

Organophosphates

Organophosphates (OPs) are organic compounds which contain a phosphate or thiophosphate group. They were specifically developed as insecticides but are also related to some nerve gases. The sulphur-containing thiophosphates are more stable and persistent than the phosphates.

OPs are cholinesterase inhibitors (see Glossary), that is, they act by suppressing the function of the enzyme acetylcholinesterase which is essential to terminate nerve impulses. The suppression leads to spasms and convulsions and finally to paralysis. The action is the same in insects as in mammals, but insects are many times more sensitive.

They can be absorbed by an insect through its cuticle (hard skin) via direct contact, or they can be ingested via plant material if they are used as systemic poisons (i.e. poisons taken up by the plant through the roots or leaves, or by injection). Various OPs are commonly used in domestic pest control including termite treatments.

The US Environmental Protection Authority banned chlorpyrifos for domestic use in 2000, due to unacceptable risks to children's neurological and behavioural development, but in Australia chlorpyrifos is in common use inside the home and is a major termite control chemical.

Health effects

OP pesticides have a different mode of action to OC pesticides in insects and humans. They also do not persist as long, and do not accumulate in the body and the environment. However, most OPs are readily absorbed through the skin and have high acute toxicity. Complete protective clothing must be worn when handling them.

The symptoms of acute poisoning usually appear within a very short time and include headaches, fatigue, giddiness, saliva formation, sweating, pinpoint pupils, chest tightness, nausea, abdominal cramps and diarrhoea. Exposure to OPs may mean a person requires immediate medical help. Recovery takes several days.

Chronic or repeated exposure may have long-term effects such as asthma and chemical sensitisation and may cause permanent damage to the nervous system. In some rare cases, after an acute exposure to OPs, a delayed-onset nervous system condition can set in. The mechanism for this is unclear, but the effects include permanent impairment of nervous functioning and permanent and crippling fatigue.

Government occupational health authorities offer simple tests for workers to determine level of exposure to OPs, based on urine samples.

Environmental effects

Their general action will kill beneficial insects (bees, ladybirds, lacewings, etc.) as well as ones regarded as pests.

Alternatives

The much less toxic synthetic pyrethroids can be used.