

## ***Safety awareness***

Farm safety issues can be divided into:

- chemical usage on farm
- hygiene issues related to the handling of grain and other commodities
- and safety in the use of farm machinery and equipment.

This CD only addresses safety in chemical usage and hygiene. Safety in relation to farm machinery and silos is covered in:

- *Storing Handling and Drying Grain* by Alan Andrews, published by the Department of Primary Industry in Queensland, and
- Agricultural Health and Safety Notes published by the Australian Agricultural Health Unit (see below).

## ***Sources of information***

### **Farm Chemical Users Course**

The main source of information is the Farm Chemical Users Course which has been attended by thousands of farmers. In some states satisfactory completion of this course is an essential requirement for the purchase and use of Schedule 7 Agrochemicals. In Victoria the Courses are run by the University of Melbourne, many TAFE institutions and private providers. For information about this course contact the Farmcare Secretariat [□](#).

### **Agsafe**

Agsafe  
PO Box 816, Canberra ACT 2601  
ph 02 6230 4799  
fax 02 6230 6710

Agsafe provides accredited training for the storage, handling and supply of agricultural chemicals. The training is mainly directed towards the retail sale of agricultural chemicals. Agsafe also offers the following publications:

*Chemicals Manual* \$24  
*Principles of Pest Management* \$40

### **Australian Agricultural Health Unit**

The Australian Agricultural Health Unit  
PO 256, Moree NSW 2400  
ph 02 6752 8210

fax 02 6752 6639

This unit has issued the Agricultural Health and Safety Notes as part of a two day course on Managing Grain Production Safety. The notes help farmers to:

- understand their responsibilities for occupational health and safety management
- identify the hazards to health and safety
- and define the risk associated with each hazard.

The Health and Safety Notes include information on farm chemicals and organic dusts, and are supplied as part of the two day course.

Click here [□](#) for information about the two courses.

## **Various short courses**

[□](#) Click here.

## **Information on further courses**

Click here [□](#) for information about other courses throughout Australia.

## ***Chemical safety in grain storage***

Information in this CD-ROM about the use of particular chemicals is necessarily less detailed than information from suppliers. Knowledge of the effects of using chemicals is also constantly evolving. Before using any chemicals, you should always read carefully and follow all safety instructions provided by suppliers.

<a href="#">□</a>	<b>Use of fumigants</b>
<a href="#">□</a>	<b>Use of grain protectants</b>

## **What is the situation with regard to fumigant gases?**

There are currently only two fumigant gases registered for use on farms—phosphine and carbon disulphide. Carbon disulphide is only registered for use in New South Wales but its use is sometimes encountered in Victoria.

### ***Phosphine***

The two main health issues relating to phosphine are spontaneous flammability and acute toxicity.

Phosphine is spontaneously flammable (explodes without external ignition) when the concentration reaches 1.8% or 18000 ppm v/v. (The concentration applied to kill insects is about 1000 ppm or less.) When opening a flask of aluminium phosphide, always point it away from you, as there may be a flash because some phosphine has built up in the flask since it was closed. The gas from exposed aluminium phosphide must never be confined—not even in a plastic bag. The whole opened formulation must be used *immediately* and *as directed on the label*. Only resealable flasks of pellets may be closed after use.

The working concentration of 1000 ppm is *dangerous to life* and phosphine must not be used in any manner which may allow exposure to this concentration. A level of 7 ppm is dangerous in a few hours. Current research suggests that there may be no long term health hazards from exposure to very low concentrations (less than 0.3 ppm) in the course of using this product. The TLV (threshold limit value for continuous exposure in the workplace) is 0.3 ppm, though there are pressures to reduce this to 0.03 ppm. In Victoria the EPA has set a background level—50 metres or more from the silo—at 0.004 ppm (Meaklim 1998).

Note that 2% phosphine in cylinders (ECO2FUME) cannot explode, but can be lethal. A face mask with the correct filter must be worn when cylinders are being handled or connected into a fumigation system. There are now small meters which can be used as personal monitors. These give visual and auditory signals when the phosphine concentration exceeds the TLV. It should become standard practice to use one of these monitors when handling cylinders, or in any situation where phosphine gas is being circulated. The meters cost about \$1500 but should be an essential item of fumigation equipment.

### ***Disposal of aluminium phosphide residues***

It is not acceptable to mix aluminium phosphide formulations into grain, either as tablets, pellets, bags or blankets, as the residues are a long term hazard for grain handlers and consumers.

Tablet formulations must be set out on trays; bags and blankets must be suspended above the grain. The formulations should be buried in waste ground then soaked generously with water, before covering with soil.

The method of checking air to show that there is no harmful concentration of phosphine has been described.

### ***Carbon disulphide***

Carbon disulphide is a highly flammable volatile liquid. It is a liver toxin and may cause cancer. It has been removed from the international (Codex) list of fumigants with permitted residue limits. Its use requires full safety protection, that is, long plastic or rubber gloves, an apron, plastic or rubber boots, and a protective face mask. Carbon disulphide should not be used on grain which is about to be transported, as this use exposes the transporters and receivers to serious health hazards.

## **What is the situation with regard to grain protectants?**

The toxicity of grain protectant insecticides is generally similar to, but less than, the toxicity of other insecticides used pre-harvest. Acute toxicity is the toxicity of exposure to the insecticide concentrate by spillage, breathing or swallowing. The measure of acute toxicity is called the LD50—the lethal dose which will kill half of the exposed animals. The LD50 is measured on rats or other test animals but is taken to indicate the danger to humans. The oral (taken by mouth) LD50 is different from the dermal (taken through the skin) LD50.

A table listing the acute oral toxicities to rats is given in the section on grain protectants ([□](#)). It provides a comparison of the acute toxicities of the grain protectants.

Grain protectants have been formulated to have slightly lower toxicity than closely related field sprays. This is because the persistence of the residue leads to more contact for handlers and greater consumption of these compounds on food. Nevertheless, operators should be fully protected, especially by wearing long plastic or rubber gloves, an apron, plastic or rubber boots and a protective face mask. Pesticides enter the body by absorption through the skin, by breathing fumes and dust, and by swallowing.

Although there is a great deal of concern about residues in food, it is the spray operator who is most at risk from exposure to pesticide. The spray operator's risk of acute or chronic exposure is quite high. By comparison, the consumer's risk from residues in food is slight.

### ***Repeated exposure***

Farmers should avoid repeated exposure over a short period. The risk of low level exposure increases when there is only a short recovery period.

### ***Adequate ventilation***

When using a grain protectant, always try to carry out all mixing and spraying operations in well ventilated areas.

### ***Regular health checks***

Exposure to the organophosphates, fenitrothion, chlorpyrifos methyl, pirimiphos methyl, dichlorvos and alfacron can be tested by measuring blood plasma cholinesterase in a fairly simple test. However, a measurable reduction in cholinesterase activity is unlikely to be seen unless there has been serious exposure. This test is useful for workers who regularly have to apply organophosphate insecticides, as it will show whether there is any steady fall in cholinesterase activity.

### ***Danger of using dichlorvos***

Dichlorvos is a very toxic compound which the United States classes as a suspected cancer-causing agent. Its high volatility makes it especially dangerous to breathe in, making facial protection essential. Dichlorvos is still in use in the

industry because its high activity and short residual life make it useful for urgent disinfestation. As a long-term protectant, however, it has little value.

## Keeping a record of chemicals used

A record of farm chemicals used is an absolutely essential part of the Hazard Management Program. A good record will also enable buyers to be confident of the pest control history of the commodity. (Click [here](#) to see a typical format for keeping these records—(□)). Safety procedures for storage, mixing, spraying and disposal of agrochemicals are given in the Australian Agricultural Health Unit Safety Note no.13, *Farm Chemicals* and in the Chemical Users Course.

## Human hygiene safety issues in grain storage

<a href="#">□</a>	Grain dusts
<a href="#">□</a>	Fungal contamination
<a href="#">□</a>	Oxygen or CO2 deficiency (modified atmosphere hazard)

## Dust hazard

### **Respiratory exposure**

Exposure to agricultural dusts may cause both short term and long term breathing system problems. This hazard may occur whenever grain is moved. The risks are fully described in *Organic Farm Dusts*, Australian Agricultural Health Unit Safety Note no.12. Dust hazards may be minimised by improved design, dust collection or ventilation. Protection is provided by suitable disposable dust masks, or respirators with replaceable cartridges. See Updates for suppliers.

### **Dust explosions**

A dust explosion is the rapid burning of a cloud or suspension of dust in air. The minimum explosive concentration for grain dusts is in the range of 20 to 50 g/m<sup>3</sup>. This occurs when an enclosed dusty atmosphere is ignited by a flame or other ignition source. Sources of ignition to avoid include hot surfaces, naked flames, welding equipment, faulty electric motors and switchgear and sparks from impact friction. Bulk Handlers have strict Hot Work Permit protocols and the same care is needed on-farm.

Industry experiments showed that spraying grain with mineral or vegetable oil at about 200 mg/kg reduced the dust created in moving grain. It was decided, however, not to allow grain to be treated in this way. Spraying with water can reduce dust but the effect is very shortlived and the water added must not noticeably increase the moisture content.

## Fungal contamination

Grain which has become weather damaged in the field or water damaged in store will carry a fungal infection. In store, this will probably include various *Aspergillus* and *Penicillium* species, some of which produce dangerous toxins such as aflatoxin. Respiratory protection is absolutely essential (a facemask with a P3 high capacity particle filter, see Updates).

**Typical half face mask**

**Typical full face mask**



Source: Protector® Technologies Group Respiratory Protection brochures. Used by permission. [www.protectornet.com](http://www.protectornet.com)

Australian wheat and oilseeds often carry a heavy infection of *Alternaria* species at harvest. This is often associated with grey weather damage or black-point. The *Alternaria* species may be less toxic than the *Aspergillus* and *Penicillium* species, although they are being increasingly linked to asthma and similar allergic ailments. This is especially important in the southern grain belt. We recommend farmers wear dust masks when entering a grain store.

## Modified atmosphere hazards

In normal storage in sealed silos there may be a build-up of carbon dioxide and a reduction in oxygen due to natural grain respiration. This occurs because the grains are still living seeds, taking up oxygen and giving off carbon dioxide. This process increases greatly if the grain is damp or infested.

When using inert (inactive) atmosphere with a high concentration of carbon dioxide as the means of pest control (generally to satisfy the requirement for organic grain), there will be strong attachment of carbon dioxide on to the commodity. The subsequent slow release of this gas is a potential hazard near this grain.

Carbon monoxide can be measured by some of the phosphine gas meters (eg Bedfont EC80) and there are meters for measuring carbon dioxide. The main point, however, is to be aware of the hazard, and to fully ventilate areas of exposure using temporary fans if necessary.

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## Endnote



You've now reached the end of this section. Before you explore another part of this program, you might like to reflect on your present occupational health and safety record, or, if you are considering a change in your operation, what your future OH&S needs might be. Perhaps you could visit the Workshop and try a quiz—[□](#). An excellent way of taking these issues seriously would be to register for the two day Managing Grain Production Safety Program.

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