinking water quality guidelines.

Effectiveness also depends on whether the legislated action is a single, "once only" event offering passive protection or must be repeated every time a particular situation arises. Regulations requiring the use of child-resistant containers are both passive and active: a properly closed child-resistant container offers a degree of passive protection, but an active response is also

needed, in that the user must keep the product in its original container and close the container properly after each use. These regulations are a good example of effective legislation, and there is evidence that they have been successful in reducing deaths and hospital admissions among young children. Nevertheless, there are still many poisoning incidents involving regulated products. This is not only due to factors relating to the use of the packaging, as discussed below, but also due to the fact that the regulations allow for limited availability of the regulated substances in non child-resistant packaging for use by elderly or handicapped persons.

The role of education in legislation for chemical safety:

- influences the development of policy and resulting legislation
- persuades decision-makers and the public that legislation is an effective way to deal with potential risks
- generates support for legislation from the public, and community and professional organizations
- informs those affected (product manufacturers, retailers, health care workers) about the effectiveness of the measure in order to create a climate of opinion in favour of it
- once legislation has been implemented, informs people how to comply, and helps them to appreciate its value
- retains the political will to sustain legislation

2.7.4 Legislation and education

Education is essential to the success of legislation. Obviously people need to know what they have to do to comply with a law, but also, if they are going to accept the law and appreciate its value, they need to know what it aims to do, and about the hazards it is intended to prevent, and must be given information that demonstrates its effectiveness. Law-enforcing authorities are best able to provide such information, advice and publicity because they have the means to produce and disseminate it, using mass media campaigns, for example.

2.7.5 Product registration

Registration schemes require manufacturers to seek government approval for a product before it is marketed. They must present comprehensive scientific data to show that the product is effective but not unduly hazardous to human or animal health or to the environment. In general, most chemicals should be registered in a country before they are used, transported or marketed. This provides a mechanism for preventing toxic exposures by controlling the use of chemical products and banning or restricting the use of those that may be unsafe.

2.7.6 Licensing

Licensing is a statutory system of approval required at a national level as a precondition for placing a chemical product on the market. It may apply not only to the product but also to the manufacturer and distributor. A *licence* is a formal written permission granted for a specified period by a regulatory agency, authorizing the marketing of a chemical product. The agency receives an application for marketing authorization, which it may or may not grant. A typical licensing system includes application, registration, assessment, representations, and decision. A licensing system can ensure that only products of good quality are authorized for sale, and that the quality is monitored.

This process contributes to the prevention of toxic exposures as it not only guarantees quality but also establishes the responsibility of the industrial, commercial and regulatory sectors. An additional provision for safe use of chemicals is a system that requires retailers to have a licence to obtain, store and sell hazardous chemicals, and users to have a licence to buy and use them.

2.7.7 Standards

Safety standards can regulate the design and manufacture, storage, transportation and use of a product. Safety standards may be compulsory and enforced by legislation and regulations, or voluntary and not enforceable by law, only by professional or industrial organizations.

Examples of compulsory safety standards are those relating to child-resistant closures for hazardous chemicals, or to the maximum concentration of a chemical in the air permissible in the workplace. Examples of voluntary standards are the codes of practice that exist in some countries for pharmacists relating to the dispensing of medications in child-resistant containers. Their effectiveness depends on pharmacists' willingness to conform to the standard, which in turn depends on whether they believe that such containers are an effective form of prevention.

The effectiveness of product safety standards as a means of preventing poisoning depends on the technical quality of the standards and the existence of testing laboratories to check that products conform to the standard, and to certify those that do; for example, to check that packs claimed to be child-resistant fulfil the technical criteria, or to check the quality of a chemical to ensure that it does not have unacceptably high levels of toxic contaminants. Even then, products conforming to standards can fail to prevent poisoning if misused.

Setting standards for exposure limits is also a mechanism for prevention of toxic exposure. However, the effectiveness of exposure limits in protecting human health depends on the reliability of data from which they are derived, whether they are extrapolated from animal or human data, and whether they adequately take account of differences in susceptibility of the population who will be exposed (either the general population or workers).

2.7.8 Notification systems

Notification systems are run by government agencies to ensure that they are aware of the existence of products available on the market and as means of ensuring that the product will be used as safely as possible, by means of appropriate testing, classification and labelling, by setting exposure limits in the workplace and by ensuring adequate methods for storage, handling, disposal and treatment of accidental spillages and of injuries caused by the chemical. Voluntary notification is invited by the regulatory agency, whereas statutory notification is mandatory.

2.7.9 International conventions and recommendations

International bodies, such as the United Nations, produce conventions and recommendations in the area of chemical safety addressed to governments and organizations concerned with chemical safety, to help ensure the prevention of toxic exposures. They are developed by experts to provide a basic scheme to allow national and international regulations to develop in a uniform fashion and contribute to worldwide harmonization in this field.

A number of international conventions and/or agreements ensure that chemicals are manufactured, transported, produced, commercialized, used and/or disposed of under acceptable standards.

In 1982, the United Nations produced a “Consolidated list of Products whose Consumption and/or Sale have been Banned, Withdrawn, Severely Restricted or Not Approved by Governments”, and this is regularly reviewed and updated.

Imports of unwanted chemicals that have been banned or severely restricted are controlled by The Rotterdam Convention on the Prior Informed Consent (PIC) Procedure for Certain Hazardous Chemicals and Pesticides in International Trade, Rotterdam, 10 September 1998. The agreement ensures that countries importing chemicals are notified about any product that may be banned or severely restricted in the exporting country. This notification gives the competent authorities the opportunity to assess the risks associated and to make appropriate decisions as to the importation and use of the product. The arrangement is particularly helpful to developing countries that may unknowingly import a dangerous chemical and allow its use in circumstances where there is a serious risk to health.

Transboundary transport of toxic chemicals is addressed by the “Recommendations on the Transport of Dangerous Goods”, Agenda 21, Chapter 19, adopted by the United Nations Conference on Environment and Development (UNCED) in 1991, and further ratified by the International Programme on Chemical Safety.

Conventions also apply to:

- narcotic drugs and psychotropic substances: Convention against Illicit Traffic in Narcotic Drugs and Psychotropic Substances, Vienna, 20 December 1988
- hazardous wastes: the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, control of trans-frontier shipments of hazardous wastes, 22 March 1989
- chemical weapons: Convention on the Prohibition of the Development, Production, Stock-piling and Use of Chemical Weapons and their Destruction, 29 April 1997
- persistent organic pollutants: Stockholm Convention on Persistent Organic Pollutants, 2001.

Websites with information on international conventions and agreements

International Programme on Chemical Safety	www.who.int/ipcs
Intergovernmental Forum on Chemical Safety	www.who.int/ifcs
Joint FAO/WHO Expert Committee on Food Additives	www.who.int/ipcs/food/jecfa
Joint FAO/WHO Meeting on Pesticide Residues	www.who.int/ipcs/food/jmpr
United Nations Environment Programme, Division of Environmental Conventions	www.unep.org/DEC
Prior Informed Consent	www.pic.int
Agenda 21, United Nations commission on sustainable development	www.un.org/esa/sustdev/documents/agenda21/index.htm

3. Planning educational programmes

Successful educational programmes are based on a good understanding of the problems and of the communities where they take place. They have definite aims and objectives, a clear message directed to a specific target audience, and a planned strategy that is achievable with the human and material resources available.

3.1 Understanding poisons prevention needs of the community

The needs and priorities for poisons prevention must be assessed at many levels, at global and national levels and at local levels in communities, families, small groups and individuals. This is a complex process, and the opinion of experts or professionals about the needs of the community may not be the same as what people want or feel they need when they assess their own situation, either as individuals or as a group. For example, the requirements of poisons labelling regulations may conflict with the need expressed by the consumer for more advice about the adverse effects of a poison on a packaging label.

People's assessment of their needs may be limited or inflated by their perceptions and knowledge about what could be available. They may be influenced by pressure from vested-interest groups and the media. Also, they may be prevented from expressing their opinions by lack of opportunity, motivation or assertiveness skills.

Poisons prevention programmes may be initiated as a response to people's needs and demands, to address toxicological problems that are easily detected, quite obvious, or widespread, as, for example, problems resulting from a disaster.

At other times, poisons prevention programmes may be initiated to address problems that have been detected through statistical studies (retrospective, prospective) or by health workers, and then become a priority. Poison centres, hospitals and health professionals all come into contact with toxicological problems. For example, a programme to prevent carbon monoxide poisoning was implemented in Lille as a response to the "epidemic" of carbon monoxide poisoning in the winter. Programmes addressing problems before they start to grow may prevent disasters occurring.

The identification of global, national and regional prevention needs is part of the work of WHO (IPCS), government departments, and regional health and environment authorities, which then formulate policies and plans to meet those needs.

3.2 Analysing and evaluating the problem

A prevention programme should address one or more risk factors that are carefully defined, measurable, and prevalent among the members of a chosen target group. It is important to be sure that the issue being addressed is a real cause for concern. At an early stage, the project group should find out what people already know and feel about the issue, to be sure that the poisoning issues being given high priority by the programme are also those of greatest concern to the target group and the community as a whole. It is also important to ask whether a reduction in the risk factor would improve the health status and/or quality of life of target group members, and to consider whether it is possible to reduce its prevalence or incidence, or to change the risk factor itself.

A review of human exposures should be undertaken to obtain information about the types of exposure that occur and how often they are seen, the proportions in each category that are serious, the specific events most associated with exposure, the environments where the risk is greatest and the population groups most at risk. Relevant information includes:

- *the substance/etiological agent*: chemical composition, function, method of use, appearance, packaging, physical characteristics, brand or product name, source
- *the individual*: age, sex, occupation, place of residence, developmental and motor skills, behaviour
- *the population*: economic status and ethnic background
- *the environment* where the event occurred: geographical location, type of environment, products available and how they are used and stored, social disadvantage, family stress
- *location and events leading up to the accident*: level of supervision, time of day.

This initial research should try to find out whether there are certain regions and sectors of society more seriously affected than others, to define factors associated with a risk of poisoning, and to measure their incidence and prevalence. The analysis should also attempt to find out what specific activities, behaviour or beliefs within the target group relate to the particular problem. An understanding of behaviours and beliefs is essential for a well-focused and successful prevention programme, particularly if the aim of the programme is to change behaviours or to introduce appropriate regulatory changes.

Collection of even a minimum of local data should be a priority, not only for the planning of the programme but also as evidence to show local authorities, organizations and the population who may not believe that these problems exist in their community, and to gain their support.

3.2.1 Obtaining information about occurrence of toxic exposures

There are several sources of information about the frequency and severity of poisoning in the community, about the victims, the agents involved, and the circumstances surrounding the event, although no single source provides a complete picture. The choice of data source and survey method will depend on the objectives of the study and the kind of exposures to be

studied. For example, the most useful source of information on childhood exposures will probably not be the most useful source of information on occupational poisoning; comprehensive information on fatal poisoning is unlikely to be available from the same source as information on non-fatal poisonings.

Prospective surveys of medical records are more likely than retrospective surveys to produce useful, accurate data, because staff can be encouraged to improve their routine record-keeping and to collect and record specific items or types of information that they might not normally include in the case records.

Population-based studies give a more accurate picture of incidence and prevalence of unintentional exposures in a community. Records from hospitals or health services may be useful if these serve a population that can be defined and measured, although allowance must be made for the possibility of a certain amount of bias depending on their accessibility to, and use by, all the community. In most cases, there is a degree of inequality.

When the type of study has been agreed, the research team will need to agree:

- definitions for a case of exposure, classification for severity of poisoning, type of agent, circumstances of exposure, etc.
- the dataset to be collected
- the method and duration of data collection.

Systems set up to collect data continuously provide an alternative to repeated surveys for monitoring changes in frequency of specific problems over time. Systems exist in some European countries and in the USA, for example, to monitor cases of accidental injury, including toxic exposures, seen in hospital emergency departments.

Hospital records

There are two different sets of data that can be obtained from hospitals: data on poisonings and suspected poisonings seen in emergency departments, the majority of which are minor exposures, and data on admissions, only a small proportion of emergency department attendances, and mostly significant exposures with moderate or severe effects. Information from a representative sample of hospitals in a locality may provide better quality epidemiological data than a single hospital collecting information on all injury events, although it may miss unusual or clustered events.¹ It may not be feasible to survey all poisoning exposures attending or admitted to those hospitals, and a strategy will be needed for sampling the cases within the sample of hospitals.

Emergency department data will not be so representative of the events occurring in a given population if people initially consult other health services after a poisoning event, such as a poisons centre telephone help line, that reduce the need for attendance at emergency departments.

Retrospective surveys of patients' medical records can provide some useful information, particularly about clinical effects of exposure, but, since the

¹ Morrison A, Stone DH. Injury surveillance in accident and emergency departments: to sample or not to sample? *Injury Prevention*, 1998, 4:50–53.

data are recorded for clinical management rather than for epidemiological study, they are usually incomplete and inconsistent. For prospective studies, hospital staff can be specifically asked to collect more detailed information on risk factors, circumstances and agents of exposure, either at the time of attendance or by follow-up.

Ambulatory services records

Records from health centres and general practitioners can be used to detect cases of toxic exposure that do not reach hospital. They are subject to the same limitations as hospital records.

Analytical services

Clinical analytical laboratories that measure or detect pharmaceuticals, substances of abuse, or chemicals in the body provide the best evidence of exposure. It may be possible to quantify the extent of exposure to some chemicals and correlate this with the clinical information about the patient. Analytical laboratories may provide services to hospitals, poisons centres or forensic services.

Poisons centres

Poisons centres detect a large number of toxic exposures and poisonings from asymptomatic to major, collecting information reported by the public or by medical and nursing staff about the agents of poisoning, the patient's condition and the circumstances of exposure. For cases reported by medical and nursing staff, clinical details may be available, and outcome information obtained by follow-up. Case reports from the public are more likely to provide information about the circumstances of exposure than about the condition of the patient.

Poisons centres are particularly useful sources of information for planning prevention programmes and for evaluating their effectiveness. A review of information about the types of exposure that occur and the severity of poisoning can reveal trends or unexpected occurrences. Some of the details about agent, victim and circumstances of exposure recorded by poisons centres are seldom available elsewhere. Although clinical data may be scanty, it is often possible to review a number of cases, probably more than could be collected by a single hospital, and this helps to ensure the validity of the data. There is also the potential for monitoring events continuously or periodically over a long period of time.

However, poisons centres are not usually able to provide true population-based estimates of frequency of poisoning, neither are they a representative sample of events in the population, because the size of the population served is usually unknown. Moreover, public access services are seldom equally accessible to all the community, even when they can be used free of charge, because access depends on proximity to a telephone, and may be restricted by language barriers and lack of awareness of the service. Reports from hospitals will also be biased because poisons centres are more likely to be consulted when exposures involve less common products, or need more complicated and unfamiliar treatments.

The responsibility of poisons centres to communicate this information to other individuals and organizations concerned about prevention is discussed in chapter five.

Mortality statistics

Mortality statistics are relatively inexpensive and easy to analyse to obtain age-specific data related to a definable population. Their usefulness depends on how accurately cause of death has been recorded. Death certificates and coroners' records may provide more information than statistics about the products involved and the circumstances of exposure. However, for most types of exposure, only a small proportion of events result in death, so these are not a representative sample of accidents. In some developing countries with poor access to health services, the review of forensic data may provide useful information on toxicological risks.

Community surveys

Another way of obtaining information is to ask a sample of people in the community. Such surveys can include incidents that do not need medical attention or advice from a poisons centre, as well as those that do. They may be able to collect more information about social characteristics and circumstances surrounding exposures than can be obtained from hospital records. Information about poisoning events has been obtained by approaching people directly, holding face-to-face or telephone interviews with individuals, or holding meetings with groups.^{1,2} Written questionnaires completed in the classroom were used for a school-based survey to collect anonymous information from adolescent schoolchildren.³ If there are no resources for such a survey, it may be possible to add relevant questions about children's accidents or use of chemicals to existing community surveys.

There is a possibility of bias if these methods are used to collect information on poisoning events, because they rely on the memory of the respondent, and on the respondent's judgement as to which events constitute a poisoning exposure.

Government departments

Complaints from consumers or environmental organizations to government departments concerned with health, employment, trade and industry, may also provide information about toxic exposures or potentially hazardous products or situations, and could provide warning of the need for preventive action.

3.2.2 Obtaining information about the target population

The target population to whom the preventive effort is directed may be the same as the population "at risk" from poisoning, but not necessarily. For

¹ Roberts H. Accident prevention: a community approach. *Health Visitor*, 1991, 64:219–220.

² Schwarz DF et al. An injury prevention program in an urban African-American community. *American Journal of Public Health*, 1993, 83:675–680.

³ Currie CE et al. Incidence and distribution of injury among schoolchildren aged 11–15. *Injury Prevention*, 1996, 2:21–25.

example, when young children are the group at risk, education campaigns usually target parents. The target population may be children, parents, grandparents, householders, medical personnel, students, owners of small businesses or a particular occupational group. The programme might aim to reach several different groups or focus on just one.

Finding out the characteristics of the target group and the community as a whole is as important as finding out about the poisonings that occur in the community. To ensure that prevention activities are appropriate and acceptable, it is important to understand the social environment in which toxic exposures take place and how people cope with living in an unsafe environment; how for example, they manage to keep their children safe. It is important to gain an insight into attitudes and perceptions that affect behaviour related to poisoning prevention.

The aspects of the community and target groups that should be investigated include:

- size and composition
- any specific groups which may be particularly at risk
- income and social class
- educational and literacy level
- previous exposure to pictures and diagrams
- religion
- cultural background
- existing channels of communication – informal social networks, opinion leaders, schools, health workers, community workers, youth leaders, influential people, leaders in the community
- available and popular means of communication – newspapers, magazines, radio, television
- whether there are traditional ways of communication such as storytelling, drama, songs
- environmental factors which may influence health behaviour, such as housing, environment, availability and quality of health services, and schools
- local attitudes and values, particularly attitudes towards health education initiatives
- expressed and felt needs and preferences.

3.3 Programme planning and management

The programme needs a clear management plan. Everyone taking part needs to know who else is involved, who will be responsible for different aspects of the programme, and the lines of responsibility and communication.

One organization or individual needs to take a lead role in coordinating activities. It is also useful to designate individuals to coordinate communications and fund raising, and even to appoint someone to act as a spokesperson if necessary. Someone will need to be appointed to manage

the budget. The group will probably need a secretary to handle correspondence and arrange distribution of written and audiovisual materials, and an office with telephone and photocopier.

A management group or steering group, with representatives from the various agencies participating in the programme and the funding body, may be appointed to review progress and monitor financial information. Potential partners and collaborators should be identified and asked to participate at an early stage so that they have the opportunity to join in the process of identifying the goals, objectives, implementation plans and evaluation strategies. It is also important to involve the target group in setting priorities, objectives and methods for the prevention activity and in planning the most effective time and place for activities.

A project proposal, plan and timetable should be produced, describing the problem, the target group, the objectives, the activities that will be taking place, the people and organizations involved, the resources and budget required, how the project will be managed, and the method for evaluating the programme. Communication must take place when and where it will reach the target group. Leaflets or posters must be placed where the target group will see them; radio broadcasts must be at a time of day when the target group is likely to be listening.

3.3.1 *Defining aims and objectives, priorities*

The aims and objectives should act as the frame of reference for managing, monitoring and evaluating the programme. Aims should be achievable, though not necessarily achievable through one single project or programme. The following list gives examples of aims; one programme would probably address only one or two of these at a time.

- To increase public awareness of poisoning risks from use, storage, and disposal of chemicals, and to provide information about ways to prevent poisoning.
- To improve poisons prevention knowledge and reduce the number of hazards in the home in a particular community.
- To give parents information that will enable them to keep their children safe from poisoning hazards.
- To raise awareness of the problem of unintentional poisoning.
- To help people change their attitudes and behaviour so that they behave safely with respect to poisons.
- To bring about social changes so that the community has the desire and the ability to achieve a safe environment.

Broad goals should be broken down into specific objectives that are precise and achievable and measurable, relating to knowledge to be acquired, skills to be learnt, attitudes to be explored, actions to be taken, behaviour to be changed, or beliefs to be changed. They should specify the target group.

A programme aiming to enable parents to keep their children safe from poisoning hazards might have the following objectives:

- To educate parents in a specific community about how to store household chemicals and medicines safely in the home.

- To increase the number of homes in a community where medicines and household chemicals are stored safely.
- To educate parents and other care-givers about children's normal psychological and motor development and abilities.
- To teach people how to use safety devices such as CRCs and how to obtain them.

The objectives for a programme aiming to decrease the risk of serious poisonings when exposures occur might be:

- To tell people about the poisons centre and give every household stickers or leaflets with the poisons centre telephone number.
- To increase parents' knowledge of the correct first aid for poisoning.
- To teach parents the effects of poisons that are significant hazards in the local community, so that they are able to recognize when someone has been poisoned.

Objectives could include a realistic estimate of the amount of change that might be expected in a given time with the available resources. Some initial research might have to be conducted first to find out what the present situation is before a target for change can be set.

3.3.2 Identifying resources that will be needed

It is important to identify the human and material resources needed to implement (plan, initiate, maintain, sustain) the programme, and the resources available, then plan programmes that make the best use of these. Sufficient resources are vital to the success of the programme. Local resources should be used whenever possible, particularly for programmes directed at rural or minority communities.

Human resources

A range of individuals, groups and agencies will probably be needed, for example:

- people willing to help (colleagues, clerical and secretarial staff)
- people with particular knowledge, skills or expertise, such as:
 - technicians
 - artists who can produce graphic materials reflecting the cultural and physical characteristics of the community
 - educators with experience, enthusiasm, energy and time
- people with position, power and status who agree to assist in the development and implementation
- people who can influence the target group (relatives, friends, volunteers, patient associations, self-help groups, leaders, role models).

Material resources

These could include materials for display or distribution to the target group, such as leaflets and posters, exhibition materials; also materials for use by

teachers and trainers such as teaching guides, resource booklets for use with community groups, flip-charts, puppet shows, slide shows, videos, as well as accompanying equipment, such as visual equipment to project slides or overhead transparencies or show videos.

Both kinds of educational material are important. Many professionals will be deterred from undertaking prevention activities if they do not have educational materials or teaching aids, whereas a supply of good materials facilitates and promotes educational activities.

Financial resources

Funds will be needed to: employ people to undertake various aspects of the programme; for the production of teaching aids, educational materials or questionnaires to be distributed to the target group; and for distribution of questionnaires or educational materials, including costs of using mass media if these are used. If the programme includes distribution of free samples, for example, child-resistant containers for storing household fuel or chemicals, or activated charcoal, the cost of this must be calculated. Rooms may need to be hired for meetings or training days. If the programme is sending trainers or educators into the community, they will need transport or money for fares, and money to cover living expenses while they are away.

Facilities and services

Facilities include an office with telephone and photocopier for management of the prevention activity, and rooms for holding meetings of the organizing team. Rooms may also be needed for teaching and holding workshops.

Schools and universities may be able to provide a service. School coursework is often designed to seek proposals from community organizations and businesses to work with students in the development of a project, programme or activity. The students will probably work on the design and construction of the vehicle for the programme message, rather than provide subject expertise. Other departments of the same institution may be willing to work with the programme on another element of the project, such as implementation.

3.3.3 Training needs

Training is needed to ensure that everyone involved has a good understanding of the programme and a thorough grasp of their role, as well as specific information on the problem and its consequences.

Training will be particularly important when the message to be delivered is complex, or when trainers need to be provided with background facts and information. It is important that everyone involved in providing information to the community gives the correct information. Training workshops can be organized to set out the background to the programme, the aims and objectives, and all the information needed about the message and method of communication. This may include:

- scientific, behavioural, and practical information needed to convey the message to trainers and/or target audience

- instruction in teaching techniques effective for the target audience and an opportunity to learn new skills
- information about the use of specific teaching tools and associated equipment and materials
- an explanation of the processes to be used to evaluate the activity.

If the programme includes professional counselling for parents and other individuals on prevention of poisoning, the professionals will probably need training in the content of the message and in how to deliver it. Lack of training may discourage professionals from undertaking prevention activities even though they believe these activities are important and should be part of their everyday work.

Training can provide members of the local community with the necessary skills to undertake appropriate roles in the programme. The Safe Block Project¹ trained individuals with minimal formal education to coordinate a large-scale community-based prevention programme involving community leaders, block leaders, and individual families. Training may be needed for interviewers if this technique is to be used to gather information from the target population to evaluate the programme.

3.3.4 Finding financial resources

It is important to devise a realistic yet flexible financial plan. If a revenue source with specific cost parameters can be identified prior to devising a programme, the programme can be tailored to the budget. If not, it is likely that several different organizations or community donors will have to be approached for sponsorship. In this case, it is advisable to have two or even three plans for presentation, involving different levels of financial commitment, assuming that the aims of the programme can be achieved at lower levels.

Government agencies

Government agencies, for example, ministries of health, environment, labour, agriculture, or other governmental organizations that have responsibility for the population to be targeted, or for some facet of the problem being targeted, should be contacted, because they may have money allocated for this type of programme. Also, they may know whether similar prevention exercises have already been undertaken. Developing countries may be able to obtain funds from other countries that have development agencies to support overseas activities.

United Nations organizations

A number of United Nations organizations, such as those dealing with health, environment, work and children's welfare, are potential sources of funding for prevention of toxic exposures in the context of their assistance to countries.

¹ Schwarz DF et al. An injury prevention program in an urban African-American community. *American Journal of Public Health*, 1993, 83:675–680.

Nongovernmental organizations

Organizations concerned with protection of the environment, accident prevention, children's health or consumer affairs, may have funds that could be allocated to prevention of toxic exposures.

Health agencies

Health care agencies that already address both the population and the needs of that population may be able to help with the implementation of the programme, and save the cost of duplicating work that has already been done. The association of the agency's name with the programme can provide credibility or visibility.

Private

Companies that have an interest in poison prevention activities include insurance companies that are interested in activities which will diminish their expenses. Some chemical companies may be willing to provide financial support to educate the users of their products. Corporations may be "goodwill ambassadors" offering to provide financial backing for poison prevention efforts targeted to the population that they serve, even though their organization may have no connection to toxic substances or health concerns.

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4. Planning how to communicate the message

A poison prevention activity must have a clear message expressed in positive terms. The message should be specific and concrete, addressing a small number of issues rather than a large number of topics.

Both the message and the chosen method of communication should be appropriate for the target group, and take into account aspects of the target group listed in the previous chapter. It is advisable to test the method and materials with the target group to ensure they are acceptable. This is particularly important if resources have been “imported” from a programme outside the area and group being targeted. Some communities may find a particular approach difficult to understand or unacceptable for cultural or religious reasons, or unacceptable for use with both sexes. For example, a video depicting women wearing overalls as protection when spraying pesticides may not be culturally acceptable in countries where it is unacceptable for women to wear trousers. Most methods can be adapted for use with different target groups, perhaps by changing examples to reflect local experiences and issues.

Effective communication

- is repeated and reinforced over time using different methods
- uses existing means of communication – for example songs, drama and storytelling
- is entertaining and attracts attention
- uses clear simple language with local expressions and emphasizes short-term benefits of action
- provides opportunities for dialogue and discussion to allow learner-participation and feedback on understanding and implementation
- encourages participation, stimulates discussion and involves the group in learning; checks that understanding and competence has been reached.

Hubley J. *Communicating health*. London, Macmillan, 1993.

The target groups themselves can help to develop methods that are culturally appropriate. Whenever possible, local artists and technicians should be used to produce new materials that reflect the cultural and physical characteristics of the community.

The choice of method also depends on:

- the subject matter
- the resources available
- whether the aim of the campaign is to communicate simple facts or complex facts, to change beliefs and attitudes, or to teach skills
- whether the issue is one which requires national attention or is better addressed at regional or local level.

Education campaigns are more likely to be effective if they use a number of educational activities and different methods rather than a single approach that may work for some people but not for others. One approach would be to start by using simple, cheap methods of communication to see whether these are effective, and only if they are unsuccessful, to use more expensive methods.

4.1 Face-to-face communication

Face-to-face communication can take place between just two people, or with small or large groups. The advantage of methods using oral communication is the opportunity they provide for discussion, participation, and questions, particularly with small groups. The educator can find out how much the audience already knows about the subject and whether they have understood the message so that additional explanations can be given if necessary. The disadvantage is the large number of people needed to spread information throughout the population.

Most traditional forms of communication involve face-to-face or oral communication, such as drama, singing, dancing, storytelling, and proverb telling.

4.1.1 With groups

Educational research has found that when adults are part of a group and actively involved in the learning process, they learn more, are better at solving their problems, and are more influenced by what they learn and more likely to change their beliefs and attitudes. Active involvement can take the form of participation in discussion with teachers and other students, sharing experiences, role-play and problem-solving exercises, group exercises and games. Participatory group work of any kind needs to be well designed and well organized. It should be planned and administered by educators or trainers who are trained to develop such activities, and trained to initiate, sustain and facilitate discussion.¹

The target group might be students in a school or higher education establishment, professionals on a training course, a workers' union group, or a community group such as a women's group, youth group, parent's group, or a group of people attending a day-care centre or senior centre, or a religious gathering.

Poisons prevention should be included in the curriculum for postgraduate training courses in child health for nurses and other professionals, but may be overlooked by course organizers unless its importance is brought to their attention. In Sweden, the poisons centre took the initiative by offering to give lectures, and as a result, poisons prevention is included in professional training courses.

Oral presentations and lectures

Lectures and talks are particularly appropriate for groups of students, workers or professionals attending formal education or training. However, oral presentations can also be used with community groups, and some poisons centres, such as some of those in the USA, employ educators for this purpose. For the majority of centres that lack the resources for such staff, it may be possible to join with other organizations concerned with other aspects of accident prevention and include poisons prevention as part of a more general presentation.

¹ Weinger M. Part one: Teaching environmental health. In *Teacher's Guide on Basic Environmental Health*. Geneva, World Health Organization, 1999 (WHO/SDE/PHE/99.5).

Oral presentations are best if brief and made interesting with good visual aids. They should use examples familiar to participants and relevant to the local context or current events.

Visual aids can help to emphasize what is said. They provide the audience with a visual memory to help them remember the key points, rouse interest and gain attention, present a picture of something which would take time to describe in words, make difficult ideas easy to understand, and generate discussion. They should not be simply a memory aid for the speaker. Types of aids include flip charts, wall charts, flash cards, slides, overhead projector transparencies, films and videos.

Pictures should be simple and clear. They should be pre-tested with a sample of the intended audience to make sure they can be understood. Slides and overhead projector transparencies should be legible, understandable, interesting, memorable, and appropriate. They should not contain too many words and letters must be large enough to be read from the back of the room.

In more formal settings, it is useful to develop a short list of broad learning outcomes to help speakers structure their sessions and to help participants see what they are intended to learn. A discussion session and time for questions can provide opportunity for active participation. With some groups it may be possible to give the students exercises or worksheets afterwards so that they can work with the information that has been presented.

Workshops

Workshops allow people to participate by answering questions or solving problems using their own experiences and available resources. Participants divide into small groups to work on specific tasks or questions for an agreed time, and then reassemble at the end for a report-back session to explore what participants learned during the exercise. In some settings it may be useful for groups to select a chairperson to facilitate discussion and a recorder to take notes.

Practical considerations

For participatory methods, the furniture and layout should encourage active participation. Seating arranged in a circle or round small tables in a horse-shoe shape allows face-to-face discussion. Moveable chairs allow people to break into small groups as needed. A few small rooms may be useful for group work. When participants need to write, appropriate lighting and tables or other support will be needed. An overhead projector and/or flip chart or blackboard are essential to demonstrate the key concepts and results of group work. When a flip chart is used, important sheets can be detached and attached to the wall for easy reference.

For more formal training workshops, students could introduce themselves to the rest of the group and to the trainer, giving brief information about their jobs, educational background and experience, current level of understanding or skill in the topic to be studied, training needs and interests, problems and special issues, and what they expect to gain from the programme. When participants have to register beforehand, it may be appropriate to send out a questionnaire to the target group asking for some of this information.

Discussion groups

Public health programmes have developed methods to promote discussion and stimulate interest among people in local, usually rural, communities, and help them work together to identify their health problems, plan for change, and implement, sustain and monitor that change.¹ When the community is involved in the planning process, priorities and plans will be relevant to the local situation and the community is more likely to become involved in the programme.

This is a long-term strategy that depends on having trained field workers to work with local communities and support community organizations. This approach will only be useful in prevention of poisoning if the community sees poisoning as an important issue.

4.1.2 One-to-one teaching

One-to-one teaching and counselling for individuals or families is an important method of education that can address their specific needs and reach members of the target group who would not be reached by other means. It may be particularly important in communities where literacy is low. There are several examples of this method being used to promote poisons prevention, sometimes in the wider context of home safety. They are most likely to succeed if incorporated into existing routine activities carried out by health workers. Those who undertake one-to-one education need good communication skills and training in how to communicate the particular issues addressed by the programme.

Counselling can be given in primary health care centres, day-care facilities, child clinics, antenatal clinics, hospital emergency clinics, paediatric wards and outpatient clinics. For example, an educational programme was initiated in an emergency clinic to introduce the message of poisoning prevention to an inner city population who would otherwise be unlikely to receive such a message, with minimum expense.² Parents attending the clinic after a childhood poisoning incident were counselled for about five minutes by staff trained in the delivery and content of the message, with minimum disruption of patient-flow patterns.

Community nurses and health workers who regularly visit parents with children can be trained to recognize hazards in the home, and discuss ways to make improvements and methods for accident prevention. Home visits can also be initiated after a poisoning incident or other accident has resulted in contact with health services. In one programme in the USA, public health nurses visited families after children had been treated at a burn centre. The nurses made home safety assessments and injury control recommendations including poison prevention recommendations.³

The Safe Block Project⁴ included systematic home safety inspections by specially trained local board of health staff, community teams, and community health workers, to identify household injury hazards and teach

¹ *The Phast Initiative. Participatory Hygiene and Sanitation Transformation*. Geneva, World Health Organization, 1996 (document WHO/EOS/96.11).

² Woolf A et al. Prevention of childhood poisoning; efficacy of an educational program carried out in an emergency clinic. *Pediatrics*, 1987, 80:359–363.

³ Sullivan M et al. Reducing child hazards in the home. *Journal of Burn Care and Rehabilitation*, 1990, 11:175–9.

⁴ Schwarz DF et al. An injury prevention program in an urban African-American community. *American Journal of Public Health*, 1993, 83:675–680.

residents how to correct them, including how to store and label medications properly.

4.1.3 Telephone information services

Poisons centres mainly use telephone services to provide information about what to do after an exposure has occurred, but the telephone can be used for primary prevention. In the USA, where telecommunications are good and readily accessible to the community, members of the public are encouraged to contact the centre for general information about prevention. Poisons centres in the USA that undertake telephone follow-up after a poisoning enquiry, use the opportunity to offer prevention information and counselling to individuals. The wider roles and responsibilities of poisons information services in prevention are considered in chapter 5.

Where it is possible to use the telephone service for prevention, its effectiveness depends on maintaining awareness of the service in the community by advertising and education campaigns. However, in regions where most of the community cannot afford a telephone or where telecommunications are poor, the telephone has a very limited role in prevention.

4.2 Popular media

Popular media traditionally used in African and Asian communities to spread social ideas by word of mouth can be effective for promoting educational, health-related messages,¹ particularly in communities where literacy is low. They are a kind of entertainment that deals with the issues and concerns of the day. In some communities, storytelling is popular, in others drama, puppet shows or folk songs.

Storytelling communicates a message that is easier to remember than a formal talk, presenting information in a way that is closer to the way people think. It can be made relevant to the local audience and can be presented to encourage audience participation.

Drama and popular theatre can involve the audience during the presentation and can be followed by a discussion of the issues and possible solutions. Puppets are a form of drama. Puppets can say things that it would be unacceptable for an actor to say, and criticize traditions and institutions without causing offence. Presentations can include music and songs to increase their entertainment value. Suitable locations for performances might be markets, festivals, agricultural shows or schools. It will be important to publicize them in advance.

Songs can be a powerful way to communicate a social message and promote community participation. It is important to involve local musicians, and maintain a high standard of entertainment.

Any health education carried out through folk media should be based on some initial research on what the community knows, feels and believes about the topic, and pre-tested with a sample of the intended audience.

¹ Hubley J. *Communication health*. London, Macmillan, 1993.

4.3 Mass media

Mass media includes printed means such as newspapers, books, leaflets, wall posters and billboards as well as broadcast media, radio and television. Mass media can spread simple information and facts accurately and rapidly to a large population, most methods being relatively low cost. Mass communication raises awareness of an issue so that it becomes a matter of general public concern, triggers other initiatives, and reaches groups within the general population that would not be reached by other means.

On the other hand, mass communication may fail to reach the target group. Since the direction of communication is one way and cannot be adapted to local situations or communities, the message may be misunderstood, particularly if it reaches groups for whom it was not intended. These methods are not very effective at changing attitudes and beliefs, changing behaviour, teaching skills or conveying complex information.

4.3.1 Television and radio

Television and radio can reach very large target groups, and need only a small success rate to achieve high numerical success. They are more dynamic than the written word and more easily capture the attention. They can be effective for groups who have low literacy and are unable to understand the written word. Many countries with low literacy have a high ownership of radios.

Television may represent a particularly effective health education vehicle for reaching groups not reached successfully by traditional health education techniques. Information about toxic mushrooms, broadcast on Swedish television at a popular viewing time, was noted by the Swedish Poisons Centre to be associated with a reduction in reports of poisoning, although this was not confirmed by a formal evaluation.

One disadvantage of television is that the cost of airtime is likely to far exceed the resources available to organizers of poison prevention activities unless they have commercial sponsorship. However, free time can be obtained on television and radio by giving interviews on local community-related news programmes to promote poison prevention activities. Although the time allowed will usually be brief, it can be long enough to communicate a clear and concise message.

Another disadvantage is the possibility that the message will have unintended effects, drawing attention to poisons that then become popular in suicide attempts. This happened in Sri Lanka when the media carried reports of the toxicity of yellow oleander plants, and in the Philippines when the public were warned of the dangers from firecrackers containing yellow phosphorus.

The effectiveness of broadcast media in changing attitudes and behaviour is difficult to evaluate, but research suggests they are more effective if part of an educational programme that includes other local activities.¹

¹ Sundelin C et al. Information through television: does it promote child safety? *Injury Prevention*, 1996, 2:36–40.

4.3.2 Newspapers and magazines

The local press can be used to increase awareness of accident risks and suitable preventive measures by providing them with articles, reports and press releases. A Swedish campaign addressing accident prevention placed articles in the press directed not only to all the community, but also to certain age groups and occupational categories with high accident rates.¹ Articles described events, named causes of accidents that had occurred, and described how such accidents could be prevented in future. Health alerts in newspapers seem less likely to have unintended adverse effects than alerts broadcast on television.

Advertisements can be used to publicize prevention activities; in the USA, Poison Prevention Week is publicized through advertising in the local press.

In communities where magazines are popular with teenagers or young women, they can be very effective means of reaching these sections of the community, with messages written by their own generation in a popular style. Magazines have been successfully used by the Swedish Poisons Centre to reach teenagers.

4.4 Videos

Video is another medium able to reach groups who would not easily be reached by the written word, for example, young children. Videos can be produced for a specific audience. Prevention campaigns are more likely to be able to afford to produce and disseminate videos than to buy air time on television; furthermore they have control of the content of the video, rather than being at the mercy of a television producer. Videos also have the advantage over television broadcasts of being available for viewing more than once. The extent of distribution will determine their impact.

They are most effective when actors and situations reflect the same social, cultural and ethnic background as the target group. Videos were used by the South African campaign on prevention of paraffin poisoning, and were an ideal medium for showing people how to open and close child-resistant closures.

4.5 Printed materials

The advantage of the written word over the spoken word is that people have the opportunity to look at printed materials more than once if they want to, whereas they have to rely on their memory of what they have heard. The effectiveness of written materials depends on the recipients being able to read and understand the language. If used in areas where caregivers or the group at risk are unable to read (too young to read, illiterate, not knowing the language), the message must be conveyed without supporting text.

4.5.1 Content and design

Leaflets, folders, booklets, fact sheets, and posters can all be effective vehicles for distributing prevention information. Information can also be distributed on stickers. For example, stickers to put on the telephone to remind

¹ Schelp L. The role of organisations in community participation – prevention of accidental injuries in a rural Swedish municipality. *Social Science and Medicine*, 1988, 26:1087–1093.

people of telephone numbers of the poisons centre or other emergency services, or stickers to put onto bottles to identify them as containing kerosene and with instructions about how to use the safety closure.

Materials targeted at younger age groups could include safety quizzes, stickers, games, cartoon strips, illustrated educational storybooks, and pictures or posters to colour in. Colouring in pictures helps young children understand and remember the message probably because of the closer involvement of subjects with the material.

When planning to produce printed materials it is important to begin by considering what the objectives are, and what information must be included to fulfil the objectives. The message should be appropriate for the age and reading level of the target group. Language should be simple, clear, concise and specific. Appropriateness for the target group is also an important consideration, and influences, for example, the use of colour and the size of print. Illustrations often help understanding and recall of the message, and can increase the attractiveness and impact of the materials.

Printed materials should be pre-tested before they are distributed to find out if they are misunderstood. It is particularly important to test materials conveying the message using pictures without any text. Materials should also be tested for acceptability, particularly if they were developed for groups from a different cultural background.

It can be useful to look at other publications produced for poison prevention campaigns, to see how layout and typeface can be used to emphasize the message. Asking students at local art colleges or other educational establishments to design and produce materials as a project can reduce the cost. Alternatively, some producers of educational materials will be happy to let other groups with similar aims use or adapt them.

It may be useful to find out what educational activities organized by industry or government agencies are already in progress, and to find out what educational materials are already available.

4.5.2 Distribution

Effectiveness of printed information depends not only on its content and design, but also on where and how it is distributed. Materials for free distribution throughout the community should be displayed in areas visited by a wide cross section of the community including: schools, shopping centres, libraries, hospitals, and doctors' surgeries. Literature about safety aspects of specific products can usefully be displayed in retail outlets where these products are sold.

Alternatively, literature can be given directly to the target group. For example, material directed at parents of young children could be given to parents by health workers on home visits, or by staff of child health clinics, day nurseries, play schemes, or schools. Postal distribution is another method that directs information more precisely at the target group. It might be an effective means of distributing information to a very specific target group, for example to people who have contacted a poisons centre for advice on childhood poisoning.

Materials which are more expensive to produce and cannot be distributed freely, need to be advertised, and administrative arrangements may be needed to process and dispatch orders. Printed materials for educators and

trainers and community group leaders would probably come into this category.

Good teaching aids and resources for using with community groups facilitate and promote educational activities. Teaching aids could include teaching guides and resources for teachers with activities, teaching exercises, and teachers' notes. They can be designed for use in a variety of different settings. For example, resources suitable for use in further education courses could also be used for in-service training for professionals or for interested community groups; resources suitable for use in schools could also be used in play schemes or youth groups.

Community poisons prevention activities could be promoted by booklets giving ideas for activities with community groups, with background information and facts for group leaders, posters, stickers, leaflets, etc.

4.6 Displays and exhibitions

Posters, displays and exhibitions can be placed in shopping malls, shop windows, inside shops and pharmacies, in libraries, banks, post offices, child health centres and other primary health centres, hospitals, and clinics. A Swedish accident prevention programme provided information on child safety in health centres, in the form of a file for the parents, kept in the waiting rooms, containing elementary and basic information on child accidents, preventive measures, where to turn for health services, and advice on buying toys and equipment.¹

4.7 Child-centred events

Competitions for colouring in and designing posters are held every year as part of the USA National Poison Prevention Week. Companies donate prizes and posters are displayed in hospital lobbies and cafeterias, shopping malls, libraries, and even on outdoor billboards.

¹ Schelp L. The role of organisations in community participation – prevention of accidental injuries in a rural Swedish municipality. *Social Science and Medicine*, 1988, 26:1087–1093.

5. Who does prevention?

5.1 Role of poisons centres

Prevention is an important area for national and international collaboration between poisons centres to exchange experiences, participate in joint training programmes, and develop tools and materials. The most important role for poison centres in poison prevention is to contribute to the detection and study of toxicological problems by collecting and analysing exposure data and providing information, accompanied by appropriate advice, to responsible authorities, in particular to health authorities.

When they detect acute poisoning problems, such as an increase in frequency of a particular type of poisoning or new reports of particularly severe health effects, poisons centres may need to send urgent warnings and alerts to health authorities, other poisons centres, emergency services and health care providers likely to be involved in management of toxic exposures. Poisons centres may be the most appropriate organizations to communicate alerts and warnings to the media. The Milan Poisons Centre detected an episode of mass poisoning with methanol in Italy when they registered an unusual number of severe cases of metabolic acidosis and visual disturbances in a short period. The Poisons Centre immediately advised the health authorities, with the result that the source of poisoning (adulterated wine) was identified and actions were taken to prevent further exposure, namely removal of remaining bottles from shops, and broadcast warnings through the mass media to alert the public.

Poisons centres can support educational programmes by making their library and reference resources available to educators developing new materials, or by producing their own educational packages written by poison centre experts. These materials may address specific needs, for example, the prevention of lead exposure, or may refer to more general matters, such as prevention of poisoning in children, or safe use of household products. The extent to which poisons centre staff are directly involved in poisons prevention education depends on their expertise and interest, and on the availability of financial and human resources.

5.2 Partners in prevention activities

The responsibility for poison prevention is shared among individuals, community groups, health professionals, health service institutions and government and nongovernmental organizations. Collaboration between agencies, organizations, and individuals is a very important aspect of poison prevention programmes. It may be impossible to undertake an effective

programme without the combined expertise, effort and resources of a number of partners.

5.2.1 *Initiators vs. partners*

Agencies, organizations, and individuals that have an interest in poisons prevention may be initiators or partners in given activities. Initiators, identifying the problem and recommending an action, are usually poisons centres or health authorities. The choice of a role, or even the decision to participate, may depend on many factors, including, but not limited to:

- the nature of the problem that will be addressed
- the type of message planned, intended outcome, and/or targeted audience
- whether the desired action or activity is required by law
- whether the focus is regulatory, medical, or behavioural
- whether corporate responsibility or corporate risk management is involved
- whether the issue is an emerging public health issue or a continuing issue/problem
- whether the intended message is amenable to short- or long-term activity
- whether the issue requires national attention, or is better addressed at the regional or local level.

While a large number of people and organizations may be considered, specific initiatives are most effective if they include those who identified and/or studied the problem and those who can deliver the message at the target level. For example, activities aimed at school children will be effective only if teachers are involved in the preparatory phases of the programme and deliver at least some of the messages.

5.2.2 *Organizers and partners*

While collaboration and partnership imply shared responsibility, activities are effective only if individuals are designated to coordinate communications and disseminate information. Once a toxicological problem is stated and a target message developed, an individual or organization should be chosen or appointed to take a lead role. Expectations can then be defined.

At the same time as the nature and extent of the issue are delineated, potential partners/collaborators can be identified, and asked to suggest other organizations or individuals who should be involved. As many partners as possible should have the opportunity to participate in identifying the goals, objectives, implementation plans, and evaluation strategies.

For example, in the case of prevention campaigns addressed to workers in a given industry, it may be appropriate to invite trade unions, manufacturers' associations, public safety services, health authorities and representatives of international work organizations to participate. When prevention campaigns address children, teachers should be involved in the preparation and implementation of the programme.

5.3 Agents and agencies that are potential initiators and partners

Below are described the responsibilities of some of the agents and agencies that have an important role in poisons prevention.

- *International organizations*, such as specialized agencies of the United Nations, UNICEF, International Red Cross, Red Crescent, and non-governmental organizations, may play an important role in the promotion of poisons prevention activities. They can provide either technical advice or financial support, and have a major role in raising awareness about the need for prevention at the governmental level. In many cases, international organizations are pivotal in raising the political support required for a successful activity.
- *Law-making bodies and regulatory agencies* at the national, state, and local levels have responsibility for poisons prevention in terms of general policy, and also for specific issues, particularly those bodies concerned with health, occupational safety and health, hazardous substances, pharmaceuticals, agriculture, fisheries and food, the environment, transportation of hazardous materials, consumer products and consumer protection, and education. For example, they have the power to ban or control the use of high-risk chemicals and other dangerous products, to impose safety measures or to monitor exposed populations, and introduce other regulatory measures that aim to minimize the impact of chemicals on human health and the environment.
- *Local authorities* may have responsibility for activities such as collating poisoning statistics, investigating human and environmental exposures to poisons, controlling the disposal of hazardous materials, providing poison prevention educational resources and training, handling occupational health issues, evaluating the social conditions that may determine some type of poisoning cases, and providing expertise on how to reach the target population with a clear message.
- *Educational institutions* providing general education for students at all age levels, and those providing technical and professional education, have a responsibility to include poisons prevention and safe use of chemicals in their teaching programmes. They also have roles in providing data on chemicals held in libraries and databases, and generating data through research work.
- *Commercial and industrial organizations* have a responsibility to monitor hazards related to use and storage of their products in the home and to develop strategies to minimize or prevent such exposures by changes in product or packaging or instructions for use. The chemical industry is often quite responsive to information from poisons centres. There are specific instances of pharmaceutical manufacturers changing pack size, labelling, and classification of their products. Manufacturers of pharmaceuticals, chemicals and agrochemicals often produce educational materials, provide consumer advisory services, and sponsor research into poison prevention. Poison prevention activities are often geared towards good public relations, a good “image” and product sales; however, in some cases, activities such as the dissemination of information and provision of specialized training in the management of hazardous chemicals, are a legal responsibility for producers, distributors or retailers of haz-

ardous chemicals. Within commercial and industrial organizations, the individuals and groups most concerned with prevention include:

- industrial hygienists
- divisions responsible for community safety and responsibility
- divisions responsible for risk management and legal affairs
- researchers and manufacturers of protective packaging and clothing
- occupational physicians.

Manufacturers and large retail organizations can make an important contribution by providing funds for training programmes and for the production and distribution of educational materials through corporate sponsorship. For example, the South African Petroleum Industry Association provided funding to enable the South African Campaign to Reduce Paraffin Poisoning to supply safety caps for containers. Safe Kids Canada, a national charitable organization, was set up using sponsorship from Imperial Oil and continues to be funded by a variety of corporate supporters including a food manufacturer, an advertising agency, banks, the media and service clubs.

- *Trade associations* for manufacturers of pharmaceuticals, industrial and household chemicals and agrochemicals are influential in the policy-making, practice and training of their members in the area of poison prevention. In industrialized countries, where consumers are more aware of risks from chemicals, many trade associations produce educational materials for the public, stressing the importance of using and storing their products safely. Some prevention campaigns have benefited from financial support from trade associations.
- *Trade unions* can be influential in developing poison prevention policies in the workplace and in requesting that such policies are put in place.
- *Distributors and retailers* can contribute to prevention programmes by ensuring that products are stored and displayed safely, with packaging intact and labels legible, and product information leaflets prominently displayed. Retail outlets may be appropriate places for displaying information to raise awareness of prevention programmes or educational leaflets or posters. They have a responsibility to ensure that products are safe when they are sold to the consumer and to follow regulations relating to sale of toxic products. Such regulations may, for example, control use of toxic chemicals in the home by prohibiting sale to non-professionals or children, control supply of medications by restricting sale to pharmacies, or regulate the display of products (e.g. in France, retailers have to store paint stripper containing dichloromethane in cabinets). Retailers also have an important role in controlling product availability, and ensuring that consumers have a choice of less toxic products when these are available.
- *Public safety officials*, including police, fire and ambulance personnel, are involved in the management of chemical incidents and may contribute their experience of the management of hazardous chemicals and their potential health effects.
- *Organizations focusing on child safety issues*, governmental or non-governmental, national or local, may produce educational materials, run

poison prevention courses and campaigns, fund poison prevention research and lobby government bodies on issues of policy.

- *Health care providers*, through cooperation and consultation with poison centre staff, other medical and paramedical professionals in public health agencies, clinics, hospitals and primary health care centres, and their representative professional organizations, have an important role in data collection and advocacy. Specialization in health education may be an option for health care professionals and students, including physicians, general practitioners, psychiatrists, nurses, public health nurses, child health nurses, ancillary health care providers, health workers at the local level, health advisers, traditional healers, and indigenous health care providers.
 - *Community health workers* specializing in health promotion, such as health visitors, have a special responsibility for accident prevention because they are the members of the primary health care team in frequent contact with children and their parents, both as individuals and in groups. They also have access to families' homes, a good understanding of child development, and opportunities for identifying the needs of their client population. Community health worker visits are an opportunity to identify hazards in the home and discuss them with parents, and offer advice on how to prevent injuries.
 - *Emergency department physicians and primary care physicians* are also ideally situated to provide poison prevention education, but they may not be trained to identify and communicate poison prevention messages, and the emergency department setting may not be conducive to education.
 - *Community pharmacists* are unique amongst health professionals because they are so readily accessible to the general public (the healthy and the sick) for advice and information in the informal atmosphere of the local community pharmacy.
 - *Professional organizations for health care providers* at national and local levels are influential in the policy-making, practice and training of their members in the area of poison prevention. They may also produce educational materials for the public.
- *Coroners and medico-legal experts* have an important role in data collection and in drawing public and regulatory attention to problems that need to be addressed.
- *Social workers* have the same frequent contact with children and their parents as community health workers. They also have access to families' homes, and opportunities for identifying hazards in the home, discussing them with parents and offering advice on how to prevent injuries.
- *Churches, religious and philanthropic organizations* may be extremely influential in some countries.
- *Community and voluntary organizations*. A large range of local voluntary and community groups exist, many of which undertake educational work on health matters, including poison prevention. Voluntary organizations are a response to live issues and problems, and may complement statutory services. They may act as catalysts to bring about improvements in the health services. Patient and parent participation groups may focus one of their activities on poisons prevention awareness. Self-help groups

can be defined as groups of people who feel that they have a common problem and have joined together to do something about it. They may focus on medical, behavioural or social problems, and their aims may include providing information and advice, and pressure-group activities to increase public awareness of their problems, lobby for improved services where appropriate, and change attitudes towards people with problems.

- *Media.* In most cases the support of national and local print and broadcast media, such as television, radio, newspapers, magazines, and producers of print, audio, and/or video educational materials, is essential for the success of poison prevention education. The media can play a key role in informing the public in the event of a chemical emergency. It is important that they check the accuracy of information before disseminating it, by consulting a poisons centre. It is particularly important that the media are properly informed and able to disseminate urgent information without causing undue alarm and panic. The media can also be used to convey regular educational messages concerning prevention of poisoning. It may be useful to involve public spokespersons who have credibility with the target audience.
- *Organizations and coalitions at the national and local level* interested in related areas, such as injury prevention, environmental preservation and community protection from hazardous chemicals, may provide useful help and support. Consumer groups have an important role in education about safe use of chemicals in the home, and also in the provision of information to government, manufacturers, retailers and distributors, about accidents caused by specific products, about users' perception of hazard, and about dangers related to the way consumers store and use products.
- *Members of the target audience*, for example, workers or parents, should participate whenever possible in the process of identifying goals, objectives and methods, and may have an important role in implementing the programme. Community workers who are good communicators can play a key role in a project, bridging the gap between health professionals and members of the local community.

6. Why do an evaluation?

Once the prevention activity has been launched, it is important to assess whether it is effective, whether any changes could improve effectiveness, and whether continuing allocation of money and resources is justified. Published programme evaluations can be important for future decision-making. An account of a successful programme is likely to stimulate others to repeat the activity among other groups, and can help to sustain support for the activities. On the other hand, an account of an unsuccessful activity programme may prevent others wasting resources by repeating it. Such accounts may help planners to estimate the potential costs of repeating similar programmes in a new situation.

There are several aspects of the programme that can be evaluated:

- how well the programme is operating
- how much the programme has cost so far in money, time, effort, resources
- whether the programme is achieving its objectives
- whether the results and outcomes are as expected
- whether there are any unintended or unexpected benefits or problems.

6.1 Planning evaluation

The planning of the evaluation should be included in the initial programme planning, and the programme design should include methods for evaluation and a budget and resources allocated to carrying it out. Early planning is essential because some evaluation methods require baseline information to be collected, or communities or individuals to be randomly allocated to control and study groups before the programme starts.

How the evaluation is carried out depends on:

- why the information is needed
- who it is intended for
- when the information is needed by the decision-makers.

All participants and representatives of the target group(s) should be involved in the different stages of the evaluation process, in setting objectives, collecting data, judging outcomes and deciding on future activities.

6.1.1 Factors influencing the selection of an evaluation design

The amount of money, manpower and time available to conduct the evaluation will have a major influence on the design and scope of the evaluation.

It is very useful to undertake a simple, low-cost evaluation to provide an initial assessment of the efficacy of the programme before undertaking more complex and more costly evaluations.

Choice of evaluation design is also influenced by:

- the time needed for the intervention to have an effect
- sample size needed to ensure sufficient statistical power to document the effect of the intervention
- the resources needed and available to allow the study of a group of a given size
- existence of baseline data about toxic exposures and poisonings
- ability to identify and recruit appropriate intervention and comparison groups to conduct a controlled study
- ethical considerations (for example, in the recruitment of subjects, in withholding an intervention from the comparison group)
- cooperation of individuals or agencies, such as school teachers or health care providers.

Repeat evaluations may be needed to show that the effect of the programme is sustainable and that the effect is real and generalizable in different settings. Re-evaluation may be needed after political or other changes have occurred that might have an effect on the programme. If the level of awareness and the motivations/constraints of the target group change over time, repeated assessment may show whether the programme has become unsuitable or irrelevant and should be discontinued.

6.2 Barriers to conducting evaluations

There are a number of factors that make it difficult to carry out evaluations:

- *Lack of well defined goals and objectives* for the programme, making it difficult to show what change has taken place and to assess what has been achieved.
- *Lack of readily available data* about toxic exposures, poisonings and chemical incidents appropriate for evaluating the prevention programme. Data about accidents can be difficult to obtain, exist in unsuitable formats, or be incompatible with data from other sources.
- *The need for a large sample* to provide sufficient statistical power to detect a change in rates of relatively rare events.
- *The cost of evaluation*: there may not be sufficient funds to support a complex evaluation, as these are almost always costly.
- *Lack of appropriate expertise among programme staff*: for example, no epidemiologists or other academics.
- *Lack of staff with enough time* to conduct the evaluation.
- *The need to consider both the short-term and long-term effects* of the programme. This is particularly the case with educational campaigns that may be effective in the short term, but have no long-term effect.
- *The need to consider delayed effects* which are not apparent until long after the intervention took place.

- *Difficulty in separating the effects of the intervention from other influences on attitudes and behaviour.*
- *The need to establish the reliability and validity of the outcome measures used.*

6.3 Methods for evaluation

This chapter considers mainly the evaluation of educational strategies and activities used in prevention of toxic exposures. The same methods can be used to evaluate other prevention strategies, such as introduction of child-resistant containers, distribution of activated charcoal to parents, or distribution of protective clothing to people working with pesticides, but different indicators will be measured and different factors need to be taken into consideration when deciding which method to use.

There are two ways of evaluating a prevention programme: *process evaluation* looks at how things were done, while *impact evaluation* looks at the effectiveness of the programme or impact on health, such as reduction in number of toxic exposures or severity of poisonings in the target population, or changes in behavioural indicators.

Both process evaluation and impact evaluation can be undertaken using either quantitative or qualitative methods. Quantitative methods count and measure what was done and what happened as a result of the programme (for example: how many? how often? was there a difference between the people targeted by the campaign and those not reached by the campaign in terms of their behaviour, or the number of poisonings reported?).

Qualitative methods evaluate the quality of the activity, the nature of the outcome, the effect of the activity on people, and the kind of changes in behaviour that occurred as a result of the intervention.

6.3.1 Impact evaluation

Indicators

The impact of the prevention programme is a measure of the change that took place as a result of the programme. The most convincing measure of the impact of a poison prevention programme is a change in the rates of poisonings. However, such a measure may not be feasible if there are no readily available data about toxic exposure. Also, a change in the rate of poisoning may be an inappropriate measure if the changes are too small to measure, for example, changes in mortality from poisoning in young children in some populations may be too small to interpret. The impact of the programme on morbidity and mortality might be too long term to be a feasible measure.

Other indicators that can be used instead depend on the objectives of the programme. If the programme has a clear message, and specific, measurable objectives such as those described in chapter 5, it should not be difficult to decide which indicators should be measured, for example, increasing knowledge or changes in attitudes or behaviours related to poisoning. A programme which aims to decrease toxic hazards in the home, by teaching people to adopt safe practices (e.g. keeping medicines in CRCs and storing them in lockable medicine cabinets, or keeping household chemicals in

cupboards), could be assessed by counting the number of homes with these specific safety measures. This could be measured by direct observation during a visit, by asking householders during a telephone interview, or by postal questionnaire.

Similarly, programmes aimed at reducing toxic hazards in the community or workplace might be evaluated by a survey of cottage industries, workshops, farms or plantations. Assessment of campaigns promoting the safe storage of pesticides could be undertaken by visits to workplaces to observe whether or not chemicals were kept in properly labelled containers, and in a safe and secure store with an accurate inventory. A programme aiming to teach employers and workers about the safe use of pesticides, might, for example, survey the use of protective equipment and clothing, methods used for waste disposal, adequacy of washing facilities for workers, and cleanliness of the workplace.

A programme may aim to decrease toxic exposures by increasing knowledge or skills, for example, by teaching first aid for poisoning in the event of an exposure, teaching how to recognize commonly encountered poisonous plants or animals and how to avoid them, teaching how to use safety devices such as child-resistant containers, or teaching the correct way to dilute and mix pesticides and use spraying equipment. Such programmes could be evaluated by testing knowledge and skills.

It may be appropriate to choose more than one indicator since interventions often have differing impacts on apparently similar indicators, and assessment of only one indicator might produce a misleading measure of success. For example, a prevention programme in the USA promoting safe practices in the home, resulted in more homes keeping household chemicals in a cupboard with a child-resistant catch but no increase in the number of homes where all medicines were kept in child-resistant containers. A variety of indicators is also needed to assess the impact of campaigns carried out over a long period of time, with some outcomes not being apparent in the short term.

Methods for evaluating impact

It can be difficult to separate the effects of the intervention from the many other influences on attitudes and behaviour. How certain is it that the observed effects are really due to the programme rather than any other factors?

The most straightforward evaluation of the performance or impact of the programme is to simply look at the changes in impact indicators and describe or measure the changes that took place. The assessments could be carried out once, or be repeated to give an indication of changes over time. However, it may be difficult to infer that any observed improvements were due to the programme rather than other influences, and would not have taken place without it. This kind of evaluation is sometimes called a “non-experimental” evaluation.

Quantitative measures include number of poisoning cases reported, number of deaths from poisoning, or changes in behaviour such as the number of homes using child-resistant containers before and after a campaign, number of workshops improving their chemical stores or washing facilities, or number of workers using protective clothing.

A qualitative assessment of impact might ask:

- How many of the individuals reading educational posters and leaflets, and looking at visual aids or other materials, understood the message?
- What did parents and teachers think about the impact of the educational activity among children?
- Did individuals receiving counselling about prevention of poisoning in the home think it was helpful.
- Why did people change or not change the behaviour targeted in the campaign, for example, or follow the advice to store chemicals safely?

Qualitative evaluation of poisoning incidents to find out how exposure occurred, by looking at clinical case records of poisoning victims, talking to the victims or their parents, or by observing working practices, could provide insight into the effectiveness of a prevention campaign.

Assessing the impact of external influences

To obtain a greater degree of confidence that the observed changes were due to the programme rather than external influences, the evaluation must try to rule out confounding factors that might have caused the observed effects. To do this, the study group is compared with a control group that is not exposed to the intervention but is similar in all other relevant characteristics.

The use of control groups can partly address the problem of determining whether a change in the number of poisoning cases admitted to hospital is due to the impact of the programme, a change in admission policies, or to clinical management protocols that determine whether a patient is admitted to hospital, where both cases and controls are similarly affected.

Case reporting may be increased because the programme increases awareness of the poisoning. This is particularly likely to be the case if cases/exposures are identified from anecdotal evidence of exposure, such as from parents' reports to a poisons centre, or interviews with parents. The possibility of increased awareness could be investigated by asking the people who report cases how they had been influenced by the programme. If the study cannot be designed to address this problem, then other studies will be needed to corroborate the findings, such as a survey of hospital admissions, or deaths.

The control groups can be chosen before an evaluation is begun, or afterwards, during the analysis of the data. There are several alternatives for choosing a control group:

- a historical control group, chosen from the same population before or after the programme
- an internal control group, including case control design
- an external control group from an area not exposed to the programme.

The intervention and control groups are supposed to be similar in all relevant characteristics except exposure to the programme. However, often one of the comparison groups is influenced by a confounding factor that does not affect the other group as much. Dealing with confounding requires the measurement of probable confounders and their statistical treatment through matching, standardization, stratification or other forms of multi-

variate analysis. One cannot completely rule out alternative explanations for the observed differences, but the use of control groups may provide a sufficient degree of confidence to decide the future of a programme.

Evaluations which look at changes over time should take into account the possibility that the changes may be due to random fluctuation rather than the effect of the programme. Other factors complicating the interpretation of changes over time include effects of external events unconnected with the intervention but which occur during it and may have as much impact as the programme itself. For example, mass media reports of poisoning occurring during an educational campaign would increase safety consciousness in the community. Another example might be the withdrawal of a chemical from the market, because it has been banned or because the manufacturer discontinues production. Also, assessment of the immediate and delayed effects of an educational activity among children must take into account that there may also be a natural increase in knowledge during that time. The evaluation design should attempt to measure the maturation effect so that it can be seen whether the improvement is due to the educational activity, i.e. is greater than would be expected from a natural increase in knowledge.

Participation in an evaluation to test increase in knowledge may be the means by which people become more aware of toxic hazards rather than the prevention activity.

Randomized controlled trials

If people are randomized into groups, then it is likely that any confounding factors will be equally distributed between the groups, so that any differences observed between the groups after the prevention activity can be attributed with more certainty to the activity, there being only a small known probability that the difference is due to confounding, bias or chance. Randomization does not eliminate confounding but ensures that the probability of confounding is measurable. The confounding factor does not even have to be known.

Randomization should be carried out to reduce the possibility of bias from either individuals or researchers being able to choose whether they are allocated to the intervention or control group. A double blind trial, in which neither the individual nor the researcher knows who is receiving the intervention, is not usually possible as a method for evaluating educational activities. For some programmes, the unit of randomization can be a group of people, such as a village or town, or all the patients seen by a particular doctor.

There are several disadvantages connected with randomized controlled trials:

- The evaluator must be present at a very early stage of the programme planning to design randomization.
- It may not be ethical to withhold the programme from eligible individuals.
- It is difficult to design a randomized controlled trial of an educational campaign because the control group is often influenced by the intervention as its effects diffuse through the target community.
- It may be difficult to get community groups to agree to be randomized.

- The stringent design may result in a situation so different from reality that the results are irrelevant to the decisions that need to be made.
- They are expensive, so their use is limited to large-scale programmes.

Randomized controlled trials have been used in the UK to evaluate the effectiveness of giving home safety advice and low-cost safety equipment to parents in a primary care setting, using medically-attended injuries, self-reported behaviour, use of safety equipment, and knowledge, as outcome measures.¹

6.3.2 Process evaluation

Process evaluation looks at how things were done, who was involved, how the programme was organized, whether it was carried out as intended, how well the resources were allocated and disseminated and whether they reached the target group. Process evaluation can investigate which factors hindered or facilitated the activities, for example, whether the methods and messages used were appropriate for the target population and of acceptable quality, and whether there were any adverse outcomes. When programme impact evaluation fails to show that a programme was effective, process evaluation can show why and whether this was due to inadequate implementation or the methods used.

A simple assessment of the campaign could measure *numbers of activities* by direct observation, by questionnaire, or by analysis of data sources such as registers of activity. In an educational campaign it might be possible to measure the following activities:

- the number of brochures, leaflets distributed, posters displayed
- the number of campaign messages or programmes broadcast on radio or television programmes
- the number of talks or training sessions given
- the number of schools including poisons prevention in the syllabus
- the number of newspaper articles about poisoning that were published
- the number of child health centres displaying information on poisons prevention
- the number of community pharmacies displaying information on poisons prevention
- the number of industrial companies sent posters and literature related to prevention of poisoning
- the number of trainees that have participated in a training programme
- the number of households that have been visited and given information about making the home safe.

The campaign could also be assessed in terms of its *accessibility* to the target population, using measures such as:

- the proportion of the general population and the target population able to receive television/radio broadcasts

¹ Kendrick D et al. (1999) Preventing injuries in children: cluster randomised controlled trial in primary care. *British Medical Journal*, 1999, 318:980–3.

- the proportion of the population within easy reach of the places with displays of poisons prevention literature (posters, brochures, leaflets), or exhibitions
- the proportion of the population likely to be able to attend at the time when the meeting is held
- the length of time a display or other exhibition is on show
- the readership of newspapers that carry articles about poisons prevention
- the availability to the local population of a health service carrying out a prevention programme.

The *coverage* of the target population can be measured by:

- the proportion of the target population who receive leaflets, attend exhibitions
- the proportion of the general population and the target population viewing or listening to TV/radio broadcasts
- the proportion of schoolchildren who attend poison prevention lessons at school
- the proportion of parents who receive poisons prevention information or counselling when they attend primary health care centres
- the proportion of homes with pre-school children that have been visited.

Qualitative methods of process evaluation could address issues such as:

- What did those on the receiving end of the programme think about the prevention activity or the message given?
- Did they think it took account of their skills, knowledge, and ethnic, social and cultural background?
- What did they think were its strengths and weaknesses and what changes would they suggest?
- Did individuals receiving counselling about prevention of poisoning in the home think it was delivered at an appropriate time and place?
- Did health workers, counsellors and teachers involved in community activities think their training was adequate?

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SECTION II

POISONS PREVENTION IN DIFFERENT ENVIRONMENTS

Prevention of toxic substance exposure in the home environment

1 Programme overview

1.1 Addressing prevention in the home

The home environment includes every place where individuals and families live, except for communal institutions, and a wide variety of chemical products, such as those associated with personal hygiene, medications, and products for home-based activities such as cleaning and repair of the home and car, hobbies, gardening and pest control. Also, toxic gases can be produced in the home by heating and cooking equipment or as a result of fires. Everyone in the community is potentially at risk of exposure but the risk is greatest among pre-school children, who account for the majority of unintentional exposures to chemical products in the home.

Prevention programmes must target specific communities, addressing the needs and priorities of local people and accidents happening in the locality. Community participation is important, because the most effective accident programmes are those involving the whole community.

1.2 Identifying who will be responsible

Campaigns should be planned and carried out by collaboration and co-operation between parents and caregivers, and all those groups whose actions affect the safety of chemical products in the home, the home environment, or the family. These include:

- those who influence or control supply of chemical products, for example:
 - manufacturers and trade associations who are responsible for supplying products that are safe, and are possible sources of funding for training programmes and for production and distribution of educational materials

The South African Petroleum Industry Association provided funding to enable the South African Campaign to Reduce Paraffin Poisoning to supply safety caps for containers.

Spencer Jones J. Towards a national paraffin safety action plan. *South African Medical Journal*, 1995, 85:821.

Safe Kids Canada, a national charitable organization, was set up using sponsorship from Imperial Oil and continues to be funded by a variety of corporate supporters including a food manufacturer, an advertising agency, banks, the media and service clubs.

Sidky M. SAFE KIDS Canada. *Injury Prevention*, 1996, 2:70–72.

- distributors and retailers who are responsible for ensuring that products are sold in safe containers with adequate information
- consumer groups who may have information about accidents associated with use and storage of specific products, that can be given to government, manufacturers, retailers and distributors
- those who influence what people do at home, or who are in contact with parents:
 - community health workers e.g. health visitors and community nurses who have frequent contact with children and their parents, access to families' homes, a good understanding of child development, and opportunities for identifying the needs of their client population
 - mass media
 - health education and health promotion groups
 - accident prevention groups
 - housing and environmental health services, fire and police services
 - poisons centres
- health services and individuals providing health care:
 - health service providers, particularly those who treat patients after exposure to a poison, because they can disseminate local data on toxic exposures
 - health service purchasers/commissioners
 - health care workers
 - public health professionals
- those in contact with children:
 - teachers, day nursery staff, children's nurses, social workers working with children
 - parents
 - childminders, who are often older children.

Local and national authorities, particularly those responsible for health services, may help provide effective leadership. An initial meeting should be organized to define goals, agree on the responsibilities of cooperating individuals and organizations, identify other individuals and organizations that could cooperate or participate, and constitute a committee or action group to plan the programme.

1.3 *Defining the programme: what substances are included, who is exposed, and how it is going to be accomplished*

Most programmes target a specific age group and a specific locality (national, regional, or local), and some are more narrowly focused on particular groups at risk, defined in terms of social deprivation or income level, social class, belonging to a minority group, or living in temporary or sub-standard housing. Some programmes address all accidents or all unintentional exposures to poisons in the home, others target a specific exposure of particular local concern (for example, the problem of paraffin ingestion by young children in South Africa, or carbon monoxide poisoning caused by faulty heating appliances and poor ventilation in the home).

The programme planning process should include a review of measures already in place in the locality and elsewhere, and the evidence for their effectiveness.

1.4 Identifying available resources and sources of support

Groups, organizations and individuals already involved in accident prevention activities are potential sources of materials for promotion, training and education, and may be able to give information and advice related to their own experiences. Possibilities for funding include: local and national government, health authorities, bodies funding research, nongovernmental organizations with concern for child health or accident prevention, financial organizations, and commercial organizations such as product manufacturers, chemical companies, packaging manufacturers and retailers.

1.5 Raising programme awareness in the community

The programme can be advertised using the local press, radio or television, and by placing posters or exhibitions in strategic places in the community such as libraries, post offices, and child health centres. Programmes aimed at groups within a geographically limited area can use key individuals to go and tell people about it.

The Safe Block Project, developed by the Philadelphia injury prevention programme, recruited a network of block and community leaders to make contacts with residents in their blocks, hold monthly residents meetings, and distribute information to them.

Schwarz DF et al. An injury prevention program in an urban African-American community. *American Journal of Public Health*, 1993, 83:675–680.

In Uppsala, Sweden, before a series of television programmes on child safety were broadcast, staff of day-care, child health and primary health centres attended special meetings where they were encouraged to tell all parents they met in their work about the programme. Families in the area with a pre-school child received a personal letter from the head of child health services giving information about the broadcasts.

Sundelin C et al. Information through television: does it promote child safety? *Injury Prevention*, 1996, 2:36–40.

2 Risk characterization

2.1 Identifying which agents are involved in unintentional exposures

Sources of local and national data about toxic exposures in the home should be reviewed, such as hospitals, clinics and health centres, poisons centres, coroners and statistical sources. To detect products that are infrequent causes of serious morbidity, data from poisons centres or multicentre surveillance systems will be more useful than data from individual hospitals. Information on incidents, including “near misses” that do not reach hospital, can be collected by interviewing members of the local community. People from the local community can be trained to carry out interviews.

2.2 Investigating risk factors and understanding their influence on unintentional exposures

Information about the agents implicated in exposures, the child, the environment and the circumstances of the accident may indicate factors associated with high risk.

2.3 The agent

- *Appearance:* Liquids may be mistaken for drinks if they look like water or soft drinks. Medicinal tablets may look like sweets.
- *Packaging:* Packaging can be an effective barrier between the child and the contents of the pack, if correctly used. However a significant proportion of exposures occur as a result of children gaining access to recloseable containers that have not been correctly closed.

In Sri Lanka, kerosene oil containers in homes were said to be hardly ever stoppered.

Lucas GN. Childhood poisoning in Sri Lanka. *Ceylon Medical Journal*, 1990, 35:41–43.

Exposures commonly involve products that have been taken out of their original containers and put into another one. Products may be decanted by retailers or distributors before the product is sold, or by consumers after they have bought it. Intermediate containers commonly lack a secure closure, and are often associated with food or drink, such as a bowl or cup or an empty soft drink bottle.

In Malaysia, a survey of 70 children hospitalized for accidental ingestions of poisoning, found 70% had ingested kerosene from soft drink containers.

Azizi BH, Zulkifli HI, Kassim MS. Circumstances surrounding accidental poisoning in children. *Medical Journal of Malaysia*, 1994, 49(2):132–137.

- *How and why it is used:* Finding out the reason why a particular product is used, and how it is used and stored in homes, may indicate whether prevention efforts should be directed at reducing the use of the product or making it safer to use. Such information could be obtained by interviews with people after an exposure, or during a home visit.

2.4 The child

Children are most at risk between 12 and 36 months of age, when they develop hand-to-mouth activity and become more mobile. They remain at risk until about the age of five or six years, because of their innate curiosity, lack of judgement and inability to read.

2.5 The environment

- *Safe storage* effectively separates the product from the child, but homes may not have safe storage, or people may not use it. It is often more con-

venient to put things in unsafe places than to use safe places. Locked cupboards, suitcases or boxes, or cupboards fitted with child resistant door catches are most secure. The safety of unlocked storage depends on whether it is visible and easily accessible to a child, and whether it is in a part of the home where the child may be unsupervised. Home visits could be a way of finding out how people store chemical products.

An investigation into storage of paraffin in homes in villages in South Africa found that most households had a paraffin container on the floor, under the bed or behind the stove, where it could easily be reached by children. Only 25% had a paraffin container inside or on top of a cupboard that was out of reach of children.

Krug A et al. The impact of child-resistant containers on the incidence of paraffin (kerosene) ingestion in children. *South African Medical Journal*, 1994, 84:730–734.

- *Social disadvantage*: Overcrowded accommodation, unemployment of one or both parents, low social class and illiteracy, have all been associated with increased risk of accidents.
- *Family stress*: Several studies have found stressful situations (e.g. serious illness, pregnancy, recently having moved home, parental absence from the home, depression) to be associated with a risk of child poisoning, because families are likely to be less careful in storage of dangerous products and less able to supervise children adequately.

2.6 Circumstances of exposure

The majority of ingestions by children occur when they are left alone, if only for a few seconds. Incidents most commonly happen when parents are pre-occupied with meal preparation or otherwise distracted.

Exposure often occurs when a product is in use and the container has been left open, within easy reach of the child. Some products are left for prolonged periods while they are in use, in places where they are easily accessible to children. For example, rodenticides are sometimes left in open dishes on the floor, and bleach or detergent is added to laundry left soaking in buckets.

3 Exposure controls

3.1 Containers and packaging

Child-resistant packaging has successfully reduced the incidence of childhood poisoning from medications and household chemicals in many countries. Educational programmes may be needed to ensure such packaging is used and accepted by consumers, and it is important for campaigns to stress that safe packaging alone is not enough to prevent poisoning. Safe storage is important even for products in safe packaging.

3.2 Removal or modification of the poison

The hazard from a particular product can be decreased by restricting or banning its use. Alternatively, the use of less toxic products could be pro-

moted or the formulation of the product could be changed to improve its safety.

Campaigners in the USA secured the cooperation of manufacturers to reduce the alkali concentration in many household products, and successfully achieved their aim of reducing serious morbidity from oesophageal burns.

3.3 Labelling practices

Product labels and literature provided with the product, such as package inserts, are the most important means for providing guidance on safe handling and use, and advice in case of exposure. Local accident surveys should note whether exposures in the locality result from misunderstanding of the information on the product label. Prevention strategies can be designed to address these problems, by for example, producing materials that explain correct use and storage, with translations for minority groups in their own languages.

3.4 Storage and handling guidelines

Guidelines about how to store medicines and household chemicals safely are one of the most important messages in educational campaigns. If the campaign is targeting a limited area, home visits are a particularly effective means of promoting the message, to warn householders about the dangers and give advice on how to eliminate them.

3.5 Supervision

Many parents do not realize their children have developed skills to open containers or climb to reach high shelves and cupboards, so an important message for education directed at caregivers is to explain the appropriate level of supervision for children at different stages of development.

3.6 Changing social, psychological and economic factors

Increased financial and social support to deprived households with young children is likely to be effective in reducing exposures to poisons, but may be beyond the means of a prevention programme. On a more limited scale, free provision of low-cost safety materials, such as child-resistant closures for paraffin bottles, can be effective in some situations. In rural areas of less affluent countries, local community health workers should help the community to find local solutions to improving home safety. For example, where houses do not have lockable cupboards, local community health workers may be able to find local craftsmen to make and supply them.

4 Education and training

Education campaigns should focus on:

- identifying hazards, e.g. products that cause serious or frequent morbidity, product misuse, unsafe storage practices

- the nature of the hazard
- how to prevent poisoning and the effectiveness of different methods
- how to use safety devices such as CRCs
- promoting the poisons information service (if there is a public service)
- first aid for poisoning
- child development.

One or two specific messages are preferable to a large number. The message must be culturally and developmentally specific; materials should be bold, simple and easy to understand.

4.1 Individual counselling and group teaching

Medical and nursing staff in outpatient departments, emergency departments and children's wards, and child health clinics, can give information and advice. Community health workers on home visits can identify hazards in the home and offer advice on how to prevent poisoning. Home visits undertaken after an unintentional poisoning, to discuss the event and look at strategies for preventing it happening again, are also useful.

The Safe Block Project hired a team from the community to visit homes, identify hazards and teach residents how to correct them. The visits were shown to be particularly effective with respect to keeping medications out of reach of children.

Schwarz DF et al. An injury prevention program in an urban African-American community. *American Journal of Public Health*, 1993, 83:675–680.

Talks given to youth groups and to groups of childminders or parents by community nurses and local council health promotion departments, may reach a different section of the community. Prevention programmes can encourage these activities by providing teaching materials.

4.2 Literature, posters and exhibition material

Attractive leaflets may be available from organizations concerned with accident prevention. They may be particularly useful for illustrating how to use safety packaging, or how to identify local plants, for explaining the meaning of safety symbols on product labels, or promoting the telephone number of the local poisons centre. The effectiveness of written materials depends on the recipients being able to read, and understand, the message. It is important to pre-test health promotion materials before distributing them to make sure they are not misunderstood. They can be distributed by placing in libraries, shops, clinics, etc., or by post, when they can be sent with small safety devices, such as child-resistant caps or cupboard locks.

4.3 Mass media campaigns

Mass media campaigns have been used to promote chemical safety in the home, but effectiveness is difficult to evaluate. Radio was used for educa-

tion about the prevention, safety and immediate response to paraffin poisoning in rural areas of South Africa.¹

4.4 Providing information on the Internet

Many poisons centres and some other organizations have web pages with information about prevention of poisoning that are available to people with access to computers.

4.5 Training community workers and health workers

Community nurses and rural community health workers need to be educated in the basic principles of safe storage of products in the home so that they can advise families about poison prevention.

5 Evaluating and monitoring prevention efforts

It can be difficult to distinguish the effects of a community education programme from the effects of other factors which affect attitudes and behaviour. It may also be difficult to show that the programme has directly affected the number of exposures, and other indicators may be more appropriate, such as the number of homes where medicines were stored safely, or the number of people with a good knowledge of first aid.

An investigation of the effectiveness of CRCs in reducing the incidence of paraffin ingestion used data from hospitals and clinics, and from a household survey six months after the distribution of CRCs, to find out how many homes still had an intact CRC and were actually using it for paraffin storage, and to find out the opinions of householders.

Krug A et al. The impact of child-resistant containers on the incidence of paraffin (kerosene) ingestion in children. *South African Medical Journal*, 1994, 84:730–734.

6 Preparing for emergencies in the home

Parents and others caring for children should learn basic first aid, keep a recommended first aid manual at home, and read educational materials provided by poisons centres or others on accident prevention and home safety. They should know which products are potentially hazardous and which local plants and animals are poisonous. Caregivers should know who to contact in an emergency and how to contact them.

Householders should make sure the home is safe, with proper storage and means of disposal for household products and medications.

¹ Spencer Jones J. Towards a national paraffin safety action plan. *South African Medical Journal*, 1995, 85:821.

Prevention of toxic substance exposure in the workplace

1 Programme overview

1.1 *Developing a mission*

Modern industries, from small family businesses to large corporations, use chemicals in increasingly diverse workplace environments. There are many tens of thousands of industrial chemicals, many of which can cause health problems as a result of occupational exposure. Effects range from chronic skin diseases caused by solvents to reproductive and developmental problems caused by toxic metals. Health problems due to exposure to toxic substances cause needless human suffering and increase the cost of business. The development of programmes to prevent exposure is an increasingly urgent necessity. It is sound business practice to incorporate prevention principles into business plans and goals, and thereby reduce absence due to ill health, medical costs and insurance rates.

1.2 *Planning prevention and defining responsibility*

Development of a prevention programme requires commitment of resources and an internal structure that defines who is responsible, what they are responsible for, and how the programme is going to be implemented. All people involved in the process must value the concept of prevention.

If the business is large enough, a toxic substance committee could be formed to provide structure and focus the prevention effort. The committee may be composed of safety managers, manufacturing supervisors, purchasing agents, warehouse personnel, engineers, and research and development personnel. The monthly committee duties may involve reviewing new chemicals purchased by the company to decide where they can be stored, which employees need to be trained in handling and use, and what kind of personal protective clothing is needed.

1.3 *Defining the scope of the programme*

The scope of the programme needs to be clearly defined, in terms of the chemicals and products to be included in the programme and the employees who may be exposed to them. This initial definition focuses the programme and ensures it is comprehensive.

1.4 Raising awareness

Employees must be made aware of the existence of the programme by means of awareness campaigns with posters, active training and participatory events. This will give employees ownership of the programme and empower them.

2 Risk characterization

The risk associated with each substance must be weighted in relation to other substances and workplace hazards.

2.1 Preparing an inventory of toxic substances

A chemical inventory is an organizational tool used in the review process. It should contain the following elements: all common chemical names and synonyms, a Chemical Abstract Service number or other identification number, a hazard classification code (flammable, oxidizer, corrosive, etc.) hazard rating (low to high), location and quantity. Information databases or libraries on chemicals should also be easily available to employees.

For example, in 1989, Denmark conducted a nationwide survey to determine the use and distribution of hazardous chemicals in industry. Approximately 13 000 chemical products were reported, total usage was estimated, and toxicants were classified according to hazard. Danish authorities were able to use this information to estimate high-use industries and review occupational hazards. These data became an invaluable source of information for the analysis, design and development of programmes to prevent exposure to toxic substances.

2.2 Determining risk

The extent of risk should be determined using exposure limits and guidelines established by health and regulatory organizations. The risk associated with the use of a particular substance should be rated with reference to toxic substance inventories, toxicology reviews, sampling data, and workplace circumstances.

For example, nitric acid carries different associated hazards depending on its grade and use. A metal finishing operation may typically use an industrial grade mixture between 40 and 60%, which is stored and dispensed with pumps from large metal drums. Analysis of the process may demonstrate that it is used constantly without access to appropriate ventilation. Currently there is no approved respirator that offers protection from constant exposure to nitric acid fumes. Laboratories, however, typically use nitric acid in concentration, greater than 70% (red fuming nitric acid) but store it in small glass containers, and use it only sparingly under an approved hood.

3 Exposure controls

The most effective tools for minimizing risk are engineering controls. This might involve design and maintenance of ventilation systems, guarding and warning systems, or the modification of engineering systems that eliminate or reduce exposure to toxic substances.

A second level of exposure controls is administrative control of risk through job rotations, training, written guidelines and policies, and inspections. For example, mandatory breaks or limitations to shift length for hazardous operations reduce fatigue. Training should include hands-on training in correct handling techniques. Exposure that cannot be completely controlled by either of these strategies must be controlled through use of personal protective equipment, such as respirators, safety glasses, and clothing. The programme must include training for workers in use of PPE and may need medical surveillance.

3.1 Labelling

Procedures should be established to check the labelling of chemicals on receipt to ensure that they are properly identified. In addition, each workplace should institute an internal labelling system to provide a uniform system of hazard identification. It should be based on local regulatory or public authority guidelines and include common chemical names, symbols or warnings, the status of the container (e.g. “in process” or “empty”), and bar codes for tracking within the workplace. Periodic inspections should be carried out to ensure that chemicals are properly identified in the area of use. Pipelines for transfer of toxic liquids and gases should be labelled with directional arrows and contents.

3.2 Storage and handling

All toxic substance prevention programmes should include written specific and detailed storage and handling guidelines for the use and storage of toxic or poisonous substances including acids, bases, flammables, oxidizers, pesticides and carcinogens. Storage precautions should be clear and concise and include details of container types, segregation practices, spill provision, labelling guidelines, security measures, or housekeeping rules.

3.3 Choosing toxic substance suppliers and disposers

It is good business practice to ensure that suppliers, carriers, and disposal facilities practice prevention and risk avoidance by complying with regulatory guidelines, and use safe and responsible labelling, handling and disposal methods. Purchasing and warehouse personnel should use local or international shipping and transportation guidelines to conduct formal or informal inspections. Containers should not be received if they are damaged or leaking or if the contents are not clearly identified. Larger businesses may develop a formal programme to audit their suppliers and disposal facilities.

4 Training and education

Training and education have more influence on behaviour than any other part of a prevention programme. Areas in which formal training may be needed include:

- general awareness of toxic substances
- emergency response situations
- respiratory protection and use

- hazardous waste labelling, disposal and transport
- toxic substance labelling, storage and housekeeping.

Effective prevention programmes need planning and organization. The employees who are responsible for conducting training and those who need to be trained should be identified by name. Training should involve several different methods, such as videos, hands-on workshops, drills and exercises or classroom learning and competency testing.

5 Emergency preparedness and response

A prevention programme should include plans to prevent chemical releases, fires, and explosions, and to minimize the environmental impact of any release or exposure that occurs. If a release occurs or is threatened, the priority for emergency decision-making should be human health, then environmental protection, with lowest priority being safeguarding business concerns.

APELL (Awareness and Preparedness for Emergencies at Local Level), developed by the UN Environment Programme in 1988, is a resource and guideline for organizing emergency response plans. It is a ten-step approach designed to prevent loss of life or damage to health and social well-being, and to avoid property damage.

6 Medical surveillance

The purpose of medical surveillance as part of a prevention programme is to ensure prospective employees are fit to do the job, to periodically monitor employees during the course of work, and to establish a system of medical emergency response if a toxic exposure occurs.

7 Hazardous non-routine tasks

Before undertaking tasks using toxic substances in a new or modified procedure, or cleaning tasks that are part of their routine job, employees should consult the toxic substances officer and the health officer, and be given information about the hazards associated with the material, risk prevention measures, and measures the company has taken to decrease these hazards.

A work permit system could be organized to include specific preventive measures to use during the course of work. A written work order with a section giving information on conditions of work could be used to state the personal protective equipment needed for the job.

7.1 External contractors and consultants

Before starting any work on site, contractors or consultants should be given a copy of the toxic substance exposure prevention programme, and possibly information about the toxic substances they will be exposed to while on site, and the precautions employees may take to decrease the risk of exposure. For example, external contractors involved in the construction or demolition of buildings used for industrial or other commercial purposes, may need to move asbestos ceiling tiles or wire installations. They should be given maps to identify asbestos-containing materials and instructed to use

the proper personal protective equipment. A contract may include a requirement to sign a statement indicating that programme guidelines were reviewed and understood. Orientation and training responsibilities should be clearly defined.

8 Toxic substance and waste disposal procedures

Toxic substance waste may be composed of a number of constituents and the risk associated with handling and disposal is often difficult to assess, due to inadequate information about the nature of the hazard. Waste materials are often in containers different from their original containers, and sometimes mixed with other substances in the same container to reduce the cost of disposal.

Container selection, labelling and housekeeping are all important elements of a disposal programme. Disposal guidelines should include periodic inspection of waste containers and facilities. Periodic reviews of disposal records, training records and release incidents should be carried out to ensure compliance with exposure prevention guidelines.

Prevention of toxic substance exposure in the rural environment

1 Programme overview

1.1 Developing a mission

In the rural workplace environment, education and communication are the most important strategies for prevention because environmental control is difficult and there are few regulatory controls.

1.2 Committing to prevention

Injury, disease and death from poisoning directly contribute to lost production, so it is good business strategy to prevent exposure to toxic substances. Rural land owners, cooperatives and advisers need to be made aware of this, so that they will commit time and resources to a prevention programme. Commitment is the essential first step in developing a prevention programme.

1.3 Defining the scope of the programme

Everyone in the rural environment is affected by the use of toxic pesticides, because air drift can carry chemicals up to 50 miles from the application site. So prevention education programmes must target not only rural workers, but also their families, local residents and the health care personnel who treat them. Identifying who may be exposed, and to what, is an important first step in the programme.

Air drift of toxic by-products of aluminum phosphide pellets stored too close to rural dwellings has resulted in deaths from exposure.

Garry VF et al. Investigation of a fatality from nonoccupational aluminum phosphide exposure: measurement of aluminum in tissue and body fluids as a marker of exposure. *Journal of Laboratory and Clinical Medicine*, 1993, 122:739–747.

Although not specifically addressed in this programme, efforts should also be made to identify the wildlife and areas of the environment that are exposed, so that they can also be protected through sound business practices.

1.4 Raising awareness

People need to be made aware of the risk associated with use of toxic substances and the resources available locally for prevention. Local information

centres should be established to provide information to the community about safe use of toxic substances and the associated risks. They can promote a communications network for landowners, cooperatives, workers and advisers for information on toxic substances. Local centres are more likely to communicate effectively. They should promote practical strategies for creative promotion of prevention, using local culture and resources to produce posters and brochures, and organize workshops and training.

Unsafe levels of cholinesterase inhibition have been identified in ethnic tribes in Thailand. Farmers from the Lahu tribe, in northern Thailand were found to be at high risk for organophosphorus pesticide exposure, as they lack the knowledge to properly handle pesticides and many fail to use adequate protection to prevent exposure. Distribution of protective equipment as well as education and access to health services have been recommended.

Soogarun S et al. Decreased serum cholinesterase levels among a sample of a rural Thai population. *Medscape General Medicine*, 2003, 5:30.

2 Risk characterization

It is difficult to establish cause-and-effect relationships between use of toxic substances in rural environments and health problems. There are several reasons for this:

- insufficient information about specific incidents of exposure, and inadequate toxicology data
- uncertainty associated with environmental epidemiology studies
- the constant change of people and jobs that makes it difficult to characterize and assess the rural work environment
- the latent period between exposure and the appearance of chronic health effects such as cancer.

Nevertheless, a prevention programme must be based on assessment of the risk and identification of high-risk substances and situations or susceptible groups of the populations, so that resources can be appropriately allocated to controlling exposure where priority is greatest.

Risk assessments should be based on toxicology publications, chemical inventory data, and information gathered during site visits about the local work environment, the substances used, and the local ways of using them.

2.1 Collecting inventory data

It is difficult to compile an accurate chemical inventory for toxic substances used in rural areas because:

- rural farms and businesses keep poor records of pesticide purchase and use
- developing countries usually lack effective systems for reporting use of toxic substances
- smuggling across borders is a significant problem.

However, chemical manufacturers and suppliers usually keep accurate sales and distribution records and could be asked to provide information, on the basis of their social responsibility for public welfare. Inventories should

include chemical names used locally and synonyms, Chemical Abstract Service (CAS) numbers, and a hazard classification code.

3 Exposure controls

The most effective control is elimination or substitution of toxic substances through integrated pest management techniques. Other controls, listed in order of decreasing effectiveness, are:

- engineering controls, e.g. enclosing cabs of tractors applying pesticides
- administrative controls, e.g. mandatory limitations on shift length for applicators, installing a siren system which alerts workers to leave fields during crop dusting, and excluding pregnant women from high risk jobs.
- personal protective equipment focusing on clothing to protect the skin, which is the most common route of exposure.

3.1 Labelling practices

In the rural environment, chemicals are typically received in concentrated form, then mixed and transferred to different containers. These containers must be properly labelled in the local language with the common chemical name, symbols or warnings, and the status of the container (in use or empty). The labels should be highly visible.

3.2 Storage and handling guidelines

Secure storage is particularly important in rural communities because children often live near places where pesticides are stored and used regularly, and are often taken into the fields while their parents work. Pesticides stored in isolated locations away from dwellings are particularly hazardous if not stored securely. Storage areas must also be cool and dry, and chemicals should be stored such that there is no danger due to chemical reactivity, flammability, or corrosiveness. Chemical containers need to be checked immediately on receipt from manufacturers and suppliers to identify and isolate those that have been damaged in transit.

4 Training and education

The most significant factor contributing to overexposure to toxic substances is lack of education. Workers and families must be given information about the risks associated with the chemicals they use, routes of exposure, labelling and storage, training in handling of chemicals and empty containers, emergency response, and use of personal protective equipment. Training should be mandatory and periodic. Programmes should identify the names of trainers and trainees, and training sessions should be documented. Training guidelines have been produced by IPCS for pesticide users and medical personnel.

5 Responding to emergency situations

People should know what steps to take in an emergency to treat people who have been exposed and prevent more people becoming exposed. They must

be able to recognize exposure, and the typical signs and symptoms of acute and chronic poisoning. They must know who to contact for immediate medical attention, and must have training in first aid. Emergency response guidelines should be posted in a public place where they can be consulted in an emergency. Local medical emergency personnel or authorities could be enlisted to produce posters giving initial first aid procedures.

6 Medical surveillance

Because of the unstructured nature of the work and the migratory characteristics of the workforce, it is difficult to monitor exposures and screen workers for health conditions. Rural workers are often unable to distinguish acute and chronic effects of exposure from symptoms of common medical conditions. A medical surveillance programme should focus on documentation and follow-up of specific exposures to toxic substances to help health professionals identify areas where prevention efforts and awareness campaigns should be targeted.

7 Toxic substance and waste disposal procedures

Workers should be given specific on-the-job training in container handling and disposal because incorrect handling and disposal may result in exposure of workers, accidental poisoning in their families, and contamination of soil and water. Significant exposures to toxic substances can even result from handling empty containers if handled by workers who have not been trained in correct procedures or are unaware of the risk associated with the operation.

Disposal of toxic waste is another cause for serious concern. Health professionals should be enlisted to collect surveillance data for the establishment of stricter waste disposal guidelines. Workers should be trained in waste disposal methods that can be applied in their own local situations, with the resources that are available to them. If rural landowners are unable to locate companies to dispose of waste and waste containers, then sites remote from groundwater sources and living areas need to be designated for landfill disposal, and suitably signposted.

A survey of farm workers in the Mid-Delta of the Mississippi, USA, found fewer than 50% had been trained in handling and disposal of pesticide containers, and that 58% of respondents disposed of containers indiscriminately, 10% recycled containers, 8% put containers in public dumpsters, 10% disposed of containers in lowland areas, and 4% dispose of containers with household rubbish.

Omishakin MA. A survey of pesticides containers management among African-American agricultural workers in Mid-Delta of Mississippi, USA. *Journal of the Royal Society of Health*, 1994, 114:81–82.

Examples of prevention activities of different partners in prevention

Most of this material was presented during a workshop “Prevention of Toxic Exposures: Public Education Activities” organized on behalf of the IPCS by the Belgian Ministry of Social Affairs, Public Health and Environment, in coordination with the Belgian Poisons Information Centre, from 9–11 September 1996, at the Institute of Hygiene and Epidemiology, Brussels.

1 Prevention programmes in poisons centres in various countries

1.1 Belgium

The Belgian Poisons Centre has organized numerous activities in the area of prevention. These include:

- collecting data and publishing an annual report of activities
- publishing a leaflet describing the poison centre, poison prevention measures, and first aid for poisoning
- publishing articles in newspapers, or large circulation magazines, aimed at young mothers and families
- publishing articles in professional journals distributed free of charge by the Ministry of Health to general practitioners, nursing journals and scientific journals
- organization of, and participation in, conferences, seminars, and hospital meetings.

A study of the epidemiology of carbon monoxide poisoning was carried out to determine the morbidity and mortality, location of poisoning, main risk factors, and the effectiveness of prevention. Data were obtained from hospital emergency departments, ambulances, coroners, death certificates, and the press. The study showed that the risk of poisoning was determined by a complex interaction of social, behavioural, educational, administrative and legal factors, not all of which could be addressed by means of an educational campaign. For example, regular servicing of heating appliances in rented houses may depend on the relationship between the landlord and tenant, while in institutions the replacement of old unsafe appliances may depend on provision of financial aid.

The study also showed the value of comparing data from different sources to obtain an accurate picture of the whole problem when investigating the incidence, severity and circumstances of exposures to toxic substances. Accident surveillance systems, poisons centres, hospitals and general practitioners, each provide different information.

1.2 Chile

The Poisons Unit in Santiago, Chile, answers enquiries from the public and from medical doctors and nurses, and has undertaken a number of prevention activities, including:

- setting up a web page with information on prevention and treatment, with links to pesticide manufacturers' web sites
- talks on the radio (e.g. the police radio station or other station) once or twice a month, about prevention or about a specific toxicological problem
- production of educational materials, which are distributed without charge due to funding from private enterprises, including:
 - leaflets with information about storage of medicines or kerosene
 - stickers with the Centre's telephone number, distributed to paediatricians and physicians to be given to parents
 - a poster with the Centre's telephone number and some prevention messages, principally about the correct storage of pesticides and medicines, emphasizing the responsibility of parents and teachers
- training of medical and nursing students in prevention of poisoning
- publication of specific sections in a nursing textbook about prevention of poisoning – in Chile, nurses have a role in “health supervision” that gives them the opportunity to talk about prevention, and it is more effective for the Unit to train nurses to pass on the message to mothers than for the Unit to talk directly to mothers (as proved by their experience)
- promotion of the Unit telephone number, which is also on the labels of several house cleaning products, detergents and home pesticides (this resulted in an increase in the number of telephone calls).

1.3 India

In the region served by the National Poisons Information Centre in Delhi, India, the most common causes of toxic exposures include:

- inadequate safety precautions by workers using or manufacturing pesticides
- inadequate controls related to the use of toxic chemicals by small industries
- inadequate health checks for employees
- inadequate labelling of chemical products
- chemical contamination of food
- unsafe storage of chemicals in the home, particularly kerosene
- environmental pollution from industry often due to uncontrolled disposal of waste
- use of leaded petrol
- use of herbal and ayurvedic medicines.

As a basis for planning prevention activities, the National Poisons Information Centre began a ten-year retrospective survey of poisoning cases to collect information about the local incidence of poisonings. It also devel-

oped a programme of health surveillance for some exposed population groups (including urine analysis for heavy metals) and a programme for the environmental monitoring for heavy metals in the air and soil around Delhi.

As an initial step in its prevention programme, the Centre contacted social workers and local community leaders, and raised awareness in the community about potential hazards and the need for prevention of exposure. The Centre gave talks to community groups, participated in television programmes, produced pamphlets promoting the use of its services, gave first aid information, distributed booklets and posters about child safety, and produced a video about food poisoning.

In December 1996 the Centre held a prevention campaign whose objectives were to:

- prepare a model training programme on prevention of poisoning for health care providers at the primary health centre level
- generate more information on poisoning
- raise public awareness about chemical hazards and methods for prevention
- train physicians in the recognition and management of toxic exposures
- orient district hospital managers to provide sustained referral support rather than referring to tertiary health centres.

The activities planned included:

- a “Poison Prevention Day” on the anniversary of the Bhopal incident with an exhibition of posters, distribution of handouts, puppet shows, publicity in the media
- seminars, workshops and conferences for various professionals and workers:
 - a workshop on toxic exposures for the health staff from ten primary health centres
 - a training seminar for doctors, nurses and pharmacists to share their experiences through case studies, presentations, and discussions, and to list chemicals and cases of poisoning in their areas
 - a training seminar on pesticides in an agricultural area, addressed to farmers
 - a Conference on Prevention of Toxic Exposures for childminders, social workers, block development officers, sanitary inspectors and teachers (including pesticide exposure, poisoning in the home and workplace).

1.4 Indonesia

About ten regional poisons centres were established in the country in order to enable most of the population to consult and/or attend a centre personally in the event of toxic exposure. The centres collaborate closely with non-governmental organizations and social organizations to raise awareness of some of the common toxic hazards by producing and distributing brochures, flip charts, and posters on topics such as:

- inadequate labelling and lack of information sheets carried by vehicles transporting chemicals
- the dangers of chemical exposure
- the tendency for small shops to display food and pesticides in close proximity
- the use of toxic dyes to colour food
- contamination of food in the home from pesticide spraying
- use of inadequate protective clothing by pesticide workers.

Some sponsorship had been obtained from chemical companies for preparing the prevention and education material.

1.5 New Zealand

The prevention programme undertaken by the New Zealand National Poisons Information Centre, Dunedin School of Medicine, University of Otago, includes production of educational materials, research into the causes of poisoning, and evaluation of prevention activities:

Poisoning prevention resources for the public

In response to needs identified by surveys of callers to the Poisons Information Centre (the general public, caregivers of pre-school children, grandparents), materials have been produced to raise awareness about the Poisons Information Centre services, child-resistant packaging, first aid for poisoning, and disposal of medications and pesticides. These materials include:

- a pamphlet on first aid management
- stickers and magnets with the Poisons Centre telephone number
- a book for the public on poisons and their management
- displays on poisons for “Safety Days”
- articles in magazines, newspapers and journals
- kits of slides with a booklet, posters and pamphlet for presentation to small groups (e.g. on how to prevent childhood poisonings, how to use medicines safely)
- a book on poisonous plants and fungi produced with the regional councils for rate payers
- a pamphlet on poisonous plants and fungi produced with the Ministry of Health
- a poster on poisonous plants produced by a government agency, developed following a review of these plants in New Zealand
- a survey of consumers’ needs for information
- a poisons prevention pamphlet for pet owners and a survey of veterinarians who use the poisons centre.

In addition, a no-charge telephone number has been set up for the poison information centre.

Poisoning prevention resources for professionals

The Centre has produced a training video for pharmacists on poisoning management, a CD-ROM of the poisons centre database, and slide kits on preventing pesticide poisoning and safe practices for laboratory workers.

Project to extend the use of child-resistant containers for medicines

This project, undertaken in collaboration with SAFE Kids, and a hospital authority, aimed to identify child-resistant containers (CRCs) that conformed to the existing standards, settle issues related to reimbursement to pharmacists for costs of dispensing in CRCs, and promote the use of CRCs among the public, prescribers and pharmacists.

Survey of causes of poisoning deaths

A survey by the Centre of coroners' records identified dextropropoxyphene as responsible for a disproportionately high number of poisoning deaths. As a result, dextropropoxyphene has been removed from some prescribing formularies.

Evaluation of DUMP campaigns

The Centre evaluated the effectiveness of "DUMP" campaigns to prevent poisoning by encouraging people to return unused medications to pharmacies and reduce the availability of medications in the home. Evaluation of local campaigns showed that:

- large quantities of unwanted medicines were returned, but only a small percentage of households participated
- awareness of poisons prevention increased, but only for a short time
- there was no change in poisoning rates for adults or children, for unintentional or intentional poisonings
- medicine wastage was identified, which led to a change in government policies to reduce waste by prescribing smaller quantities and monitoring compliance more closely
- poor labelling practices by pharmacists were identified; the school of pharmacy and the pharmaceutical society subsequently gave more emphasis to this.

1.6 Turkey

A number of prevention activities have been undertaken by the Ankara Poison Centre at the Refik Saydam Hygiene Institute, in Turkey, including:

Promotion of the activities of the centre to the public and to health professionals

The Centre's first prevention activities included the publication of brochures for the public and health professionals containing information about the activities of the centre.

Provision of information to the media

This included information on poisonings in general, participation in television and radio programmes, and preparation of articles for newspapers. In response to an outbreak of poisoning with *Amanita phalloides*, a number of television programmes were prepared, followed by a publication on diagnosis and treatment of mushroom poisoning.

Preparation of educational materials

In order to address the problem of pesticide poisoning, the Centre prepared educational materials aimed at pesticide workers: a poster about the safe use of pesticides, and an illustrated booklet describing the signs and symptoms of pesticide poisoning.

Training of health professionals

The Centre participated in training courses run by the Ministry of Health giving information on diagnosis and treatment of poisonings for emergency physicians.

Response to emergencies and disasters

A campaign was initiated in response to the urgent need for information on chemical warfare agents during the Gulf War. This included the preparation and distribution of a publication for health professionals and a programme of lectures for physicians in 28 cities on the diagnosis and treatment of poisoning by warfare agents. The Centre also participated in television programmes to raise public awareness about potential threats and their management.

Active participation in international programmes to promote chemical safety

The Centre is part of the Poisons Research Directorate, which is the focal point for the International Forum on Chemical Safety (IFCS), International Register of Potentially Toxic Chemicals (IRPTC), IPCS, and Organization for Economic Cooperation and Development (OECD) Chemicals Programme. The Centre participates in activities concerned with the harmonization of laws and regulations on chemicals within the European Union and in the State Planning Offices' preparation of five-year development plans on chemicals.

1.7 Switzerland

Although the Swiss Toxicological Information Centre (STIC) has not developed many educational campaigns as such, a number of prevention activities have been undertaken in order to prevent poisoning in a particular population at risk (i.e. children, workplace exposure), and in generating alerts regarding toxicity of new drugs and products. These activities have included:

- intense teaching to health care professionals and lay persons
- toxicovigilance activities with the Swiss authorities (Federal Administration of Public Health)
- direct contact with manufacturers of hazardous substances and products
- surveys (questionnaires addressed to members of the public who have contacted the STIC in a toxicological emergency)
- widespread distribution of pamphlets on prevention of poisoning.

In addition, a national poison prevention day was planned with the public health authorities and health insurance companies. An activity whose efficacy was assessed was a campaign to introduce child-resistant containers for low viscosity petroleum products. This was associated with a marked decrease in calls to the poisons centre about such accidents.

1.8 USA

Central New York Poison Control Center (Syracuse)

Most poison centres in the USA employ educators to teach prevention of poisoning of children and to undertake programmes addressing specific population groups, or specific problems. In the Central New York Poison Control Center, the prevention programme is the responsibility of a director of education, and is planned taking into account data from the American Association of Poison Control Centers (AAPCC) indicating the most significant causes of morbidity and mortality and results of local surveys carried out by the Centre. For example, in 1990 the New York Centre carried out a survey of emergency rooms and found that most 60 year olds did not know they could call a poisons centre for information. As a result, a video and follow-up brochure were produced addressed to that age group. The effectiveness was evaluated by looking at trends in poisons centre calls from older people. The programme was judged to have been successful in raising awareness because the number of calls from older people had increased after the programme was implemented.

Since little funding is available to support education and prevention, the Centre has developed programmes using inexpensive resources. For example, the Centre does not send staff out into the community to teach the population directly, but develops materials that can be used by professional and voluntary groups already working with the target population, and trains others to disseminate poisons prevention information in the community. Tools and materials have been produced at low cost as a result of working with university students who have access to new technology. For example, university students worked with the poisons centre to develop a computer interactive program on CD-ROM for teaching pre-school children about the risks of poisoning.

The Centre keeps in contact with people who have been sent these materials to find out whether they are using them and whether they have found them appropriate. Continuing contact and provision of updated material encourages trainers and teachers to feel they are part of the prevention programme and encourages commitment.

American Association of Poison Control Centers

The AAPCC undertakes a number of prevention activities. One example is the campaign to prevent iron poisoning, following analysis of statistics from poisons centres throughout the USA that showed that iron poisoning was a problem meriting aggressive action. Actions taken included:

- a petition to the Food and Drug Administration to change the status of iron to a prescription-only medicine
- a survey, in collaboration with the Consumer Product Safety Commission, of nine poisons centres to investigate the circumstances of poisoning
- the provision of grants to schools of packaging design, to stimulate design of pack types that could be opened easily by old people with lower hand strength
- an extensive national media campaign to raise awareness of the toxicity of iron
- a request that manufacturers change the appearance of the tablets so that they no longer resembled sweets
- a proposal that the standard for CRC be changed so that the adult test panel would have to include adults of 50–65 years old.

Other AAPCC activities have included: promoting educational activities of poisons centres by holding a national meeting for educators at the same time as the AAPCC scientific meeting, developing educational materials, and checking poisons prevention materials produced by organizations such as the National Safe Kids Campaign.

Poison Prevention Week has been observed in the United States for over 40 years, since being signed into law by the United States Congress in 1961. It aims to alert the American people to the problem of unintentional poisonings, especially in children under the age of five. It is planned and implemented by the Poison Prevention Week Council, consisting of approximately 40 national organizations with an interest in, and commitment to, prevention of unintentional poisoning, including public, private, government, health care, and trade organizations. Many members of the Council contribute funds which are used for preparation of printed materials. Each member organization also devises a programme reflecting its own interest in the general area of poison prevention and promotes directly through radio or TV spot announcements or indirectly through its affiliates. The Council distributes National Poison Prevention Week Planning Kits to thousands of people every year, including ideas for prevention activities, a national theme and poster, and list of available materials and contacts. There is a national press conference and related video news release. (see www.aapcc.org)

2 Prevention programmes organized by governmental agencies

Canada: the Product Safety Bureau of the Health Department

The Product Safety Bureau of the Environmental Health Directorate, Health Canada, has no direct contact with target populations but develops poisons prevention materials for dissemination by professional and community groups, disseminates safety information on television taking advantage of

free time allowed for public service messages, and has a web page on the Internet displaying safety messages.

Educational materials are developed in consultation with professionals such as public health nurses, paediatricians, the Canadian Medical Association, and groups such as consumer groups, provincial groups, children's aid societies, and welfare groups. These materials include:

- tools and materials for use by or with children, including comic strips and colouring books, and hand puppets that can be used with pre-school children and infants <8 years old
- posters for use in waiting rooms in children's clinics
- pamphlets to inform parents about the dangers of household chemicals and to explain the meaning of safety symbols found on product labels
- booklets for arts associations, identifying risks and hazards associated with arts and crafts activities.

Other prevention activities have included an evaluation of symbols used on warning labels for hazardous chemicals and collaboration with manufacturers and seniors' groups to develop packaging that could be easily used by older people.

3 Prevention programmes led by nongovernmental bodies

The Netherlands: Consumer Safety Unit

The Consumer Safety Unit, Amsterdam, is a nongovernmental organization concerned with home and leisure safety, supported by the Ministry of Health. The Unit collects epidemiological and statistical information on accidents, and collaborates with the Poison Control Centre in Utrecht to monitor accidental poisoning. Research and technical studies have included developing assessment criteria and test methods for products. Monitoring hospital admissions for suspected poisoning among children 0–4 years old has demonstrated a decrease in the number of suspected poisonings after regulations were introduced in 1986 requiring child-resistant closures for certain household chemicals (e.g. petroleum, corrosive substances), and in 1990, requiring child-safe packaging for medications (e.g. salicylates, aromatic analgesics). However, the downward trend soon levelled off, suggesting that more education and information are needed to achieve a further decrease in accidents. Educational activities include participation in public information campaigns, and production of materials for use in such campaigns and for training healthcare professionals in accident prevention.

4 Prevention programmes led by international organizations

The Centro Panamericano de Ecología Humana y Salud, a Pan American Health Organization (PAHO) office situated in Mexico (closed in 1999), developed a number of prevention and education activities. These included:

- promoting and supporting professional and community education programmes
- short training courses for the medical community

- postgraduate courses in environmental health
- training for epidemiologists in dealing with outbreaks
- production of manuals on pesticide poisoning
- production of materials for presentations for use in community education programmes.

Examples of prevention activities targeted at specific types of poisoning

Most of this material was contributed by the participants at a workshop “Prevention of Toxic Exposures: Public Education Activities” organized on behalf of the IPCS by the Belgian Ministry of Social Affairs, Public Health and Environment, in coordination with the Belgian Poisons Information Centre, from 9–11 September 1996, at the Institute of Hygiene and Epidemiology, Brussels.

1 Prevention of carbon monoxide poisoning in northern Europe

Prevention of carbon monoxide (CO) poisoning has been considered a priority for preventive action for many years, as it is one of the main causes of unintentional poisoning in Europe and USA, often resulting in permanent neurological damage or death. The strategies for prevention include:

Primary prevention: legal control or regulation to reduce the hazards and education to reduce behaviour associated with risk.

Secondary prevention: reduction of the severity of carbon monoxide poisoning through early detection, early recognition of the first symptoms and early treatment. Fetal anoxic brain damage can be reduced by early diagnostic and appropriate treatment. Early treatment can also prevent avoidable complications like long-term irreversible neurological sequelae.

Tertiary prevention: the recurrence of intoxication in the same patient or the same family can be prevented by removing the hazard from the home or workplace and changing the behaviour associated with risk; also by giving information to victims during their hospital stay and at home to encourage them to take measures to reduce the hazard.

1.1 Who is involved in CO prevention?

- Health, consumer and labour authorities and ministries have a role in primary prevention, reducing hazards in the home, workplace and public areas.
- Social insurance organizations can promote awareness through public health campaigns, dissemination of leaflets, and general health education.
- Gas and coal manufacturers and suppliers are responsible for safe supply, and in some countries are involved in information and education programmes.
- General physicians in the community, and hospital emergency physicians, have a role in secondary prevention, early recognition of common

symptoms of poisoning and initiation of appropriate treatment. For example, a poisons centre in France found that nearly 30% of carbon monoxide poisonings were initially overlooked and misdiagnosed and, as a result, inadequately treated on the first visit to the hospital or general practitioner.

- Environmental health officers and emergency physicians in hospitals need to identify the source of the carbon monoxide and provide adequate technical advice about, for example, repair or replacement of appliances.
- Poison centres have a role in surveillance of CO poisonings, recording cases and incidents, statistical analysis; alerting appropriate authorities; and raising awareness among physicians, health officers, teachers and other education professionals, schools, heating engineers, manufacturers of gas burning appliances, and the general public.

Prevention of recurrence of poisoning requires urgent coordinated action on the part of several different individuals to avoid immediate or delayed re-intoxication that may even result in death.

1.2 Identifying high-risk situations

Priorities for prevention strategy should be directed towards high-risk situations. The risk of recurrence of carbon monoxide (CO) poisoning in the same patient or family is high if no action is undertaken to reduce the hazard. The source and circumstances must be identified urgently, preferably before the patient returns home. If that is impossible, all appliances likely to produce CO must be disconnected from the gas supply until the source is identified and eliminated.

The physician in charge at the hospital should give the patient and his family information about the risk of recurrence of poisoning if no preventive measures are taken. They should be told to stop using any potential sources of CO and have appliances serviced and repaired. One aim of a regional programme undertaken by the Lille Poisons Centre in 1984 to address carbon monoxide poisoning, was to make sure that emergency physicians who diagnosed carbon monoxide poisoning immediately alerted the family and technical health officers from the Ministry of Health and Department of Labour who could then go to the home, identify the CO source and make it safe before the patient or family returned.

A high-risk situation exists when no action is taken to implement the technical advice, for example, by repairing or replacing appliances, perhaps because of the cost. Economic difficulties, social distress or risk-taking behaviour are high-risk situations that need to be identified and considered for each individual.

1.3 Identifying high-risk situations for primary prevention

It is of crucial importance to identify high-risk circumstances and new sources of CO in order to determine priorities for prevention. This can be done by epidemiological studies or by setting up a surveillance system to provide information on morbidity and mortality. Information on sources of CO can also be obtained from case reports found in medical literature and technical reports by health officers or heating engineers.

The Lille Poisons Centre established a long-term regional surveillance programme of CO poisoning. Data on hospital admissions and deaths outside hospital are analysed annually and special case studies carried out to investigate the relationship between the clinic history and the environmental situation. This has focused on identifying:

- characteristics of the population at risk, their age, sex, ethnic background, socioprofessional class, and risk habits
- characteristics of high-risk geographical areas (e.g. coal mining area in the north of France); the results of regional studies can be very different from the results of national studies
- high risk in domestic and work environments (e.g. type of housing and rooms within it, type of activities carried out in work environments)
- high-risk climate conditions (e.g. fog and wind)
- technical aspects of the appliance (e.g. the state of repair of gas burning appliances, the means of removing exhaust fumes).

1.4 Exposure controls

Detection of toxic levels: atmospheric CO should be monitored in the workplace and levels maintained below the maximum allowable limits for short exposure or continuous exposure over eight hours. Carboxyhaemoglobin levels in workers can be monitored during the working day. Carbon monoxide detectors, warning of dangerous concentrations in the atmosphere, can be used in workplaces or at home. Sensitivity must be appropriate for the situation in which they are to be used, and those intended for domestic use should be easy and cheap to buy and maintain.

Engineering controls: regulations ensure that heaters, water heaters, fume exhausts and gas production are manufactured according to appropriate standards for safe use. Engineering solutions could include systems to stop the operation of heaters when they start to produce CO, or carbon monoxide detectors built into the equipment.

1.5 Training and education

Raising awareness in the community is undertaken through three important methods for information dissemination:

- Education programmes adapted to address local needs and priorities, using printed and broadcast media, booklets, posters, and video cassettes.
- Product information and advice given to consumers when they buy new appliances (e.g. including clear warnings).
- Through the primary and secondary school curriculum, and through undergraduate, postgraduate and professional education and training programmes:
 - Students should be taught about the mechanism of combustion, how carbon monoxide is produced, how poisoning occurs, and about safe behaviour. These topics can be included in the curriculum for physics and biology.

- Training programmes and workshops for physicians and paramedical professionals, at undergraduate and postgraduate level, should include education about epidemiology and toxicity of CO, diagnosis and treatment of poisoning, and the importance of giving the patient and his/her family information about the risk of recurrence of poisoning.
- Environmental health officers and public health professionals can be trained to undertake technical inspections of the home or workplace to determine the causes and sources of CO poisoning and to propose solutions.
- Health officers and health education teachers can be taught about specific high-risk situations, populations, habits and behaviours, particularly those recognized in their localities.

It is useful to have workshops for everyone with a role in the prevention programme to raise awareness and encourage coordinated prevention programmes.

As an example, the CO poisoning prevention programme undertaken by the Lille Poisons Centre included educational activities for general practitioners and hospital physicians to raise awareness, improve early detection and treatment, and reduce the incidence of misdiagnosis. Efforts were also made to increase awareness among environmental health officers, experts in heating systems, and regional authorities, and educational materials were developed for inclusion in the school curriculum in order to raise public awareness.

1.6 Monitoring prevention efforts

The long-term effectiveness of prevention can be assessed by evaluating data from surveillance systems, or by carrying out epidemiological studies before and after the prevention programme, or over a long period of time. The benefits and unwanted effects of the programme should also be assessed. Continuing effectiveness of the programme depends on maintaining enthusiasm among those involved in its implementation, by giving them periodic information about the benefits resulting from the programme.

1.7 Emergencies in the home/workplace

Because of the severe complications that can result if CO poisoning is neglected, plans must be made for emergency response to such emergencies occurring at home, in the workplace, in schools, in public areas and other places, involving one or more patients (even mass poisoning). These plans should address early recognition of CO poisoning on site, taking into account local rescue organizations, medical facilities, financial resources etc., and information about the local epidemiology of CO poisoning (frequency and severity), the circumstances, location and source of poisoning. The plan should include information about how to recognize CO poisoning, and should identify the groups which would be involved in rescue, how they would be alerted, the medical facilities available, and triage criteria. Training programmes are needed to familiarize medical professionals and rescuers with the existing protocols.

1.8 Incident-reporting system

The harmonized reporting of incidents is of crucial importance in a prevention and toxicovigilance programme, as it provides information on frequency, severity of poisoning, high-risk circumstances of exposure, high-risk groups, and specific problems. A toxicovigilance centre may be in charge of covering a specific geographical area. The method of data collection depends on the objectives. For example, data collected to evaluate a prevention programme must be representative, whilst data collected to investigate specific problems need not be. Cost is also an important factor and plans should take into account the costs involved in:

- raising and maintaining awareness in hospitals about the need to report incidents
- reporting incidents from hospitals by fax or telephone
- training of staff
- data collection
- data analysis
- preparation of progress reports to all participants.

2 Prevention of kerosene ingestion in South Africa

The South African Department of Health developed the STOP project (Safety Towards Our People) in order to prevent the misuse of hazardous substances (also in response to a WHO initiative calling for increased awareness on poisonings).

2.1 How the problem was recognized

More than half of all South Africans (total population 44 million) rely on kerosene (“*paraffin*”) for cooking, heating and lighting. Kerosene is poisonous, volatile, and inflammable. If swallowed there is a high risk of pneumonia, and kerosene ingestion is the commonest cause of accidental childhood poisoning in South Africa, as is the case in other developing countries. Fires result in thousands of people losing their homes and lives every year.

Between 1982 and 1985, 1306 patients with acute poisoning were admitted to the Ga Rankuwa Hospital, which serves mainly the urban African community of the Odi district in the North West Province, just north of Pretoria. Kerosene was the cause of 59% of cases of acute poisoning, 74% of which involved children aged one to three years and 26% of which resulted in death.¹ A survey undertaken during 1992, involving six other academic complexes in South Africa, similarly showed that kerosene ingestion was the commonest cause of childhood poisoning in the institutions serving mainly the African population.²

Estimates based on extrapolated data derived from previous studies indicated that, in South Africa, at least 16 000 children were hospitalized each year for kerosene poisoning. The actual incidence of kerosene poisoning remained largely undocumented but it appeared that the rate was three times higher in rural than in urban areas, and occurred predominantly

¹ Joubert PH Poison admissions of Black South Africans. *Journal of Toxicology. Clinical Toxicology*, 1990, 28:85–94.

² Ellis JB et al. Paraffin ingestion – the problem. *South African Medical Journal*, 1994, 11:717.

during summer months when children were thirsty. Kerosene would be drunk from soft drink or spirit bottles, household containers, or intermediate containers used to dispense paraffin into appliances, in mistake for water (as it is a clear liquid) or soft drink. Children under four years of age from the disadvantaged socioeconomic groups were at higher risk. Overcrowding and limited storage space often resulted in paraffin being left within easy reach of children.¹

2.2 What was done to solve the problem?

The oil industry responded to the need for preventive measures by funding the Paraffin Safety Association of Southern Africa (PASASA). The national campaign developed by PASASA focused heavily on prevention through education. Safety messages, aimed at educating consumers about home safety, safety caps for kerosene containers, first aid for poisoning and prevention of accidental fires, were conveyed in print and over radio and television in all eleven South African languages. Videos, posters, and pamphlets were produced. Training and development workshops were held in all regions to train people to recognize symptoms of paraffin poisoning and give the correct treatment, and teach accident prevention, safe storage of kerosene, and safe use of appliances.

Child-resistant safety closures were designed and distributed free of charge to kerosene users wherever kerosene was sold. Production of the caps was funded by PASASA, and their distribution by the Department of Health. Self-adhesive labels were handed out with the closures to stick onto bottles to correctly identify them as containing kerosene. The label showed pictograms that discouraged drinking and indicated flammability and danger, and gave directions on how to use the kerosene child-resistant safety closure. Illustrations were particularly important, as most consumers were illiterate.

The existing closures were 30 mm screw-on plastic caps, consisting of two parts. The inner part fitted tightly on the bottle while the outer part slipped around the inner part if one attempted to open it in the normal way. The push down and turn action needed to open the closure was relatively easy for adults but impossible for a child under five years. These closures fitted a broad range of 750 ml glass liquor bottles most commonly used by kerosene consumers; 38 mm closures were subsequently developed to fit the 1-litre, 2-litre, 5-litre, and 10-litre plastic containers most often used to store kerosene.

A successful aspect of the programme was the partnership between a number of participants: PASASA and the departments of Health, Education, and Mineral and Energy Affairs, provincial health departments, local communities, producers, schools, consumers, retailers, distributors, petroleum companies, and NGOs.

3 Prevention of pesticide poisoning

Public education is required on the safe use of pesticides, especially in developing agricultural countries, such as Sri Lanka. Insecticides, herbicides, molluscicides, and fungicides are widely used in agriculture, domestic

¹ Ellis JB et al. Paraffin ingestion – the problem. *South African Medical Journal*, 1994, 11:727.

gardens and veterinary practice. They are toxic to humans, some so toxic that extremely small amounts can be fatal. Public education programmes on safe use of pesticides should focus on their toxicity and the special precautions that should be taken when using them.

In agricultural areas where use of pesticides is widespread, public education campaigns should target children as well as adults, and prevention of pesticide poisoning and safe use of pesticides should be included in the school curriculum. Educational posters displayed in places such as primary health care centres, hospitals and schools can raise awareness of the safe use of pesticides.

3.1 The message

Advice on mixing and application

- Read the label carefully before using any pesticide.
- Follow strictly the dosage recommended on the label.
- Avoid contact with pesticides:
 - use a stick when mixing pesticides and protect your body with appropriate clothing when spraying or dusting
 - cover nose and mouth with a cloth or mask
 - to avoid inhalation, do not stand downwind of pesticide applicators
 - do not smoke, eat or chew betel while mixing or spraying pesticides
 - avoid spraying when the temperature is high
 - do not use leaking equipment
 - do not clean blocked nozzles by blowing or sucking.
- Wash thoroughly or bathe using soap after applying pesticides.
- Wash equipment and clothing thoroughly after use / before putting them away.
- Take care not to contaminate water sources.

Advice on storage and disposal

- Always store unopened containers and used pesticides away from food and feed.
- Never store or dispense pesticides in containers previously used for food and drink.
- When pesticide containers are empty, destroy bottles and cans before burying them under at least 18 \leq of soil.
- Do not take empty pesticide containers or packs back home to use for storage.
- Do not throw empty containers or excess spray fluid into irrigation canals or other water sources.
- Dispose of excess of old pesticide concentrates by burying in limed pits under 18 \leq of soil.

3.2 Pesticide poisoning prevention activities in Surinam

The Surinam Poisons Centre organized a campaign to educate the population about the proper use and correct disposal of chemicals and pesticides. This was in response to environmental problems caused by lack of adequate controls on the import of dangerous chemicals, the easy access to pesticides, uncontrolled disposal of chemical waste, and dumps of chemical containers on abandoned factory sites.

3.3 Pesticide poisoning prevention activities in South Africa

The Department of Health in Pretoria developed a programme on pesticide safety aimed at school children. Preliminary research evaluated the effectiveness of an educational programme for primary school students as a method for improving awareness among both the students and adult farm workers about the safe handling and storage of pesticides. It was carried out among teachers, students and parents of 27 rural primary schools from a community of farm workers in an intensive crop production region of the Northern Province of South Africa. The research showed that the programme significantly improved students' knowledge of how to dispose of empty pesticide containers and improved the communication of knowledge from students to adult workers. As a result of this initial research, the Department of Health, provincial health departments, the Department of Education, the private sector, local communities and farmers collaborated in a programme to include the safe handling and storage of pesticides in the school curriculum. Teacher training days were organized and teaching materials developed. Community involvement was encouraged by getting students to act in drama competitions and inviting parents, farm owners, and people from neighbouring schools and communities to watch.

4 Prevention of snake bites in south-east Asia

Envenomation from snakebites is a major health concern in some developing countries. Rural agricultural workers and their families are most vulnerable. Traditional treatment methods for snakebites used in some communities are ineffective and sometimes harmful, and delay the administration of effective antivenom therapy.

Snakebite occurs more frequently in Sri Lanka than anywhere else in the world. Public education campaigns were undertaken by the National Poisons Information Centre, Colombo, Sri Lanka, stressing the need to attend hospital without delay after a snake bite, for observation and antivenom therapy if necessary, and teaching people that pharmaceuticals are more effective than traditional medicines for treating snake bites. The Centre used radio broadcasts and also produced printed educational materials for doctors and the public about snakebite treatment and about the work of the Centre. Public education campaigns over a ten-year period, from the mid 1980s to mid 1990s, were associated with a five-fold increase in hospital admissions due to snake bites, a reduction in mortality from 3.7% to less than 1%, and a reduction in morbidity.

4.1 The message

Public education should emphasize:

- The difficulty of distinguishing venomous from non-venomous snakes, and the need to avoid contact with all snakes.
- Places where snakes are most commonly found: near human dwellings, in areas covered by tall grass or dense undergrowth, jungle paths, and on agricultural land particularly during harvesting and weeding.
- Preventive measures that should be taken by people likely to come into contact with snakes.

The following measures should be recommended:

- Wear shoes or boots and ankle length garments when walking or working in areas where snakes are likely to be found, because most snake bites are on the leg.
- Carry a stick when walking in snake-infested areas, and use it to beat the grass and undergrowth in your path. At night use a light to prevent treading on snakes.
- Warn snakes of your approach by treading heavily (snakes are relatively deaf to air-borne sounds but are sensitive to ground vibrations).
- Do not carelessly put your hand into anthills, holes in trees, thick undergrowth or under logs. It is prudent to clear sites likely to be occupied by snakes around human dwellings.
- Destroy anthills and fill up cavities in trees. Clear fallen trees, and do not leave logs and firewood lying around. Take care if you have to move logs, rocks and branches in the course of your work, as there may be snakes under these.
- Dispose of garbage and junk regularly, and keep your dwelling and surroundings free of rats, frogs, and lizards (snakes are attracted to these).
- Only knowledgeable people should handle or rear snakes. An apparently dead snake should be handled with great care as it may still be alive and even when dead may inflict a reflex bite.

5 Prevention of scorpion stings in northern Africa

A prevention programme undertaken by the Moroccan Centre Anti Poisons was concerned with prevention of scorpion stings, the most frequent cause of poisoning reported to the Centre (28% of enquiries). Scorpion venom acts very quickly (within 24–48 hours), and most stings occur in rural areas, a long way from health services. At the time, there was no effective antivenom, and physician's undergraduate training did not include consideration of the most effective treatment for scorpion stings. The Centre organized training programmes addressed to health professionals. It also produced and distributed a leaflet for the public describing how to prevent stings and what action should be taken in case of sting. Prospective studies and retrospective studies of poisoning cases were undertaken in the main cities affected.

6 Prevention of plant poisoning in south-east Asia

Poisoning with plants (i.e. fruits, seeds, yams, flowers, leaves, and other parts) is a health concern in some countries where plant substances are eaten for suicidal purposes, and accidental poisoning is common among children. Some plants may cause skin reactions when handled.

Poisoning can be prevented by prohibiting cultivation of a toxic plant. For example, cultivation of yellow oleander (*Thevetia peruviana*) in domestic gardens is prohibited in Australia. Such drastic measures are fortunately only required for a few extremely toxic plants.

Education and raising public awareness about potentially toxic plants is of great importance in the prevention of poisoning. Public education campaigns should target children and adults. Educational posters should be displayed in places such as primary health care centres, hospitals and schools.

6.1 The message

A public education programme should aim to teach parents, teachers and children:

- Which toxic plants are found in the locality, at home, in the garden, in school grounds, and elsewhere.
- How to differentiate edible fruits, yams, seeds and leaves from toxic ones. This is very important. In countries like Sri Lanka, poisoning sometimes occurs with *Gloriosa superba* yams eaten mistakenly for *Ipomoea batatas*, and *Adenia palmata* fruits may be eaten if mistaken for passion fruit (*Passiflora edulis*),
- Measures that can be taken to avoid poisoning from toxic plants.

6.2 Measures that can be taken to avoid poisoning from toxic plants

- Teach children from an early age to keep unknown plants out of their mouths, not to suck nectar from flowers, chew leaves or make “tea” from leaves.
- Teach children not to eat berries or use plant parts such as seeds, for games, without checking the toxicity with parents or adults. For example, the seeds of the highly toxic jequirity bean (*Abrus precatorius*) are commonly used for games in some countries. If eaten, even a couple of seeds may cause poisoning if the outer coating of the seed is damaged.
- Keep poisonous plants or plant material out of reach of children. If a child bites a leaf of a *Dieffenbachia* plant, it can cause painful local reactions.
- If medicinal plant materials such as bulbs or seeds are kept at home, they should be kept in labelled locked containers, away from children and pets.
- Wear gloves when working with plants in the garden, and wash your hands after touching plants.
- Avoid inhaling smoke from burning trees or plants, because smoke from certain plants, such as yellow oleander, can be toxic if inhaled.
- Certain edible plant material such as yams or *Manihot utilissima*, contain natural toxicants that can cause poisoning if the material is not properly selected and prepared. Lectins present in red kidney beans can cause symptoms if they are not soaked for at least 12 hours, and boiled vigorously for at least 10 minutes in fresh water.
- It is unwise to use homemade medicines prepared from native or cultivated plants, as acute and chronic toxicity of these may not be known.

- Plants cannot be assumed to be non-toxic to humans if animals and birds eat them – even plants that are eaten by birds and animals may be toxic to humans. An example is *Acalypha indica*, a plant that commonly causes haemolysis in glucose-6-phosphate dehydrogenase (G6PD) deficient people.

6.3 Poisoning by plants in North Africa

A prevention campaign was undertaken by the Moroccan Centre Anti Poisons to prevent poisonings caused by chewing a plant called Chardon (*Attractylis sp.*), which contains a sweet tasting sugary “glue”. Information was disseminated to the media and directly to the community about the danger of chewing the plant.

7 Unintentional childhood poisoning in the home in Europe

The Poisons Centre in Lille, France, joined a multidisciplinary working group with teachers in charge of the school syllabus in the region, regional councils, and the Ministry of Health, to plan an educational programme on accident prevention for school children aged 6–10 years, and to develop tools that could be used in the normal school curriculum. It was felt that children of this age could influence the behaviour of both their younger siblings and their parents, and would themselves grow up with an awareness of safety. The programme was evaluated after a year to determine whether children’s knowledge had increased. Accident prevention is now fully integrated into the school syllabus in northern France and into teacher training programmes. Teaching materials are available from the Ministry of Education for use in other regions.

8 Prevention of occupational exposure to 1,2-dichloroethane in a cottage industry for incense stick manufacture

8.1 How the problem was recognized

Over a period of a few months, three cases of poisoning due to an unknown solvent were reported to the Poison Information Centre at the National Institute of Occupational Health (NIOH), Ahmedabad, Gujarat State, India. The first two patients were admitted to a local hospital after swallowing a few mouthfuls of a solvent that they were using at home for making incense sticks. Both the patients died of hepato-renal failure within a week. The third patient was a young pregnant woman who had consumed the same solvent. Because of the earlier experience of the NIOH Poison Centre, the patient was immediately referred to a more specialized hospital for dialysis. The patient recovered completely though her pregnancy had to be terminated because of intra-uterine fetal death. The occurrence of these three cases with similar exposure and clinical picture suggested an urgent need to investigate the nature of the chemical and the circumstances of exposure.

8.2 What was done

Incense sticks are regularly used by Indian families as a part of their daily religious routine. Ahmedabad city alone uses incense sticks worth Rs 6.00

million per month. Incense stick manufacture is a cottage industry in Ahmedabad city, taken up by a large number of workers since the closure of textile mills. The entire process of incense stick manufacture was investigated. It was found that exposure to chemicals did not occur during the process of making the incense sticks but during the packing process, when a variety of wrappers were used. PVC paper wrappers, which were relatively cheap, were glued using a solvent. The workers used their fingers to stick the paper with the solvent.

This solvent was sold unlabelled in the market along with other raw materials used for incense stick manufacture. It was analysed by an analytical chemist at NIOH and found to be 1,2-dichloroethane or ethylene dichloride. According to the Environmental Health Criteria for 1,2-dichloroethane (WHO, 1995), the compound is a highly volatile and flammable solvent readily absorbed following inhalation, ingestion or dermal exposure. It is toxic to the central nervous system, liver and kidney. According to the Joint FAO/WHO Committee on Food Additives (WHO, 1971, 1980, 1992), the compound is genotoxic in both in vitro and in vivo test systems, and is carcinogenic in mice and rats when given orally. The International Agency for Research on Cancer (IARC, 1979) has classified 1,2-dichloroethane in Group 2B (possibly carcinogenic to humans). It has been recommended that all appropriate measures should be taken to eliminate or minimize human exposure to this compound.

Low-level chronic exposure of the workers through dermal and inhalation routes resulted from the method of application and the high environmental temperatures prevalent in Ahmedabad for almost nine months of the year.

8.3 Follow-up action

In view of the acute and chronic toxicity of this solvent, it was considered necessary to take measures to prevent exposure of workers. Matters were brought to the notice of the Self Employed Women's Association (SEWA) of Ahmedabad. According to SEWA statistics, there were 20 000 incense stick workers in Ahmedabad city alone, of whom 90% were women and children; 70% of the workers worked in their own houses and 30% in small workshops. Their working hours were 9–17 hours a day, and 96% of them worked all year round. SEWA took steps to create awareness about the hazardous nature of the solvent and also to eliminate this type of packing procedure for incense sticks.

9 Prevention of analgesic misuse and abuse in Australia

In Australia, analgesic abuse had a significant impact on public health, and many people, mainly women, were affected, or died. There was extensive advertising in mass media, as well as on billboards at railway stations, on public transport and in other public places, much of it intense subtle advertising directed at women, for menstrual pain. Caffeine used in analgesic products with aspirin and phenacetin, fuelled the abuse problem. Large sums of public money had to be spent on parliamentary enquiries and to meet increased demands on nephrology units in hospitals around the country.

The first action was the identification, by those responsible for prevention (e.g. regulators and health educators), of the problem posed by the misuse and abuse of analgesics. The aim of prevention was not to deny individual access to the pharmaceuticals, but to ensure that they were being used appropriately within the limits of a person's legitimate need and ability to use them safely. Prevention strategies were based upon: supply reduction, demand reduction, responsible access and use, consumer education, product changes, and effective monitoring and enforcement.

9.1 Supply reduction

- *Change in the degree of accessibility in the community.* Aspirin, phenacetin and caffeine were reclassified to prescription-only when any combination of the three was used, and phenacetin was classified as a prescription-only drug. This had the effect of making the drugs less accessible to the user, because their supply then became dependent on a professional prescription. Doctors would be unlikely to prescribe them because of their toxicity and potential for a lawsuit by a patient if something untoward occurred. The registration authorities, after approximately a year of reassessing the quality, safety and efficacy of products with that particular combination formula, deemed them unsafe for registration and deregistered them. This measure made their sale illegal under any circumstances, even with a prescription.
- *Commercial formulation available only in a small-size pack in non-controlled outlets* (e.g. supermarkets). In addition, the pack size available in supermarkets (after reformulation to aspirin only) was restricted to a maximum of 12 powders or 24 tablets. This was done to cover consumer concerns about the need to have basic analgesics accessible over the weekend, or when pharmacies were closed.

These actions were recommended by the National Health and Medical Research Council (NHMRC), and endorsed by two major parliamentary enquiries (one in the State of New South Wales, and the other in the Commonwealth).

- *Doctors and pharmacists could exercise their duty of care not to supply*, if supply was considered not to be in the best interest of the patient's health.

9.2 Demand reduction

- *Prohibition of advertising to the public.* The cessation of advertising once aspirin/phenacetin/caffeine tablets and powders had been reclassified to prescription-only status, resulted in a sharp reduction in demand.
- *Press releases* to assist in advising the community of potential risks associated with the product were issued by the NHMRC, and many other prominent health figures in Australia expressed concern over these products, with the result that demand was further lessened because of bad publicity.
- *Restriction to supply by professionals*, who are made responsible vis-à-vis the community through legislation. The inconvenience and expense of having to obtain a doctor's prescription reduced demand, compared with products that could be obtained without a prescription, such as plain aspirin or plain paracetamol.

9.3 Responsible access and use

- *Only small-size packs were available in non-controlled retail outlets* (e.g. supermarkets). Larger packs could only be purchased from a pharmacy where advice from the professional pharmacist was available, as well as suitable counselling where abuse was taking place. If necessary, pharmacists could exercise their professional judgement and refuse supply under their duty of care responsibility. Pressure was placed on the various state education departments to remove analgesics from sale in school shops.

9.4 Consumer education

- *Formal consumer education campaigns* initiated by state health departments were targeted particularly at women and school children. The NHMRC produced a leaflet warning against excessive dosing of children with analgesics. Other education measures consisted of newspaper or magazine articles based on press release from the NHMRC, who had initiated the decision.
- *Sound advice available at the point of sale or prescribing.* If the patient sought a prescription for the aspirin, phenacetin and caffeine (APC) tablets, face-to-face professional advice by doctors and pharmacists was promoted. The registration boards for doctors and pharmacists kept these two groups of health professionals informed about the problem, and how to exercise their responsibilities. The various professional bodies for doctors and pharmacists also initiated an education campaign among their members so that they, in turn, could better inform their patients.
- *Improved warning statements on labels* of products, with very explicit warnings about the dangers of analgesic abuse, were recommended by the NHMRC and put into legislation by state governments.

9.5 Product changes

- *Reformulation to a safer formulation.* The two companies manufacturing the analgesics reformulated their tablet and powder products to plain aspirin, but used the same brand name. As a result, the products hardly sold because of the adverse publicity, the regulatory actions undertaken, and the switch to other existing single-component analgesics with different brand names.

9.6 Effective monitoring and enforcement

- *Admissions of patients* suffering from analgesic nephropathy to nephrology units were monitored over 15 years, and a significant drop in cases was noted. The initial large numbers began to decrease as a result of the regulatory actions undertaken. In addition, because of prescription-only status, a high standard of monitoring and enforcement were achieved (with inspectors, if required) by the professional registration bodies for pharmacists and doctors.