

# Health monitoring

*Guide for organophosphate pesticides*





## Contents

Organophosphate pesticides .....	5
1. Health monitoring for organophosphate pesticides under the Work Health and Safety (WHS) Regulations.....	6
2. Monitoring exposure to OPs.....	6
Other health monitoring methods .....	8
Workplace exposure standard .....	9
Removal from work .....	9
Return to work.....	9
3. Final medical examination.....	10
4. Route of occupational exposure .....	10
5. Target organ/effect.....	11
6. Acute effects .....	11
7. Chronic effects .....	14
8. Carcinogenicity .....	14
9. GHS classifications .....	14
Source documents .....	14
Health monitoring report – Organophosphate pesticides .....	17
Section 1 – A copy of this section to be provided to the PCBU .....	17
Section 2 – This section to be retained by the registered medical practitioner .....	21

# Introduction

This guide is intended to be read by a registered medical practitioner with experience in health monitoring who is engaged by person conducting a business or undertaking (PCBU) to carry out or supervise health monitoring. It provides practical guidance to registered medical practitioners about requirements under the work health and safety (WHS) laws for health monitoring.

This guide applies to all workplaces covered by the WHS Regulations where health monitoring is required.

## **How to use this guide**

This guide includes references to the legal requirements under the WHS Act and WHS Regulations. These are included for convenience only and should not be relied on in place of the full text of the WHS Act or WHS Regulations.

The words 'must', 'requires' or 'mandatory' indicate a legal requirement exists that must be complied with. The word 'should' is used in this guide to indicate a recommended course of action, while 'may' is used to indicate an optional course of action.

This guide provides information for those registered medical practitioners engaged by a PCBU to carry out or supervise health monitoring for workers. This guidance should be read in conjunction with the following:

- *Health monitoring guide for registered medical practitioners*
- *Health monitoring guides for hazardous chemicals*
- *Health monitoring guide for workers*
- *Health monitoring guide for persons conducting business or undertakings (PCBUs).*

## **Health monitoring under the WHS Regulations**

In certain circumstances, the model WHS Regulations place duties on a PCBU to provide health monitoring to workers. These requirements arise if the worker is carrying out work with hazardous chemicals including lead and asbestos. In addition, the work being carried out must be the kind of work specified in the WHS Regulations. A PCBU has the duty to determine if health monitoring is required.

The WHS Regulations prescribe that health monitoring is carried out by or supervised by a registered medical practitioner with experience in health monitoring.

## Organophosphate pesticides

Organophosphate pesticides are phosphotriester compounds that can be divided into five classes based on their differing alkyl phosphate constituents:

- phosphates
  - chlorfenvinphos
  - paraoxon
- O-phosphorothioates
  - chlorpyrifos
  - fenthion
  - parathion
- S-phosphorothioates
  - Azamethiphos
  - omethoate
- phosphorodithioates
  - ethion
  - malathion
  - phosmet, and
- phosphonates/phosphoramidates
  - acephate, and
  - fenamiphos.

### Work activities that may represent a high risk exposure

Most organophosphorus compounds are insecticides, though there are also a number of related herbicide and fungicide compounds. Organophosphate insecticides are widely used on a large variety of crops.

Examples of work activities involving OPs that require special attention when assessing exposure include:

- pest control operators who use OPs every day in their work
- manufacture, formulation and packaging
- transport, storage and distribution
- handling used containers, for example in scrap recovery
- agricultural and horticultural activities like mixing, loading and applications where direct handling of the chemical occurs
- veterinary activities like cattle and sheep dipping
- seasonal field workers exposed to pesticide residues, and
- laboratory workers undertaking research on OPs.

To be legally used in Australia OP products must be registered by the Australian Pesticides and Veterinary Medicines Authority (APVMA). Product registrations will change over time and referring to the product label and safety data sheet to determine whether the chemical products used contain cholinesterase inhibiting (anti-cholinesterase) compounds is recommended.

### Sources of non-occupational exposure

Many OPs are commonly used in home and garden products. For example, diazinon and chlorpyrifos have been widely used by consumers who may contaminate themselves or their food by not understanding or taking the precautions necessary for safe use.

Cases have been reported of acetylcholinesterase inhibition by:

- alkyl sulfates
- sulfonates, and

- a wide variety of drugs for example:
  - neostigmine
  - physostigmine
  - pyridostigmine
  - pethidine
  - some immunosuppressants. and
  - various cytostatic agents.

## 1. Health monitoring for organophosphate pesticides under the Work Health and Safety (WHS) Regulations

Collection of demographic, medical and occupational history, including pattern of use

Physical examination

Urinary organophosphate metabolites

### Health monitoring before starting work with organophosphate pesticides

Health monitoring for organophosphate pesticides (OPs) may be required before the worker starts work so that changes to the worker's health can be detected.

Initial discussions about a health monitoring program should include:

- possible health effects from exposure to OPs
- how to recognise and report symptoms, and
- what is involved in the health monitoring program, for example the frequency of testing and the tests that may be needed.

A physical examination should be carried out only if work and medical history indicates this is necessary, for example by the presence of relevant symptoms. OPs are respiratory irritants, therefore it is important to investigate respiratory symptoms. However, spirometry may not be required at this stage.

If erythrocyte or plasma cholinesterase activity levels are monitored during the health monitoring program, it is recommended baseline levels are taken. As there is considerable inter-individual variability in baseline cholinesterase activity, an individual baseline must be established for comparison purposes. If the worker has had previous exposure, it is desirable that there is a two month exposure-free period before baseline samples are taken. Two blood samples should be collected at least three days apart before exposure begins. The difference between samples should be less than 20 per cent.

### During exposure to an organophosphate pesticide process

## 2. Monitoring exposure to OPs

Where workers are exposed, suspected of being exposed or are concerned about exposure to OPs, the person conducting the business or undertaking (PCBU) has a duty to arrange a health monitoring appointment with a registered medical practitioner. For example, an appointment should be arranged following spills or loss of containment of OPs resulting in excessive exposure to workers or when workers develop symptoms of OP exposure.

OPs are readily absorbed by inhalation, through the skin and by ingestion. The dermal route is thought to be the major route of occupational exposure for most OPs. The rate and extent of absorption is dependent on the OP and the formulation.

OPs undergo two generalised metabolic reactions:

- hydrolysis to an alkyl phosphate and another compound that may subsequently undergo further metabolism, and
- oxidation of P=S groups in thion OPs (O-phosphorothioates and phosphorodithioates) to P=O groups.

There are six dialkyl phosphate compounds that, collectively, are metabolites of most OPs:

- dimethylphosphate (DMP)
- dimethylthiophosphate (DMTP)
- dimethyldithiophosphate (DMDTP)
- diethylphosphate (DEP)
- diethylthiophosphate (DETP), and
- diethyldithiophosphate (DEDTP).

The following table highlights the potential metabolites from common OPs:

**Table 1** Possible dialkyl metabolites from common organophosphate pesticides<sup>1</sup>

Metabolite(s)*	Organophosphate pesticide	
<b>DEP</b>	Chlorfenvinphos	Parathion
<b>DETP</b>	Chlorpyrifos	pirimiphos-methyl
	Diazinon	Pyrazophos
<b>DEP</b>	Azinphos-ethyl	Phorate
<b>DETP</b>	Ethion	Terbufos
<b>DEDTP</b>		
<b>DMP</b>	Dichlorvos	Monocrotophos
	Mevinphos	Trichlophon
<b>DMP</b>	Azamethiphos	Omethoate
<b>DMTP</b>	Chlorpyrifos-methyl	Parathion-methyl
	Famphur	Temephos
	Fenitrothio	Toclfos-methyl
	Fenthion	Vamidothion
<b>DMP</b>	Azinphos-methyl	Methidathion
<b>DMTP</b>	Dimethoate	Phosmet
<b>DMDTP</b>	Malathion	

\*One or more of these metabolites would be expected

The metabolites of OPs are excreted into urine or into faeces through biliary excretion.

The following test should be used to test the worker's OP exposure levels:

- urinary organophosphate metabolite (dialkyl phosphate) levels.

No biological exposure guidance values have been published. The following values may be used as a guide for interpreting results:

## Biological exposure guide for organophosphate pesticides<sup>1</sup>

*Urinary dialkyl phosphate:* less than 100 µmol/mol creatinine

— indicates **low occupational exposure or high non-occupational exposure**

*Urinary dialkyl phosphate:* 100-1000 µmol/mol creatinine

— indicates **medium level occupational exposure**

*Urinary dialkyl phosphate:* greater than 1000 µmol/mol creatinine

— may be associated with a drop in the blood cholinesterase level

— indicates **high occupational exposure**

Urinary dialkyl phosphate levels greater than 100 µmol/mol creatinine indicate that work practices may need to be reviewed. An assessment of erythrocyte or plasma cholinesterase activity may be warranted.

While the pharmacokinetic profile of most OPs is not known, it is recommended that urine samples are collected post-shift or pre-shift the following day.

### Other health monitoring methods

OPs inhibit acetylcholinesterase (AChE) in the synapses of the nervous system. This is the primary mechanism for the prominent toxicity effects associated with these compounds. Inhibition of the synaptic AChE enzyme is paralleled by inhibition of erythrocyte AChE and plasma cholinesterase. Monitoring the activity of the latter two enzymes can provide an indication of early signs of OP over-exposure. A reduction in cholinesterase activity correlates with clinical symptoms, though there is a wide safety margin between a detectable change in cholinesterase level and the development of significant symptoms.

The cholinesterase test is not as sensitive as the urinary metabolite test. While low plasma or erythrocyte activity indicates OP exposure, no firm conclusions can be made when normal levels of activity for these enzymes are observed.

Due to the considerable differences in baseline activities observed between individuals (potentially greater than 30 per cent difference), baseline activities should be obtained for each worker. Activities of erythrocyte AChE and plasma cholinesterase obtained during the exposure period are then compared with an individual's baseline activity level. The tests should be performed by the same laboratory and same method as that used to obtain the baseline activities.

If erythrocyte AChE activity is monitored, the following value should be used as a guide:

*Acetylcholinesterase activity in erythrocytes<sup>2</sup>:*

70 per cent of individual's baseline activity

Cholinergic health effects may be seen at lower AChE activities. Sampling should be performed as soon as possible after exposure or at the end of shift if this is also the end of the exposure period.

The kinetics of erythrocyte AChE and plasma cholinesterase inhibition differ depending on the OP and are different between the two enzymes. Thion OPs require activation to oxon OPs (oxidation of P=S groups to P=O groups) before inhibition of the cholinesterase enzymes can occur. Therefore, a delay in inhibition of erythrocyte AChE and plasma

<sup>1</sup> See [Chemical analysis branch handbook, 9th Edition, Workplace and biological monitoring exposure analysis, WorkCover NSW \(PDF 3.39MB\)](#) for more details

<sup>2</sup> American Conference of Governmental Industrial Hygienists (ACGIH) (2017) *Documentation of the Biological Exposure Indices for Chemical Agents, Acetylcholinesterase Inhibiting Pesticides, 7th Ed, Cincinnati.*



cholinesterase activity may be seen with O-phosphorothioate and phosphorodithioate OPs compared with the other classes of OPs.

Cholinesterase inhibition by OPs can be long lasting and can provide an indication of chronic exposure as well as high acute exposures. Following inhibition, a small set of both erythrocyte AChE and plasma cholinesterase undergo spontaneous reactivation, but the majority of the inhibited enzymes 'age' to inactive enzymes. For an aged enzyme, activity can only be restored by replacement with a new enzyme. The rates of reactivation and aging differ between each of the cholinesterase enzymes and the inhibiting OP. Aged plasma cholinesterase is replaced with a half-life of six to 12 days, while aged erythrocyte AChE is replaced with a half-life of approximately 30 days. This long inhibition needs to be considered when resampling to ascertain recovery of enzyme activity.

The frequency of ongoing monitoring should be determined based on an assessment of the type of work, pattern of exposure, the toxicity of the pesticide(s) being handled or used and work practices. Use patterns and potential incidents of exposure should be recorded. If a significant depression of erythrocyte or plasma cholinesterase activity is observed, the individual should be monitored for signs and symptoms of OP exposure, with particular attention to the nervous system.

Rural communities may have some difficulties with collection, transport and storage of blood samples. An arrangement or plan could be negotiated with a local hospital or authorised doctor, so that blood tests suitable for monitoring OP exposure are carried out at a particular seasonal time and then at an appropriate time of the day or week, for occasional or intermittent users. This arrangement would cover the majority of situations.

There is a small proportion of the population that has low plasma cholinesterase activity for genetic reasons. Also, some medical conditions can affect erythrocyte AChE or plasma cholinesterase activity. These factors should be considered when interpreting results.

Monitoring changes in cholinesterase activity is a non-specific means of assessing OP exposure. There are other pesticides, such as carbamates and pyrethroids, and non-pesticides, such as some drugs, that may also inhibit cholinesterase activity.

### **Workplace exposure standard**

Different OPs have different workplace exposure standards.

A physical examination may be indicated if the results of air monitoring indicate frequent or potentially high exposure (half of the eight hour time weighted average (TWA) or above).

### **Removal from work**

Where a medical examination indicates the worker is displaying symptoms of exposure to OPs or where results of biological monitoring indicate exposure that may cause adverse health effects, the registered medical practitioner should consider recommending the worker be removed from OP-related work.

When removal from OP-related work is indicated the registered medical practitioner must provide the PCBU with the following recommendations:

- the worker should be removed from work with OPs – the worker can be moved to another area or can use other classes of pesticides, except pyrethroids (such as permethrin) and carbamates, and
- the PCBU should review control measures and carry out recommended remedial action.

The worker must be informed of the results of health monitoring.

### **Return to work**

Should a worker be removed from OP-related work, they must not return until the registered medical practitioner has:

- assessed them as medically fit, and
- made a recommendation to the PCBU that the worker can return to remediated OP-related work.

This assessment should take into consideration the clinical condition of the worker, the worker's urinary dialkyl phosphate levels, erythrocyte or plasma cholinesterase activity and remediation of the circumstances that led to the symptoms if possible.

## **At termination of work in an organophosphate pesticide process**

### **3. Final medical examination**

A urine sample and a blood sample should be collected on the last day of the worker's final shift, and a final medical examination should be carried out at the same time or as soon as possible thereafter. Emphasis should be placed on the nervous system and any symptoms reported during the health monitoring program.

Workers with health conditions or continuing symptoms due to OP exposure should be advised to seek continuing medical examinations as organised by the registered medical practitioner supervising the health monitoring program.

A health monitoring report from the registered medical practitioner should be provided to the PCBU as soon as practicable after the completion of the monitoring program, and at regular intervals for longer term or ongoing health monitoring processes. The report must include:

- the name and date of birth of the worker
- the name and registration number of the registered medical practitioner
- the name and address of the PCBU who commissioned the health monitoring
- the date of the health monitoring
- any test results that indicate whether or not the worker has been exposed to a hazardous chemical
- any advice that test results indicate that the worker may have contracted an injury, illness or disease as a result of carrying out the work that triggered the requirement for health monitoring
- any recommendation that the PCBU take remedial measures, including whether the worker can continue to carry out the type of work that triggered the requirement for health monitoring, and
- whether medical counselling is required for the worker in relation to the work that triggered the requirement for health monitoring.

## **Potential health effects following exposure to organophosphate pesticides**

### **4. Route of occupational exposure**

For most OPs, the dermal route is the primary route of exposure in the workplace.

Inhalation of OPs depends on the volatility of the compound, on the type of formulation and on the technique of application, for example spraying.

Oral exposure may be observed in cases of accidental or deliberate ingestion.

Work-related accidental ingestion may occur as a result of poor work practices or lack of personal hygiene.

## 5. Target organ/effect

Organophosphorus compounds owe their toxic effects to the inhibition of AChE activity in nervous tissue.

AChE, under normal physiological conditions, performs the breakdown of acetylcholine; the chemical mediator responsible for physiological transmission of nerve impulses. In the presence of an OP, AChE is phosphorylated and no longer able to break down acetylcholine into choline and acetic acid. The resulting accumulation of acetylcholine in the parasympathetic nerve synapses (muscarinic-like action), the motor end-plate (nicotine-like action) and in the central nervous system is responsible for all typical symptoms occurring after acute poisoning with OP. The synapses initially become overstimulated, before becoming exhausted, with initial symptoms of over activity, and final symptoms of paralysis.

The target organs and potential effects of OP exposure include:

**Table 2** Target organs and potential effects of OP exposure

Target organ	Effect
<b>Central nervous system</b> (via inhibition of acetylcholine receptors)	<ul style="list-style-type: none"> <li>• Headache</li> <li>• Anxiety</li> <li>• Restlessness</li> <li>• Confusion</li> <li>• Slurred speech</li> <li>• Convulsions</li> <li>• Coma</li> <li>• Depression of the respiratory and circulatory centres</li> </ul>
<b>Peripheral nervous system</b> (via inhibition of muscarinic and nicotinic receptors)	<ul style="list-style-type: none"> <li>• Salivation</li> <li>• Lacrimation</li> <li>• Urination</li> <li>• Defaecation</li> <li>• Gastric cramps</li> <li>• Emesis</li> </ul>

## 6. Acute effects

Typical symptoms of acute exposure to OPs include excessive sweating, slurred speech and blurred vision.

The first symptoms of organophosphate poisoning can occur within minutes of exposure to a concentrate or a highly toxic OP. It is common for symptoms to occur an hour or so after inadvertent skin exposure to a working solution.

The symptoms of OP intoxication can be divided into muscarinic-like and nicotinic-like effects, as well as effects on the central nervous system.

**Table 3 Acute effects manifestations**

<b>Nervous tissue and receptors affected</b>	<b>Manifestations</b>
<b>Parasympathetic autonomic (muscarinic receptors) post ganglionic nerve fibres</b>	
Exocrine glands	<ul style="list-style-type: none"> <li>• Increased salivation</li> <li>• Lacrimation, and</li> <li>• Perspiration</li> </ul>
Eyes	<ul style="list-style-type: none"> <li>• Miosis (pinpoint and non-reactive) ptosis</li> <li>• Blurring of vision</li> <li>• Conjunctival injection, and</li> <li>• 'Bloody-tears'</li> </ul>
Gastrointestinal tract	<ul style="list-style-type: none"> <li>• Nausea</li> <li>• Vomiting</li> <li>• Abdominal tightness</li> <li>• Swelling and cramps</li> <li>• Diarrhoea</li> <li>• Tenesmus, and</li> <li>• Faecal incontinence</li> </ul>
Respiratory tract	<ul style="list-style-type: none"> <li>• Excessive bronchial secretions</li> <li>• Rhinorrhoea</li> <li>• Wheezing</li> <li>• Oedema</li> <li>• Tightness in chest</li> <li>• Bronchospasms</li> <li>• Bronchoconstriction</li> <li>• Cough</li> <li>• Bradypnoea, and</li> <li>• Dyspnoea</li> </ul>
Cardiovascular system	<ul style="list-style-type: none"> <li>• Bradycardia, and</li> <li>• Decrease in blood pressure</li> </ul>
Bladder	<ul style="list-style-type: none"> <li>• Urinary frequency, and</li> <li>• Incontinence</li> </ul>
<b>Parasympathetic and sympathetic autonomic fibres (nicotinic receptors)</b>	
Cardiovascular system	<ul style="list-style-type: none"> <li>• Tachycardia</li> <li>• Pallor</li> <li>• Increase in blood pressure, and</li> </ul>

Nervous tissue and receptors affected	Manifestations
<b>Somatic motor nerve fibres (nicotinic receptors)</b>	
Skeletal muscles	<ul style="list-style-type: none"> <li>• Muscle fasciculations (eyelids, fine facial muscles)</li> <li>• Cramps,</li> <li>• Restlessness</li> <li>• Generalised motor activity</li> <li>• Reaction to acoustic stimuli</li> <li>• Tremulousness</li> <li>• Diminished tendon reflexes</li> <li>• Generalised muscle weakness in peripheral and respiratory muscles</li> <li>• Paralysis</li> <li>• Flaccid or rigid tone</li> <li>• Emotional lability, and</li> <li>• Ataxia</li> </ul>
<b>Brain (acetylcholine receptors)</b>	
Central nervous system	<ul style="list-style-type: none"> <li>• Drowsiness</li> <li>• Lethargy</li> <li>• Fatigue</li> <li>• Mental confusion</li> <li>• Inability to concentrate</li> <li>• Headache</li> <li>• Pressure in head</li> <li>• Generalised weakness</li> <li>• Coma with absence of reflexes</li> <li>• Tremors</li> <li>• Cheyne-Stokes respiration</li> <li>• Dyspnoea</li> <li>• Convulsions</li> <li>• Depression of respiratory centres, and</li> <li>• Cyanosis</li> </ul>

Local effects at the site of exposure may occur without symptoms of systemic absorption:

- a splash in the eye may cause blurred vision due to spasm
- inhalation may cause bronchoconstriction and produce an excess of respiratory tract secretions resulting in feelings of chest tightness and a watery nasal discharge, and
- splashes on the skin may cause localised sweating and fasciculations.

For O-phosphorothioate and phosphorodithioates, symptoms usually reach their maximum severity 24 to 48 hours after onset and usually regress over the next one to six days. The onset of symptoms is much quicker for the remaining classes of OPs.

In the case of massive exposure, death usually occurs within 24 hours.

Another short term effect of organophosphates is the 'intermediate syndrome'. This is characterised by transient muscle weakness of the limbs, neck and respiratory muscles, that begins one to four days after a poisoning incident and may continue for up to several weeks.

Delayed polyneuropathy can occur from inhibition of another nervous tissue esterase called neuropathy target esterase. The interval between acute exposure and the onset of neuropathy may be up to four weeks. Initial symptoms are often sensory and consist of tingling and burning sensations in the hands and feet followed by weakness in the lower limbs and ataxia. In severe cases the upper limbs may be affected. There is no specific treatment for this disorder though physiotherapy may limit the muscle wasting that follows denervation.

## 7. Chronic effects

Symptoms of chronic poisoning usually do not occur until enzyme activity has been reduced to between 60 to 25 per cent of an individual's baseline.

Chronic low level exposures may lead to cumulative effects. Thus, workers continually exposed may be at high risk even at low level exposures.

Chronic exposure to OPs may cause:

- persistent anorexia
- weakness
- ophthalmological effects
- malaise, or
- certain neurobehavioural effects.

Many OPs cause primary irritant dermatitis; only a few, for example parathion and malathion, are known to cause allergic contact dermatitis.

## 8. Carcinogenicity

Most OPs have not been classified as carcinogenic according to the Globally Harmonized System of Classification and Labelling of Chemicals (GHS). For further information on specific OPs, refer to Safe Work Australia's Hazardous Chemical Information system or the relevant safety data sheet.

## 9. GHS classifications

Different OPs may have different health hazard classifications. The specific OP that a worker is exposed to will need to be reviewed to ensure appropriate identification of the health hazards. For the GHS classification of a specific OP, refer to Safe Work Australia's Hazardous Chemical Information System or the relevant safety data sheet for detailed information.

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# Health monitoring report

*Organophosphate pesticides*



This form contains confidential information and must not be disclosed to another person except in accordance with the Work Health and Safety Regulations or with consent of the worker

## Health monitoring report – Organophosphate pesticides

**This health monitoring report is a confidential health record and must not be disclosed to another person except in accordance with the Work Health and Safety Regulations or with the consent of the worker.**

There are two sections. Complete both sections and all questions as applicable.

**Section 1** A copy of this section should be forwarded to the person conducting the business or undertaking (PCBU) who has engaged your services.

**Section 2** may contain confidential health information. Information that is required to be given to the PCBU should be summarised in Section 1.

### Section 1 – A copy of this section to be provided to the PCBU

#### Person conducting a business or undertaking

**Company/organisation name:** Click here to enter text.

**Site address:** Click here to enter text.

**Suburb:** Click here to enter text.

**Postcode:** Click here to enter text.

**Site Tel:** Click here to enter text.

**Site Fax:** Click here to enter text.

**Contact Name:** Click here to enter text.

**Other businesses or undertakings engaging the worker**  
(include a separate section for each PCBU)

N/A

**Company/organisation name:** Click here to enter text.

**Site address:** Click here to enter text.

**Suburb:** Click here to enter text.

**Postcode:** Click here to enter text.

**Site Tel:** Click here to enter text.

**Site Fax:** Click here to enter text.

**Contact Name:** Click here to enter text.

#### Worker details (tick all relevant boxes)

**Surname:** Click here to enter text.

**Given names:** Click here to enter text.

**Date of birth:** Click here to enter a date.

**Sex:**  Male  Female

**Address:** Click here to enter text.

**Suburb:** Click here to enter text.

**Postcode:** Click here to enter text.

**Current job:** Click here to enter text.

**Tel (H):** Click here to enter text.

**Mob:** Click here to enter text.

**Date started employment:** Click here to enter a date.

This form contains confidential information and must not be disclosed to another person except in accordance with the Work Health and Safety Regulations or with consent of the worker

**Employment in organophosphate pesticides risk work** (tick all relevant boxes)  
(information provided by the PCBU)

Type of organophosphate pesticide used (if known; please specify): [Click here to enter text.](#)

- New to organophosphate pesticides work
- New worker but not new to organophosphate pesticides work
- Current worker continuing in organophosphate pesticides work

**Worked with organophosphate pesticides since:** [Click here to enter a date.](#)

**Type of organophosphate pesticide(s) used:** [Click here to enter text.](#)

**When last used:** [Click here to enter text.](#)

**Risk assessment completed:**  Yes  No

**Pattern of exposure**

- Frequent (daily; 5 or more days in a work week)
- Regular (2-3 days in a work week)
- Occasional (2-3 days in a work month)
- Infrequent (1 day or less in a work month)
- Seasonal (several days a week for a season)

**Duration of exposure**

- Long – 6 or more hours in a day
- Short – 1-5 hours in a day
- Brief – less than 1 hour a day
- Minimal – describe: [Click here to enter text.](#)

**Work environment assessment** (tick all relevant boxes)  
(information provided by the PCBU)

**Date of assessment:** [Click here to enter a date.](#)

**Organophosphate pesticide industry/use**

- |   |  |
|---|--|
| <input type="checkbox"/> Pest control                       | <input type="checkbox"/> Manufacture and packaging |
| <input type="checkbox"/> Transport, storage or distribution | <input type="checkbox"/> Agricultural industry     |
| <input type="checkbox"/> Aerial crop spraying               | <input type="checkbox"/> Horticultural industry    |
| <input type="checkbox"/> Veterinary work                    | <input type="checkbox"/> Farming                   |
| <input type="checkbox"/> Seasonal field work                | <input type="checkbox"/> Laboratory work           |
| <input type="checkbox"/> Other (specify):                   |  |

**Other chemicals the worker may be exposed to:** [Click here to enter text.](#)

**Controls**

Wear gloves  Yes  No

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**Controls**

Safety goggles/face shield	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Respirator use	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Respirator type text.	Click here to enter text.	
Local exhaust ventilation	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Overalls/work clothing	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Laundering by employer	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Wash basins and showers (with hot and cold water)	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Other please specify		

**Health monitoring results**

**Biological monitoring results**

Include/attach test results that indicate whether or not the worker has been exposed

**Urine Alkyl Phosphate Metabolites test (urinary dialkyl phosphate)**

Test date	DAP (µmol/mol creatinine)	Timing	Comment
Click here to enter a date.	Click here to enter text.	<input type="checkbox"/> Pre-shift <input type="checkbox"/> Post-shift <input type="checkbox"/> Next day	Click here to enter text.
Click here to enter a date.	Click here to enter text.	<input type="checkbox"/> Pre-shift <input type="checkbox"/> Post-shift <input type="checkbox"/> Next day	Click here to enter text.
Click here to enter a date.	Click here to enter text.	<input type="checkbox"/> Pre-shift <input type="checkbox"/> Post-shift <input type="checkbox"/> Next day	Click here to enter text.

**Note:**

- less than 100 µmol/mol creatinine – considered low work exposure.
- 100-1000 µmol/mol creatinine – indicates work exposure – review workplace controls to reduce exposure levels.
- greater than 1000 µmol/mol creatinine – indicates high work exposure; may be associated with a fall in blood cholinesterase levels.

**Comments about health monitoring results (for example any early indications or diagnosis of injury, illness or disease):** Click here to enter text.

**Recommendations (by registered medical practitioner) (tick all relevant boxes)**

**Further/additional health monitoring for worker**

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- This is the final health monitoring report
- Repeat health assessment in [Click here to enter text.](#) month(s) / [Click here to enter text.](#) week(s)
- Counselling required
- Medical examination by registered medical practitioner. On [Click here to enter a date.](#)
- Referred to Medical Specialist (respiratory/dermatology/other). On [Click here to enter a date.](#)

**Recommendations to PCBU**

- The worker is suitable for work with organophosphate pesticides
- Review workplace controls
- The worker should be removed from work with organophosphate pesticides. On [Click here to enter a date.](#)
- The worker is fit to resume work. On [Click here to enter a date.](#)
- Biological monitoring results indicate unacceptably high exposure levels

**Specialist's name:** [Click here to enter text.](#)

**Additional comments or recommendations:** [Click here to enter text.](#)

**Registered medical practitioner (responsible for supervising health monitoring)**

**Name:** [Click here to enter text.](#)

**Signature:**

---

**Date:** [Click here to enter a date.](#)

**Tel:** [Click here to enter text.](#)

**Fax:** [Click here to enter text.](#)

**Registration Number:** [Click here to enter text.](#)

**Medical Practice:** [Click here to enter text.](#)

**Address:** [Click here to enter text.](#)

**Suburb:** [Click here to enter text.](#)

**Postcode:** [Click here to enter text.](#)

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## Section 2 – This section to be retained by the registered medical practitioner

### Person conducting a business or undertaking

**Company/organisation name:** Click here to enter text.

**Site address:** Click here to enter text.

**Suburb:** Click here to enter text.

**Postcode:** Click here to enter text.

**Site Tel:** Click here to enter text.

**Site Fax:** Click here to enter text.

**Contact Name:** Click here to enter text.

### Other businesses or undertakings engaging the worker

N/A

**Company/organisation name:** Click here to enter text.

**Site address:** Click here to enter text.

**Suburb:** Click here to enter text.

**Postcode:** Click here to enter text.

**Site Tel:** Click here to enter text.

**Site Fax:** Click here to enter text.

**Contact Name:** Click here to enter text.

### Worker details (tick all relevant boxes)

**Surname:** Click here to enter text.

**Given names:** Click here to enter text.

**Date of birth:** Click here to enter a date.

**Sex:**  Male  Female  Pregnant/breastfeeding

**Address:** Click here to enter text.

**Suburb:** Click here to enter text.

**Postcode:** Click here to enter text.

**Current job:** Click here to enter text.

**Tel (H):** Click here to enter text.

**Mob:** Click here to enter text.

**Date started employment:** Click here to enter a date.

**Type of organophosphate pesticide used (if known; please specify):** Click here to enter text.

### Past employment and exposure details (tick all relevant boxes)

#### Have you ever worked in any of the following jobs?

If you answered 'yes' to any of the questions, please advise if you experienced any symptoms such as cough or wheeze or asthma when working.

			Comments (all 'yes' answers)
Pest control or fumigation	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.
Manufacture or packaging of OP products	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.
Transport, storage or distribution of OP products	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.

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			Comments (all 'yes' answers)
Agriculture	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.
Horticulture	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.
Farming	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.
Aerial crop spraying	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.
Veterinary work	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.
Seasonal field work	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.
Laboratory work	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.
Other (please specify)	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.

### General health questionnaire (tick all relevant boxes)

			Comments (all 'yes' answers)
Did you suffer any incapacity lasting two weeks or longer in the last two years	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.
Have you ever had any operations or accidents or been hospitalised for any reason	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.
Are you currently being treated by a doctor or other health professional for any illness or injury	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.
Are you currently receiving any medical treatment or taking any medications. Please detail.	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.
Do you practice personal hygiene at work, for example nail biting, frequency of hand washing, eating or smoking, clean shaven, shower and change into clean clothes at end of shift	<input type="checkbox"/> No	<input type="checkbox"/> Yes	

### Specific health questions (tick all relevant boxes)

Do you have or have you ever had:			Comments (all 'yes' answers)
Blurred vision or other vision problems	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.
Itchy eyes, runny or congested nose	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.
Loss of hearing or ringing in the ears	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.
Chest pains or irregular heartbeats	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.

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<b>Do you have or have you ever had:</b>			<b>Comments (all 'yes' answers)</b>
High blood pressure or heart disease (including heart attack, heart surgery, murmurs, angina)	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.
Shortness of breath on exertion	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.
Wheezing, bronchitis or asthma now or in the past	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.
Allergies, hay fever, or allergic bronchitis	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.
Severe head or spinal injury resulting in hospitalisation	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.
Severe headaches or migraines	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.
Chronic fatigue or tiredness	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.
Significant weight loss	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.
Any neurological condition affecting nerves in your feet or hands, your coordination or balance	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.
Skin disorders or dermatitis	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.
Any previous symptoms associated with organophosphate pesticides	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.
Any other significant health conditions	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.

**Medications currently taken that may affect blood test results:**

			<b>Comments (all 'yes' answers)</b>
Oral contraceptive pill	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.
Lithium	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.
Prednisone/cortisone	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.
Propranolol	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.

**General health assessment (if applicable)**

**Height:** Click here to enter text. cm

**Weight:** Click here to enter text. kg

**BP:** Click here to enter text. / Click here to enter text. mmHg

**Urinalysis**

**Blood:**  Normal  Abnormal

**Protein:** Click here to enter text.

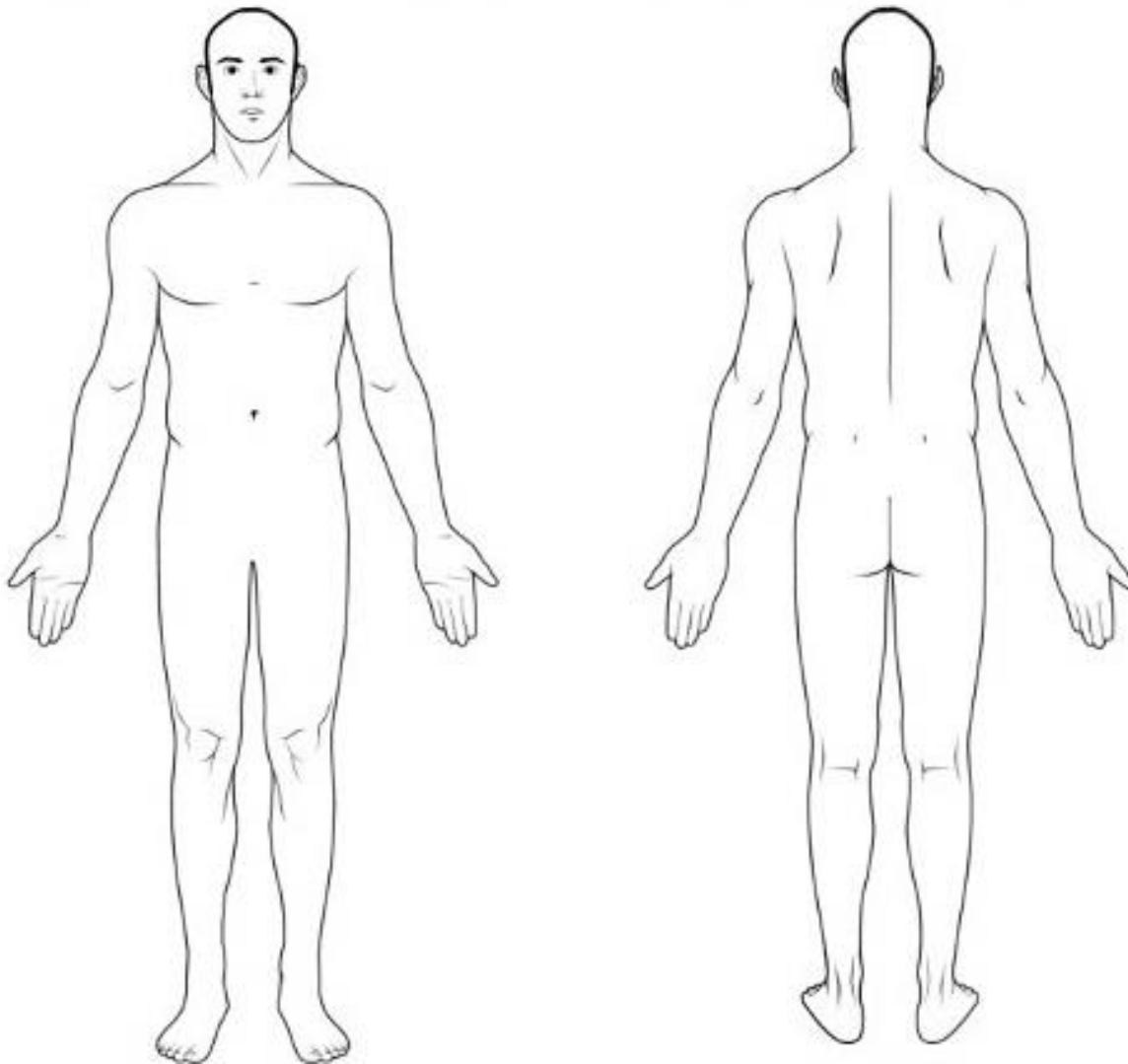
**Referred for further testing**

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**Sugar:** Click here to enter text.

No  Yes

<b>Cardiovascular system</b>			<b>Medical comments</b> (for all yes/abnormal)
Blood pressure	<input type="checkbox"/> Normal	<input type="checkbox"/> Abnormal	Click here to enter text.
Heart rate	<input type="checkbox"/> Normal	<input type="checkbox"/> Abnormal	Click here to enter text.
Heart sounds	<input type="checkbox"/> Normal	<input type="checkbox"/> Abnormal	Click here to enter text.
Murmurs present	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.
Evidence of cardiac failure/oedema	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.
<b>Skin</b>			
Eczema, dermatitis or allergy	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.
Skin cancer or other abnormality	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.
Evidence of nail biting	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.
Other	<input type="checkbox"/> No	<input type="checkbox"/> Yes	Click here to enter text.



**Figure 1** Template of the human body to indicate the location of abnormalities



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### Biological monitoring results

Include/attach at least the previous two test results (if available)

Date	Tests performed	Recommended action or comment
Click here to enter a date.	Click here to enter text.	Click here to enter text.
Click here to enter a date.	Click here to enter text.	Click here to enter text.
Click here to enter a date.	Click here to enter text.	Click here to enter text.
Click here to enter a date.	Click here to enter text.	Click here to enter text.

### Other medical history, family medical history, current medication, comments, tests or recommendations (use separate sheet if necessary)

Click here to enter text.

### Registered medical practitioner (responsible for supervising health monitoring)

**Name:** Click here to enter text.

**Signature:**

**Date:** Click here to enter a date.

**Tel:** Click here to enter text.

**Fax:** Click here to enter text.

**Registration Number:** Click here to enter text.

**Medical Practice:** Click here to enter text.

**Address:** Click here to enter text.

**Suburb:** Click here to enter text.

**Postcode:** Click here to enter text.