

ACUTE PESTICIDE POISONING: A MAJOR GLOBAL HEALTH PROBLEM

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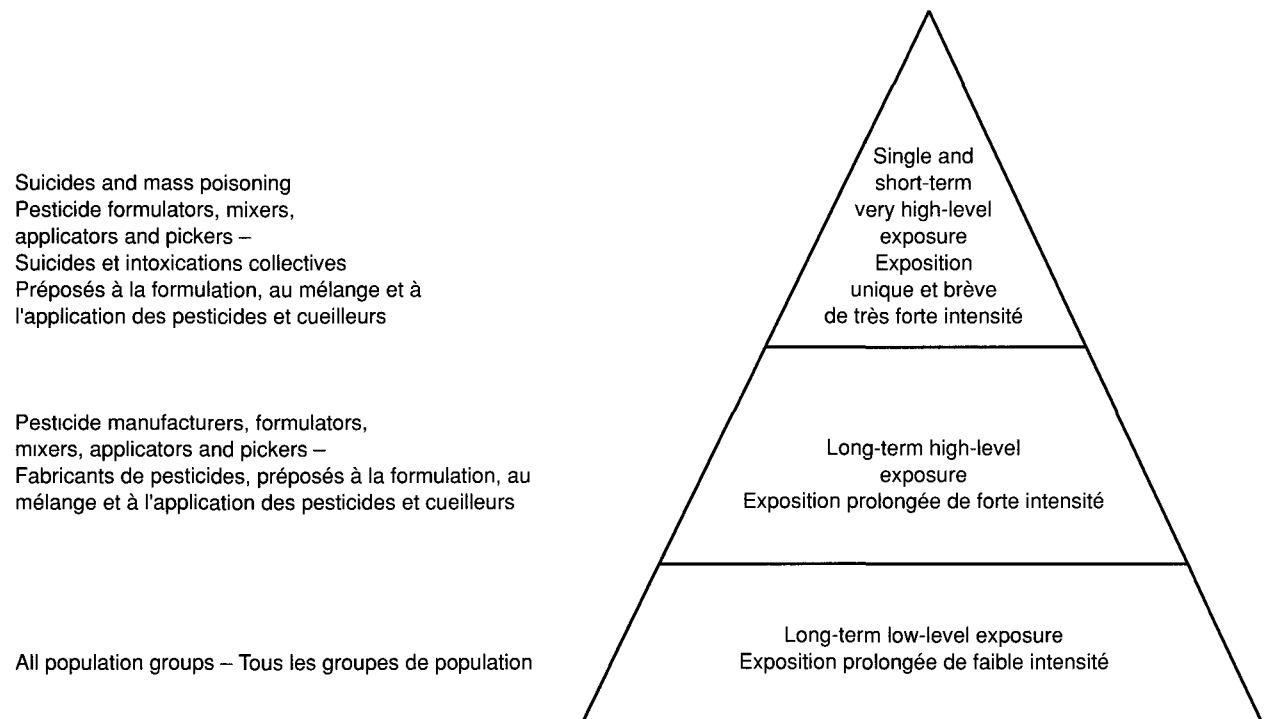
Pesticides are a group of chemicals used predominantly in agriculture and against vectors in vector-borne diseases such as malaria, filariasis, etc. There are several definitions of a pesticide; the Food and Agriculture Organization of the United Nations (FAO) (1) defines a pesticide as any substance or mixture of substances intended for preventing, destroying or controlling any pest, including vectors of human or animal disease, unwanted species of plants or animals causing harm during or otherwise interfering with the production, processing, storage or marketing of food, agricultural commodities, wood and wood products or animal feedstuffs or which may be administered to animals for the control of insects, arachnids or other pests in or on their bodies. The term includes substances intended for use as a plant-growth regulator, defoliant, desiccant or fruit-thinning agent or agent for preventing the premature fall of fruit and substances applied to crops either before or after harvest to protect the commodity from deterioration during storage and transport.

It is evident that a pesticide, so defined, is used for the variety of benefits it provides to mankind. But in so doing there are certain undesirable and unwanted effects of pesticide usage which cannot be ignored. This article focuses attention on the unnecessary acute health effects that arise from the use of pesticides.

Man may be exposed to pesticides in a variety of ways; at different dose levels and for varying periods of time. A schematic representation of the manner of human exposure to pesticides is shown in Fig. 1. In most countries all of these modes of pesticide exposure prevail, but what is most important is that each country or region identify the mode of exposure and resultant hazard which is most important to its own circumstances. For instance, in the industrialized world the problem of acute pesticide poisoning has largely been controlled and the main focus of attention is on the possible health effects arising from exposure to low levels of pesticides over a long period of time. Such exposures usually arise from environmental contamination as well as from pesticide residues in food, whereas the situation is quite the reverse in the countries of the developing world. In these countries the main health

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FIG. 1
POPULATION GROUPS AT RISK
GROUPES DE POPULATION À RISQUE



Source Reference (7) – Référence (7)

problem arising from pesticides is that due to acute poisoning. No doubt the concerns of long-term exposure to low levels of pesticides also obtain in these countries, but they should not be considered a priority health issue as they are in the countries of the industrialized world. The need to set priorities in combating the health problems arising from pesticide usage is illustrated (2) by the fact that only 1-2% of scientific papers published on pesticides and health has addressed the issue of acute pesticide poisoning. This article will mainly focus on acute pesticide poisoning, as it is a major health concern of pesticide usage.

Current status of knowledge

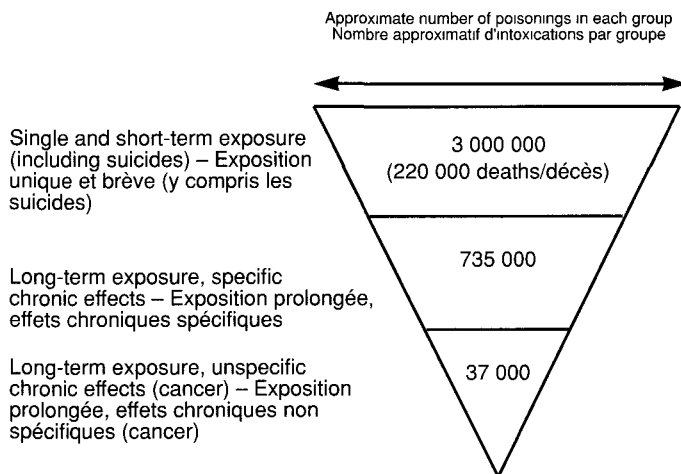
Any figures concerning the extent of acute pesticide poisoning on a global scale are largely based, by necessity, on estimates. The first such estimate was made in 1973 by the World Health Organization (3) which suggested that 500 000 cases of acute serious pesticide poisoning occurred annually. This estimate included only hospitalized cases of unintentional poisoning (excluding suicide attempts). At that time it was considered to be an unacceptably large problem, requiring efforts to substantiate this estimate as well as to control the problem. In 1982 (4) a national study of hospital cases of acute pesticide poisoning demonstrated that Sri Lanka, a country with a population of 12 million, had approximately 10 000 persons admitted to hospitals for acute pesticide poisoning annually, resulting in almost 1 000 deaths. The public health importance of this figure was highlighted by the fact that the deaths due to acute pesticide poisoning for that particular year were almost twice the total number of deaths due to malaria, poliomyelitis, whooping cough, diphtheria and tetanus, the traditional public health problems of developing countries. These figures included suicide attempts and suicides, which comprised about two-thirds of the hospitalized poisonings (4-6). The equivalent annual figures at a global level in 1985 (5) were estimated at approximately 3 million cases hospitalized and approximately 220 000 deaths.

Recently, a WHO task group reviewed the available estimates and other pesticide poisoning data and summarized the overall public health impact of pesticides (7), as shown in Fig. 2. WHO states that "the estimated 3 million cases of acute severe poisonings may be matched by a greater number of unreported, but mild, intoxications and acute conditions such as dermatitis" (this figure includes suicide attempts). It should be noted that the data shown in Fig. 2 are the inverse of the pyramid shown in Fig. 1. This is because the associated morbidity is small although a large number of persons are potentially at risk from long-term low-level exposure to pesticides. On the other hand, although the numbers exposed to high levels of pesticides for a short period of time are small, their morbidity and mortality are high. On the basis of this data, WHO states that "there is no segment of the general population that is sheltered from exposure to pesticides and potentially serious health effects, although a disproportionate burden is shouldered by the developing world and high-risk groups in each country".

Suicides have been incriminated as a major factor in the causation of acute pesticide poisoning. They contribute to approximately two-thirds of all causes of acute pesticide poisoning. The herbicide paraquat is extensively used as an agent for suicides. Paraquat poisoning is a major problem in Malaysia particularly, with 73.4% of such poisonings due to suicides, 13.8% to accidents and only 1.07% to occupational accidents (8).

Suicide in any society is a social problem which requires attention from many disciplines. The reason for the extensive use of pesticides as an agent for suicide in developing countries is the ready availability of extremely toxic pesticides. In the developed countries, pesticides are responsible for only a small percentage of all poisonings, whereas in the developing countries they are a major contributor to poisoning (Table 1) (9). The ready availability to the general public of these toxic pesticides should be controlled to limit the current epidemic of acute pesticide poisoning in the countries of the developing world.

FIG. 2
ESTIMATED OVERALL ANNUAL PUBLIC HEALTH IMPACT
EFFETS ANNUELS GLOBAUX ESTIMATIFS SUR LA SANTÉ PUBLIQUE



Source Reference (7) - Référence (7)

TABLE 1. PROPORTION OF ACUTE POISONINGS DUE TO PESTICIDES, SELECTED COUNTRIES, 1980s
TABLEAU 1. POURCENTAGE DES INTOXICATIONS AIGUËS DUES AUX PESTICIDES, CERTAINS PAYS, ANNÉES 80

Country—Pays	Percentage of total acute poisonings Pourcentage des intoxications aiguës (toutes causes réunies)
Indonesia — Indonésie	28.0
Brazil — Brésil	16.0
United Kingdom — Royaume-Uni	5.0
Australia — Australie	3.0
Canada	2.4
United States of America — Etats-Unis d'Amérique	0.8

Only relatively recently have data on acute pesticide poisoning in Africa become available. Choudhury (10) estimated that 11 million cases of pesticide intoxications occur annually in Africa. This figure includes minor non-hospitalized poisoning cases and is therefore not directly comparable with the figures given above. Table 2 indicates the extent of the problem in some of the African countries.

In making global estimates, there are a variety of pitfalls which are likely to give rise to inaccurate estimates of the extent of the problem. The main issues which distort the picture are: (i) misdiagnosis of acute pesticide poisoning; (ii) some studies confined to hospital cases, others confined to minor poisoning or mere pesticide exposure; (iii) most studies confined to a limited region and not nationally representative; and (iv) incomplete compilation of data.

In Indonesia, although the officially-collected records do not indicate a problem, local studies estimate that there are 30 000 cases of pesticide poisoning annually, of whom approximately 2 400 require hospitalization.^b In Thailand (11) the epidemiological surveillance report records 2 094 cases of pesticide poisoning with no deaths for the year 1985, while the data collected by the National Environmental Board record a total of 4 046 cases resulting in 289 deaths, indicating the great variation even in official records. The epidemiological surveillance data in Thailand are routinely obtained on the basis that

pesticide poisoning is one of the 54 notifiable diseases in that country, whereas the National Environmental Board collects data from a variety of sources.

Given this situation, there is an urgent need to collect accurate data on the different aspects of acute pesticide poisoning, particularly in the countries of the developing world. Such data should not merely be looked upon as data to establish the extent of the problem, but rather as the starting point for programmes for the control of acute pesticide poisoning. Further, such data are necessary to monitor and evaluate the efficacy of different intervention programmes that may be implemented for the control of acute pesticide poisoning.

The situation among agricultural workers

The global estimates of acute pesticide poisoning are largely based on hospital data. Very few surveys have been undertaken to study the problem of acute pesticide poisoning among agricultural workers. A survey undertaken in Asian countries (6) examined the problem, and the situation in two countries with the most reliable data (Table 3) indicates the extent of pesticide-poisoning episodes as perceived by the workers themselves.

On this basis, if it is taken that maybe on average 3% of agricultural workers in developing countries suffer an episode of pesticide poisoning a year (6), it would mean that for the 830 million agricultural workers in the developing world (12), there are about 25 million cases of occupational pesticide poisoning. The bulk of these episodes of poisoning do not get recorded, as they are considered minor and often self-limiting, and most of the patients do not seek medical attention. A survey of the preferred choice of medical attention for episodes of

TABLE 2. NUMBER OF POISONINGS IN SOME AFRICAN COUNTRIES, 1980s
TABLEAU 2. NOMBRE D'INTOXICATIONS DANS CERTAINS PAYS D'AFRIQUE, ANNÉES 80

Country — Pays	Population (millions)	Percentage agricultural labour force Pourcentage de la main-d'œuvre agricole	Annual number of cases of pesticide poisoning Nombre annuel de cas d'intoxication par les pesticides
Sudan — Soudan	24	80	384 000
United Republic of Tanzania — République-Unie de Tanzanie	23	85	368 000
Kenya	22	80	350 000
Uganda — Ouganda	17	80	272 000
Mozambique	15	70	240 000
Cameroon — Cameroun	11	80	175 000
Zimbabwe	10	80	160 000
Côte d'Ivoire	10	80	160 000
Malawi	8	85	128 000
Senegal — Sénégal	7	80	112 000
Mauritius — Maurice	2	75	3 200

From reference (11) — D'après la référence (11).

TABLE 3. PERCENTAGE AGRICULTURAL WORKERS AND PESTICIDE USERS WITH PESTICIDE POISONING, SELECTED COUNTRIES, 1980s**TABLEAU 3. POURCENTAGE D'OUVRIERS AGRICOLES ET D'UTILISATEURS DE PESTICIDES VICTIMES D'INTOXICATIONS PAR DES PESTICIDES, CERTAINS PAYS, ANNÉES 80**

Country — Pays	Agricultural workers ever poisoned Ouvriers agricoles déjà intoxiqués	Agricultural workers poisoned/year Ouvriers agricoles intoxiqués/an	Pesticide users ever poisoned Utilisateurs de pesticides intoxiqués	Pesticide users poisoned/year Utilisateurs de pesticides intoxiqués/an
	(%)	(%)	(%)	(%)
Malaysia — Malaisie	13.3	6.7	14.5	7.3
Sri Lanka	4.6	2.7	11.9	7.1

Source: Reference (6) — Référence (6)

poisoning among agricultural workers indicated variation. In Indonesia 69.9% of patients sought treatment in hospitals, in Malaysia 67.8% and in Sri Lanka 83.5%, but in Thailand only 8.4% of patients chose to seek treatment in hospitals.

Control of acute pesticide poisoning

The essential starting point in any control programme is to establish the extent of the problem. In the case of acute pesticide poisoning it has become abundantly clear over the last few years that the problem on a global scale is immense. It has also become evident that this particular aspect of pesticide poisoning is almost exclusively a concern of the developing world. The heartening feature in this gloomy picture is that the industrialized countries have been able to successfully control the problem. This must mean that there are valuable lessons to be learnt and it is possible to do likewise in the countries of the developing world. The available data suggest that acute pesticide poisoning is a major health concern in the developing world today. Yet very little has been done. The situation in Sri Lanka is a case in point: in 1982, scientists in Sri Lanka published data (4) to indicate that acute pesticide poisoning was an issue of even greater significance than the traditional public health problems of communicable diseases seen in developing countries, yet there has been no significant progress since (Table 4). There is an urgent need to take action.

The problem can be solved if all interested parties collaborate. It is wasteful and unnecessary to embark on activities which purely seek to blame the agrochemical industry. It is recognized that pesticides are primarily used for their beneficial effects, but responsible action must be taken to eliminate or minimize the associated hazards. Thus the people, national governments, agrochemical industries, scientists and international agencies all have a role to play in any control programme.

The role of responsible agents

The role of governments

The ultimate responsibility to control the use of pesticides so as to minimize health hazards devolves to national governments. They must continue, and whenever necessary strengthen, health education

^d World Health Organization. *Recommended classification of pesticides by hazard and guidelines to classification 1988-1989*. (Document WHO/VBC/88.953, 1988).

programmes among pesticide users, particularly to ensure safe practices.

Though many countries have enacted legislation, enforcement remains insufficient. As an immediate corrective measure it may be appropriate to consider selective enforcement or selective legislation to control those pesticides considered to be most hazardous. For this purpose the WHO document *Recommended classification of pesticides by hazard and guidelines to classification*^d would be most useful—pesticides classified extremely hazardous and highly hazardous should be identified for stricter controls.

Agricultural activities are undertaken in remote rural areas, which often most lack health-care facilities. The primary health care approach can be regarded as most suitable for such situations. Further, such an approach involves the consumer (in this case the worker) in the process of health-care delivery, thereby making it more effective. The primary health care approach also incorporates the multisectoral approach so essential in the control of pesticide poisoning.

TABLE 4. HOSPITAL ADMISSIONS FOR PESTICIDE POISONING, SRI LANKA, 1984-1988**TABLEAU 4. ADMISSIONS DANS LES HÔPITAUX POUR INTOXICATION PAR DES PESTICIDES, SRI LANKA, 1984-1988**

Year — Année	Total number Nombre total	Deaths Décès
1984	16 085	1 459
1985	14 423	1 439
1986	14 413	1 452
1987	12 841	1 435
1988	12 997	1 524

Source: Ministry of Health, Sri Lanka — Ministère de la Santé, Sri Lanka.

The role of the agrochemical industry

The agrochemical industries are often not included in control programmes. This is a great drawback which needs to be rectified, as these organizations can contribute significantly to the control of poisoning, particularly in the following areas:

- research into developing appropriate personal protective equipment for tropical countries;
- prevention of marketing of pesticide mixtures;
- maintenance and repair of spray equipment;
- research to develop hazard-free spray equipment;
- use of safe pesticide containers which are unlikely to be accident prone.

The role of international agencies

The international agencies, particularly WHO and the International Labour Organisation (ILO), have contributed a great deal in their attempts to control pesticide poisoning. They should continue their efforts,

with particular emphasis on education and training on safety in the use of pesticides (13, 14) and applied research activities, and should play the role of intermediary for the involvement of agrochemical industries in safety activities.

SUMMARY

The global problem of acute pesticide poisoning has been confirmed as extensive by a variety of independent estimates. Further, it is also recognized to be a problem confined to the developing countries. Most estimates concerning the extent of acute pesticide poisoning have been based on data from hospital admissions which would include only the more serious cases. The latest estimate by a WHO task group indicates that there may be 1 million serious unintentional poisonings each year and in addition 2 million people hospitalized for suicide

attempts with pesticides. This necessarily reflects only a fraction of the real problem. On the basis of a survey of self-reported minor poisoning carried out in the Asian region, it is estimated that there could be as many as 25 million agricultural workers in the developing world suffering an episode of poisoning each year. This article emphasizes the need to control the problem on a collaborative basis by all concerned, including national governments, agrochemical industries, international agencies, scientists and victims.

RÉSUMÉ

Intoxications aiguës par les pesticides: problème de santé majeur dans le monde

Diverses évaluations indépendantes ont confirmé l'étendue du problème mondial des intoxications aiguës dues aux pesticides. Il a en outre été reconnu que ce problème se limitait aux pays en développement. Les évaluations de l'ampleur des intoxications aiguës par les pesticides s'appuient pour la plupart sur les données concernant les admissions dans les hôpitaux qui ne concernent en principe que les cas les plus graves. Selon l'estimation la plus récente d'un groupe de travail de l'OMS, le nombre annuel des intoxications accidentelles s'élèverait à 1 million, outre les 2 millions de personnes hospitalisées pour tentative de suicide au moyen de pesticides. Cela ne

reflète nécessairement qu'une fraction du problème réel. Sur la base d'une enquête effectuée en Asie concernant les intoxications mineures signalées par les victimes elles-mêmes, on estime à 25 millions le nombre de travailleurs agricoles qui sont victimes chaque année d'un épisode d'intoxication dans les pays en développement. Cet article souligne la nécessité de résoudre ce problème avec la collaboration de tous les intéressés, à savoir les autorités nationales, l'industrie agrochimique, les organismes internationaux, les spécialistes scientifiques et les victimes.

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