

Health Surveillance Guideline for users of Organophosphate Pesticides

Restrictions on the use of persistent organo-chlorine pesticides have resulted in an increase in the use of organophosphate pesticides (OPs). OPs are less persistent in the environment but have a greater acute toxicity for humans. UQ staff who mix and apply pesticides are at risk of systemic poisoning. Agricultural staff are at risk from exposure to these pesticides in the field. Both acute and chronic poisoning may occur. Biological monitoring is useful in assessing the effectiveness of personal protective equipment including respirators and is also useful in assessing work practices and compliance with safety procedures. The most important and common route of entry in the workplace is intact skin. OPs may also be swallowed, inhaled or absorbed through mucous membranes or the eye.

Supervisors have responsibilities under the Work Health and Safety Act 2011 and Regulations 2011 to perform a risk assessment, when OPs are being used. Risk assessments can be done, either using The University of Queensland Risk Management Database at: www.risk.admin.uq.edu.au or in hard copy form.

The risk assessment must be done when use of the pesticide is being planned; within five years after the last assessment; when work practices involving the substance are changed; new information about the health risks of the substance becomes available, health surveillance or monitoring shows control measures need to be reviewed; or changed / improved control measures are implemented.

Health Surveillance

Organophosphate pesticides affect an enzyme in the body, cholinesterase, that normally breaks down acetylcholine. Acetylcholine is a normal substance in the body that allows the transmission of nerve impulses. It is the build up of acetylcholine in the body as a result of the OPs effect on cholinesterase that causes the acute toxicity of the OPs.

Cholinesterase levels can be detected in the blood and urine. Health Surveillance is done to detect exposure in workers and to remove affected workers before the development of symptoms. Affected staff will have further blood testing and will not return to using OPs at work, until their cholinesterase levels are satisfactory and changes have been made in the workplace to reduce exposure to OPs.

Supervisors must arrange for health surveillance of workers who will be, or have been exposed to Schedule 8 substances (Work Health and Safety Regulations 2011), and the risk assessment shows the risk is significant. OPs are listed in Schedule 14 of the Regulations. If the risk is well controlled, and it is a one-off use, then health surveillance will probably not be needed. However, most regular users will need health surveillance. Health surveillance can be arranged by contacting the Occupational Health Nurse Adviser.

The request for health surveillance should include the employee's job description. Job descriptions should contain complete information on the nature of assigned duties and physical requirements, so that it can be used to determine the nature of the health surveillance needed. Material Safety Data Sheets on the OP(s) being used should be included in the request.

Signs and Symptoms of Acute Toxicity (Poisoning)

Signs and symptoms of acute poisoning usually reach maximum severity 24 to 48 hours after a major exposure and lessen over the next week. The first symptoms may occur within minutes of exposure to a concentrated solution of OPs. General effects of excessive exposure can include salivation, sweating, teary eyes, small pupils, chest tightness, abdominal cramps, nausea, vomiting, diarrhoea, loss of bladder control, weakness, fatigue, muscular twitching, rapid pulse, headache, anxiety, confusion, slurred speech, coma and depression of breathing and circulation.

Local effects can occur in the absence of toxicity involving the entire body. A splash in the eye can cause immediate blurring of vision. Inhalation of an OP may result in breathing difficulties including an excess of respiratory tract secretions, and a feeling of tightness in the chest. Splashes of OPs to the skin may cause localised sweating and twitching of the muscles in the affected area.

Occupational poisoning generally results from skin contamination. Many OPs oxidise to a more active form following application. This represents an increased hazard to workers who may come into skin contact with sprayed surfaces. If concentrated OP is splashed into an eye, absorption may be very rapid. If swallowed OPs are rapidly absorbed from the stomach. Symptoms of poisoning usually do not occur until cholinesterase enzyme activity has reduced to between, 25% to 60% of baseline levels. Chronic low-level exposures may lead to cumulative effects. When exposure to OPs has ceased, cholinesterase in the blood (serum cholinesterase) regenerates. This may take several days and sometimes longer to return to normal. Erythrocyte Cholinesterase does not reactivate but is replaced by the body at about 1% per day and so the level returns to normal slowly.

Chronic Toxicity (poisoning)

Chronic continual exposure may cause persistent loss of appetite, weakness and malaise. Exposure to OPs may result in dermatitis. Excessive exposure to some OPs can cause nerve damage by inhibiting another enzyme in the body (neuropathy target esterase). Symptoms may consist of tingling and burning sensations in the hands and feet, followed by weakness in the lower limbs and difficulty walking. In severe cases the upper limbs and / or the eyes may also be affected.

Baseline

A Baseline sample of blood (preferably 2 samples) should be taken for estimation of serum and red cell cholinesterase before any exposure to OPs.

During exposure to organophosphate pesticides

Testing during a single pesticide season may be limited to cholinesterase testing of employees during maximum pesticide use periods. Cholinesterase testing, other than to establish a baseline will not be done during periods of non-use because the effects of exposure are transient and no useful information will be gained by such sampling.

Medical examination

Staff will be examined by the appointed medical practitioner in circumstances where:

- excessive exposure to OPs are suspected:
- workers are concerned,
- symptoms suggestive of organophosphate poisoning are present

Testing of several workers during the period of use of organophosphate pesticides is desirable.

The medical-examination will include an occupational history; medical history, physical examination. Evidence of dermatitis on the hands and forearms may indicate advice is required on work practices and a blood sample will be taken. It is preferable that blood tests are taken during the latter half of the working day during a time when organophosphate pesticides have been used.

If it is established that the person has had excessive exposure the worker can be moved to another area and can use other types of pesticides (except pyrethroids, such as permethrin or carbamate insecticides) until the cholinesterase level is satisfactory.

Generally any exposure to OPs will be ceased when the red cell cholinesterase falls to 70% or below the baseline value of the individual concerned.

The supervisor should be informed when abnormal findings have detected so that control measures can be checked. The employee should be informed of the results of the health surveillance.

Personal protective equipment

The availability, type, fit and maintenance and frequency of use of personal protective equipment should be monitored regularly.

Termination of employment

If the staff member is using organophosphate pesticides, termination of exposure records – date of termination and reason for termination should be included in the medical surveillance regime.

Reference:

Workplace Health and Safety Queensland, Department of Justice and Attorney-General
Designated Doctor Program - Organophosphate pesticide health monitoring guidelines
PN10466 Version 2. Last updated June 2012.

Hazardous chemicals – Code of Practice 2003.

<http://www.deir.qld.gov.au/workplace/resources/pdfs/hazardous-chemicals-cop-2003.pdf>

ACGIH 2012, TLVs and BEIs Based on the Documentation of the Threshold Limit Values for Chemical Substances and Physical Agents & Biological Exposure Indices Worldwide Signature Publications, Cincinnati Ohio.

Contact for Additional Information

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