



Medicine for Managers

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Pesticides and Health

Pesticides are used to control pests. They are used very widely and there is evidence of health risks associated with long- and short-term use of the agents. Consistent associations have been identified with degenerative nerve disorders, hormone disruption, respiratory issues and cancer development. Not surprisingly, duration and degree of pesticide exposure impacts the nature and development of health consequences such as in agriculture.

The word **pesticide** is derived from two Latin words, **pestis** meaning 'plague' and the verb **caedere**, meaning 'to kill'.

The compounds include chemicals to destroy and control plants and animals seen as pests because they compete with humans for food, spread disease, destroy property or are generally seen as a nuisance. Pesticides fall into categories depending on their target and include **herbicides**, **fungicides**, **insecticides**, **rodenticides** and a range of other compounds for other specific types of pest.

The World Health Organisations classified pesticides into four groups; **extremely dangerous**, **highly dangerous**, **moderately dangerous** and **slightly hazardous**.

They are used extensively to protect crops and the biggest users are China and the United States. An estimated **two million tons** are used every year and about 145 pesticides are approved.

Pesticides have been used since the Sumerians and other ancient civilisations around 5,000 years ago, using chemicals like salt and ashes, as well as sulphur, arsenic and mercury.

Their toxicity is well documented; for example, 100 people were killed in India in 1958 by pesticide-contaminated flour.

Many will remember the **Bhopal disaster** in 1984 when the chemical methyl isocyanate gas, used to make **carbamate insecticides**, leaked from the plant and formed a cloud of toxic gas over densely populated slums. Up to 10,000 people died within three days and about half a million survivors went on to develop such things as respiratory diseases, blindness, birth defects, and cancers.

Many are concerned that, to this day, careless and excessive use of pesticides may damage human health and the environment, particularly when they end up, for example, in drinking water or food residues. No population is excluded from the risks of pesticides.

Pesticides may potentially cause immediate effects such as headache, breathing problems or skin irritation.

However, perhaps more worryingly, they may insidiously accumulate over a prolonged period to cause symptoms which are difficult or impossible to link with such agents.

Hundreds of articles in the medical press have raised theoretical or practical anxieties about pesticides.

Different pesticides act in different ways. They may be liquid, solid or gaseous and may be absorbed systemically into the pest or act by making physical contact.

For example, treated plants may be consumed by pests and the pesticide absorbed through the gut, or may be a fumigant, absorbed through the respiratory system, or it may be a repellent, sufficiently unpleasant to keep pests away from the treated products.

Pesticides are commonly classified based on chemical composition. The chemical names are largely unpronounceable and consist of several syllables, but there are four principal groups:

Organochlorines based on chlorine
Organophosphates based on phosphates
Carbamates derived from carbamic acid
Pyrethroids extracted from pyrethrum flowers

The dangers of pesticides are much more than just the consequences of consuming them in trace amounts in foodstuffs or drinks.

There is also the danger to non-targeted plants and to animals.

- Sprayed chemicals may be carried by wind to other farms, crop areas, grazing areas and aquatic environments, endangering other animals
- Spraying may also be injurious to fish and other freshwater animals.
- Pesticides may be dispersed into the atmosphere and spread contained in rainwater
- They may end up in groundwater, draining into reservoirs or rivers

This may result in **biomagnification**, increased pesticide concentration through accumulation from various different sources (i.e. plants, water, animals, rain, and predation, amongst other routes). As such pesticide concentration in any given circumstance may significantly exceed what would be expected from simple treatment of crops.

Pesticides are regarded as essential by farmers to protect their crops because of the twin pressures of feeding an increasing population and safeguarding income.

Estimates suggest that they can prevent losses of up to three-quarters of fruit production, up to half of vegetable production and up to a third of cereal production.

However, many people are concerned at the incidental and unwanted side effects of pesticide use, both on untargeted plants and

vegetation, and also on animals which are not considered pests. Most crucially, concerns relate to humans.

Humans are exposed to pesticides or their breakdown products through the food chain and also through the water, soil, plants, animals and also through the air. They are absorbed largely via the respiratory system, the mouth, the skin and also through the eyes.

Because of the range of types of pesticides, the possible side effects are huge and potentially extremely varied, depending on the route by which they are taken into the body, how much exposure occurs and the toxicity of individual agents.

They are found in all tissues including blood, breast milk and fatty tissues. Different agents may produce damage and disease on different target organs.

Systems targeted include:

The neurological system causing such effects as headache, dizziness, tremors, twitching, lack of co-ordination, mental confusion and disorientation, agitation or depression, seizures and chronic illness such as Parkinson's disease.

The respiratory system including asthma, breathlessness, bronchitis and pneumonia

The gastro-intestinal system including nausea and vomiting, diarrhoea, abdominal pain and ulceration.

The endocrine system inducing effects as a result of hormonal changes associated with

such organs as the thyroid, pancreas, adrenal, breast and other glands.

The blood and marrow systems with a range of vascular effects from anaemia, to such diseases as Hodgkin's disease.

The skin causing itching, ulceration

In any bodily systems on which pesticides may interact, there is also the risk of the development of a wide range of cancers, together with impaired fertility and birth defects in women.

The potential effects of pesticides sound extremely alarming and they are.

Everyone is exposed to them and all have the potential to cause morbidity and mortality. It is clearly vital that the populations are protected by strict control of the pesticides approved, their effects and emphasising to physicians the need for awareness to make diagnoses and manage cases if there is suspicion of a pesticide aetiology.

Regulation must be very strict and agricultural practices must be monitored and sustainable practices employed to mitigate any risks.

Reconciling the conflict between feeding the world and protecting the crops, against the potential harm of toxic pesticides is a major challenge for science to create ever less harmful and more effective pesticides to improve safety.

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