



Pesticides and health hazards

Facts and figures



A healthy world for all.

Protect humanity and the environment from pesticides. Promote alternatives.

.....

The focus of this publication

Around the globe, chemical-synthetic pesticides have been used increasingly since the 1940s. Their use leads to considerable health hazards for people, due for example to direct contact during application, pesticide drift from fields, or contamination of food or drinking water. Data from research literature shows that the effects of the dispersal and negligent handling of pesticides are a significant global health problem.

This publication addresses the following issues:

- Who is affected by the health hazards posed by pesticides?
- What is known about the frequency of acute pesticide poisonings and the extent of long-term adverse health effects due to pesticides?
- To what extent do suicides and attempted suicides contribute to the total numbers of pesticide poisonings?
- In view of ongoing increases in global pesticide use, has documentation of pesticide poisonings been improved?
- On the basis of available data on pesticide poisonings, what action should be taken?

Pesticides

Pesticide use worldwide

In recent decades, there has been a steady increase in the amount of pesticides marketed for agricultural use. In the European Union alone, more than 200,000 tonnes of pesticides (active ingredients) are used annually.^[1] Between 2005 and 2010, the total volume of global sales rose from US\$ 31 billion to US\$ 38 billion.^{[2][3][4]} The amount of pesticides used internationally has risen fifty-fold since 1950.^{[5][6]} China is now the country that both uses and produces the largest amounts of pesticides.^[7]

Pesticides are everywhere

Presumably, all populations worldwide are exposed to pesticides. The ubiquitous dispersal of these substances is revealed by data on contamination of food as well as surface, ground, and drinking water.

In almost all parts of the world, low-level poisoning of human beings due to pesticide contamination of food poses a risk of chronic illness and adverse health effects. In Germany, the Federal Office of Consumer Protection and Food Safety [Bundesamt für Verbraucherschutz und Lebensmittelsicherheit] publishes an annual monitoring report on undesirable substances that constitute health risks in food. These reports show that pesticides can be found in all foodstuffs of plant origin. Two percent of all agricultural products of plant origin examined in Germany, including plums and lettuce, for example, showed signs of inadmissible application of pesticides. The levels of contamination detected in eleven samples of pineapple, tomatoes, peaches, nectarines, lettuce, and zucchini were considered to be sufficiently high to possibly pose acute health hazards.^[8]

Data and facts

Infobox 1 **What are pesticides?**

Pesticides are substances that are used intentionally in agriculture, forestry, and horticulture and on public lands and in gardens to increase crop yields, improve the appearance of plant products, or to facilitate the care of open spaces. They are also referred to as plant protection products. In Europe, pesticides used outside of agriculture are called biocides.^[9] Biocides are used, for example in private households, to repel or destroy unwanted or detrimental organisms and are also applied in large quantities in many developing countries to combat pathogenic organisms or species that serve as vectors (carriers) for pathogens (e.g. mosquitoes that are carriers of pathogens that cause malaria).

Health hazards due to pesticides Facts and figures

The many chemical substances that are collectively referred to as pesticides intervene in different vital metabolic processes in various organisms. The effects of insecticides range from damage to the transmission of nerve impulses and inhibition of blood clotting to paralysis of the respiratory and circulatory centers. Besides the target organisms such as insects, fungi, or weeds, non-targeted organisms are also always affected by pesticide use. These include wild animals and plants, domestic animals and crops, and human beings. In humans, exposure to pesticides can lead to unspecific adverse health effects that will be referred to here as poisonings.

The following sections offer a survey of acute illnesses that result from contact with pesticides as well as reviewing chronic illnesses that can occur due to long-term contact with pesticides. The text also describes population groups that are especially at risk with respect to acute and / or chronic pesticide poisoning. Based on estimates by the WHO, we then offer an impression of the global extent of pesticide poisonings. Pesticide poisonings are classified here as either suicidal or intentional poisonings, on the one hand, and unintentional poisonings that result from accidents on the job or accidents outside of occupational contexts, on the other.

Acute illnesses

Among the typical symptoms of poisoning in humans that are relatively easy to diagnose as acute pesticide poisoning are fatigue, headaches and body aches, skin discomfort, skin rashes, poor concentration, feelings of weakness, circulatory problems, dizziness, nausea, vomiting, excessive sweating, impaired vision, tremors, panic attacks, cramps, etc., and in severe cases coma and death.^{[22][23]}

Diagnosis of acute pesticide poisoning generally occurs when one or more of these symptoms, which appear a short time after contact with pesticides, are detected, so that patients or physicians can link them to pesticide exposure. However, these symptoms can also frequently be attributed to other illnesses. Analysis of blood, urine, or stomach content to detect pesticide residues can lead to an unequivocal diagnosis. But clearcut proof will only be forthcoming if a sufficiently high concentration of the poison is present and there is reason to suspect that a specific agent among the hundreds of substances available might potentially be responsible for the symptoms. Appropriate analytical methods are often very expensive or lacking altogether.

The severity of symptoms is frequently classified on a scale ranging from mild to moderate to severe or lethal.^[24] However, a standardized definition of what constitutes poisoning does not exist, so that comparing and summarizing different statistics on poisoning is difficult. The WHO proposed guidelines for identifying acute poisonings in 2008.^[25]

Global statistics on unintentional acute pesticide poisonings

In 1990 the WHO estimated that one million unintentional acute pesticide poisonings occurred worldwide annually. However, only the most severe cases registered in hospitals were included in this figure. WHO later reported that the extent of poisonings was significantly underestimated at the time. Despite this admission and the fact that, after more than twenty years, this figure is now without a doubt outdated, it is still cited. What is more, funding for a WHO project on the epidemiology of pesticide poisoning was discontinued several years ago.^[52]

The number of people who died worldwide as a result of unintentional poisonings was estimated at 20,000 in 1990.^[53] More current statistics have become available since 2008. According to this WHO data, 346,000 people die annually worldwide as a result of unintentional poisonings, two-thirds of them in developing countries.^{[54][55]} Here, too, the WHO admits that this figure may be too low.^[52] The substances involved are not specified, but presumably most of these poisonings are caused by toxic chemicals such as pesticides.^[56] Researchers have noted that probably 71% of these fatalities might have been prevented by improving chemical safety measures.^[55]

Global statistics on chronic pesticide poisonings

Statistics on chronic poisonings are very limited, since registration systems and regional studies only include poisoning cases that can be proven without any doubt to have been caused by pesticide exposure. According to a 1990 WHO estimate, it was expected that 735,000 cases of specific chronic effects and 37,000 unspecific health effects such as forms of cancer would occur annually.^[41]

Inadequate documentation and high numbers of non-reported cases

In order to estimate the frequency of pesticide poisonings, the WHO uses hospital records, population surveys, and data registered by governmental authorities.

However, global documentation and data transfer is inadequate. One case in point is Germany. In 1990, Germany introduced mandatory documentation of poisoning; all cases must be reported to the Bundesinstitut für Risikobewertung [Federal Institute for Risk Assessment, BfR]. BfR receives reports from Giftinformationszentren [Poison Information Centers, GIZ], from Berufsgenossenschaften (employee occupational health compensation boards), or directly from physicians who have provided treatment. The GIZ provide toxicological advice for physicians and private individuals and register, according to their own assessment, a large portion of non-occupational poisoning incidents. Work-related incidents are usually reported to BfR by the respective Berufsgenossenschaften.

In 2009, six of the nine GIZ reported a total of 2,954 cases of pesticide exposure. Only a few of the GIZ supplied data on the severity of these incidents in their statistics. When this information was included, 15% to 43% of these pesticide exposures were cases of mild to fatal poisoning; 57 to 85% of the cases involved exposure to pesticides that resulted in only minimal or no adverse health affects (Table 2). According to the GIZ, for technical reasons, only the most severe cases are reported to BfR.

Table 2 **Number of pesticide exposures and poisonings registered by the GIZ in Germany in 2009**

(GIZ)	Registered pesticide exposures	Registered pesticide poisonings (mild to fatal)
Göttingen	614 ^[24]	251 ^[24]
Bonn	360 ^[58]	not specified
Berlin	791 ^[59]	121 ^[59]
Erfurt	not specified	not specified
Freiburg	416 ^[60]	182 ^[60]
Homburg	51 (children only) ^[61]	not specified
Mainz	722 ^[62]	not specified
Munich	not specified	not specified
Nuremberg	not specified	not specified
Total	2,934	554

Number of cases of acute pesticide poisoning (deaths) per year for countries and regions*



Notes: 1. only intentional poisonings, 2. only unintentional poisonings, 3. severe and mild cases, 4. only poisonings treated in hospitals, 5. estimate, 6. only registered cases, * data collected for this publication, incomplete; for references see Table 3

Summary

Since the 1940s, the amount of synthetic chemical pesticides used annually worldwide has increased, resulting in considerable human health hazards. Due to contamination of the environment, presumably all populations worldwide are effected by pesticide contamination and face the threat of chronic health disorders. Particularly at-risk are people employed in agriculture because they are directly exposed to pesticides and frequently suffer from acute as well as chronic poisoning symptoms. Moreover, especially in developing countries, a large number of highly hazardous pesticides are easily available, many of which are used in agriculture, often even without appropriate protective clothing. Because of their availability, intake of these pesticides is a frequent suicide method.

Many hospital records show that a high proportion of severe acute pesticide poisonings are in fact suicides, especially in Asia. The WHO estimates that there are about 2 million pesticide suicides and suicide attempts worldwide every year. However, these statistics do not reflect the fact that cases of non-suicidal pesticide poisoning among farm workers are generally poorly documented, in particular in developing countries. Poisonings with milder symptoms that generally subside rather quickly are often not registered, so that such cases are presumably underestimated. In 1990, the WHO assumed that one million severe cases of unintentional pesticide poisoning occurred annually. What is remarkable is another, much higher WHO estimate from the same year that is rarely cited in the relevant literature. This figure refers to 25 million unintentional poisonings annually of farm workers in developing countries alone, with on average 3% of agricultural workers in developing countries suffering an episode of pesticide poisoning per year.^[41] Since the sales volume of pesticides worldwide has increased and the rate of poisonings in regions is much higher than 3%, it is probable that the number of unintentional poisoning incidents

- [67] VietnamNews (03/2008): Farmers Put Selves, Families at Risk with Careless Pesticide Use, www.vietnamnews.biz/Farmers-put-selves-families-at-risk-with-careless-pesticide-use_278.html (accessed on 29 December 2011)
- [68] WHO (2005): Viet Nam Environmental Health Country Profile, Manila
- [69] M. Corriols (2009): Acute Pesticide Poisoning in Nicaragua: Underreporting, Incidence and Determinants, thesis
- [70] D. Murray (2002): Surveillance of Pesticide-related Illness in the Developing World – Putting the Data to Work, *International Journal of Occupational Environmental Health* 8, 243-248
- [71] R. Isenring (2006): Pesticide Poisonings in Costa Rica
- [72] L.S. Weilemann (2005): Intoxikationen, *Medizinische Therapie* 18, 1533-34
- [72a] Statistisches Bundesamt (2011): Gesundheit – Ergebnisse der Todesursachenstatistik für Deutschland 2010, Wiesbaden
- [73] PAN UK (2007): Hidden Costs of Pesticide Use in Africa, Food and Fairness Briefing 2
- [74] E.A. Kodjo (2007): ANCE Fights for Prohibition of the Use of Endosulfan in Togo, *IPEN Newsletter* 57
- [75] Directorate General of Health Services (2009): Health Bulletin, Government of the People's Republic of Bangladesh, Ministry of Health and Family Welfare, Dhaka
- [76] Government of Bangladesh (2007): National Implementation Plan for Management of Persistent Organic Pollutants
- [77] WHO (2001): Pesticide Poisoning Database in SEAR Countries – Report of a Regional Workshop in New Delhi, 22-24 January 2001
- [78] C.H.S. Rao et al. (2005): Pesticide Poisoning in South India – Opportunities for Prevention and Improved Medical Management, *Tropical Medicine and International Health* 10(6), 581–588
- [79] Canwest News Service (06/2007): Pesticide Poisoning Bigger Problem than Canadians May Think, www.parentingbanter.com/showthread.php?t=52231 (accessed on 25 March 2012)
- [80] N. Rhalem et al. (2009): Risk Factors for Pesticide Poisonings, *Annales de Toxicologique Analytique* 21(2), 79-84
- [81] N.R. Bensusan (11/2000): Agrotóxicos: situação extremamente grave pode piorar ainda mais... www.socioambiental.org/nsa/detalhe?id=1315 (accessed on 17 January 2012)
- [84] F. Mancini et al. (2005): Acute Pesticide Poisoning among Female and Male Cotton Growers in India, *International Journal of Occupational Environmental Health* 11, 221-232
- [85] D.A. Khan et al. (2009): Risk Assessment of Pesticide Exposure on Health of Pakistani Tobacco Farmers, *Journal of Exposure Science and Environmental Epidemiology* 20, 196-204
- [86] PAN Germany (2005): Vergiftungen durch Pestizide, Hamburg
- [87] S. Dasgupta et al. (2007): Pesticide Poisoning of Farm Workers – Implications of Blood Test Results from Vietnam, *International Journal of Hygiene and Environmental Health* 210(2), 121-32
- [88] P. Sodavy et al. (2000): Situation Analysis - Farmers' Awareness and Perceptions of the Effect of Pesticides on Their Health, *FAO Community IPM Programme Field Document*
- [89] H. Murphy et al. (2002): Farmers' self Surveillance of Pesticide Poisoning – a 12 month Pilot in Northern Vietnam, *International Journal of Occupational Environmental Health* 8, 201-211
- [90] M. Dombia, K.E. Kwadjo (2009): Pratiques d'utilisation et de gestion des pesticides par les maraichers en Côte d'Ivoire – Cas de la ville d'Abidjan et deux de ses banlieues (Dabou et Anyama), *Journal of Applied Biosciences* 18, 992-1002
- [91] PAN international (2007): A Position on Synthetic Pesticide Elimination
- [92] Meriel Watts, personal communication, 14 February 2012
- [93] PAN Germany (2011): Stop Pesticide Poisonings! New Pesticide Policies Needed after Decades of Failure, Hamburg



© Pestizid Aktions-Netzwerk (PAN) e. V.
 Nernstweg 32, D - 22765 Hamburg
 phone: +49 (0)40 - 399 19 10 - 0
info@pan-germany.org
www.pan-germany.org

We appreciate donations to

Pestizid Aktions-Netzwerk e.V. (PAN Germany)
 GLS Gemeinschaftsbank eG, PO Box 10 08 29, 44708 Bochum
 account 203 209 6800, bank code 430 609 67
 IBAN DE91 4306 0967 2032 0968 00, BIC (SWIFT) GENODEM1GLS

PAN Germany is a charitable organisation which provides information on the adverse effects of pesticides and promotes environmentally friendly and socially just alternatives. We are part of the Pesticide Action Network International. Our work areas range from critical assessments of the pesticide industry to constructive interaction with policy-makers to practical services for farmers and consumers.

