



**Australian Pesticides &  
Veterinary Medicines Authority**

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# **The Reconsideration of Registrations of Products Containing Carbon Disulfide and their Associated Labels**

FINAL REVIEW REPORT AND REGULATORY DECISION

REVIEW SERIES 3

October 2005

**Australian Pesticides &  
Veterinary Medicines Authority**

**Canberra  
Australia**

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## FOREWORD

The APVMA is an independent statutory authority with responsibility for the regulation of agricultural and veterinary chemicals in Australia. Its statutory powers are provided in the Agvet Code scheduled to the *Agricultural and Veterinary Chemicals Code Act, 1994*.

The APVMA can reconsider the approval of an active constituent, the registration of a chemical product or the approval of a label for a container for a chemical product at any time. This is outlined in Part 2, Division 4 of the Agvet Code.

The basis for the reconsideration is whether the APVMA is satisfied that continued registration of products containing carbon disulfide in accordance with the instructions for their use:

- would not be likely to have an effect that is harmful to human beings; and/or
- would not be an undue hazard to the safety of people exposed to it during its handling.

The requirements for continued approval of a label for containers for a chemical product are that the label contains adequate instructions. Such instructions include:

- the circumstances in which the product should be used;
- how the product should be used;
- times when the product should be used;
- frequency of the use of the product;
- the withholding period after the use of the product;
- disposal of the product and its container; and
- safe handling of the product.

A reconsideration may be initiated when new research or evidence has raised concerns about the use or safety of a particular chemical, a product or its label.

The process for reconsideration includes a call for information from a variety of sources, a review of that information and, following public consultation, a decision about the future use of the chemical or product.

In undertaking reviews, the APVMA works in close cooperation with advisory agencies including the Office of Chemical Safety (OCS – public health and OCS-OHS), the Department of the Environment and Heritage (DEH), and State Departments of Agriculture as well as other expert advisors, as appropriate.

The APVMA has a policy of encouraging openness and transparency in its activities and community involvement in decision-making. The publication of review reports is a part of that process.

The APVMA also makes these reports available to the regulatory agencies of other countries as part of bilateral agreements. Under this program it is proposed that countries receiving these reports will not utilise them for registration purposes unless they are also provided with the raw data from the relevant applicant.

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This document relates to all products containing carbon disulfide that have been nominated for review by the APVMA. The final regulatory decision is based on information collected from a variety of sources. The information and technical data required by the APVMA to review the safety of both new and existing chemical products must be derived according to accepted scientific principles, as must the methods of assessment undertaken.

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## ACRONYMS AND ABBREVIATIONS

ADI	Acceptable Daily Intake
APVMA	Australian Pesticide and Veterinary Medicine Authority
ARfD	Acute Reference Dose
bw	Body weight
cm	Centimetre
CS <sub>2</sub>	Carbon disulfide
EC	Emulsifiable concentrate
FAISD	First Aid and Safety Directions
h	Hour
kg	Kilogram
L	Litre
LC <sub>50</sub>	Concentration of chemical that kills 50% of the test population of organisms.
LD <sub>50</sub>	Dosage of chemical that kills 50% of the test population of organisms.
mg	Milligram
min	Minute
mL	Millilitre
MOE	Margin of exposure
MSDS	Material Safety Data Sheet
NOEL	No Observable Effect Level
NOHSC	National Occupational Health and Safety Commission
OCS	Office of Chemical Safety
OECD	Organisation for Economic Cooperation and Development
OHS	Occupational Health and Safety
PPE	Personal protective equipment
SUSDP	Standard for the Uniform Scheduling of Drugs and Poisons
TWA	Time weighted average
µg	Microgram

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## **EXECUTIVE SUMMARY**

### **Introduction**

This review reconsidered the registration and labels of the only two products containing carbon disulfide (CS<sub>2</sub>) registered for use in Australia. They are Ajax Carbon Disulphide Grain Fumigant Ready-To-Use Liquid (41185), (the grain fumigant) and C.S.S.P. Phosphorus Pig Poison (41130), (the pig poison).

Prior to the commencement of this review (December 2002) the registration of the grain fumigant and associated product labels were suspended and new use instructions issued to allow the continued supply and use of the product whilst the review was being conducted.

In September 2004 a draft review report was released for public comment. All comments received were considered with some changes being made to the recommended instructions to appear on labels.

In December 2004 the APVMA, at the request of the registrant, cancelled the registration of the grain fumigant. The review is now concluded for the grain fumigant with this report only dealing with the findings for the review of the pig poison.

The pig poison contains CS<sub>2</sub> and phosphorus as the active constituents. It is registered for the control of feral pigs in Queensland and the Northern Territory and authorised for use in NSW under permit. The product is used by placing within a bait carcass.

The product registration and label approvals for the CS<sub>2</sub> pig poison were put under review because of concerns relating to toxicology, worker safety, and the adequacy of instructions and warnings on product labels.

### **Occupational Health and Safety Assessment**

Dermal exposure is the most likely route of exposure for the pig poison. However exposure data for workers using CS<sub>2</sub> for animal baiting were not available. The database on occupational exposure to CS<sub>2</sub> relates only to its use in rayon fibre production.

On this basis a qualitative evaluation of the acute risks was undertaken. The assessment concluded that the continued registration of CSSP Pig Poison is unlikely to result in risks to workers, subject to label changes being made.

### **Toxicological Assessment**

No product toxicity data were submitted for the pig poison. Consequently, the toxicity was estimated by extrapolation from the toxicity of the individual active constituents in the product. From a toxicological viewpoint, the continued use of the pig poison in accordance with revised label instructions as detailed below, would not pose an undue hazard to human health.

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No changes are recommended to the existing Poisons Schedule for CS<sub>2</sub> (schedule 6) or phosphorus (yellow)(S7).

As there are currently no safety directions in the Handbook of First Aid Instructions and Safety Directions (FAISD) for the pig poison, new directions have been recommended.

There will be no human dietary exposure to carbon disulfide from use of this product. As a result no Acute Reference Dose (ArfD) or Acceptable Daily Intake (ADI) have been established.

### **Public Submissions**

In response to the release of the draft review report in September 2004, comments were received in relation to the adequacy of label instructions, product safety, non-target animal effects, product efficacy, alternatives and animal welfare concerns. On the basis of these comments, changes have been made to the recommendations presented in the draft report.

The scope of the review did not cover the issues of non-target animal effects, product efficacy or animal humaneness. However should further information be provided, the APVMA will conduct investigate whether a review of these aspects of the carbon disulfide pig poison should be initiated. It should be noted that animal humaneness is not a specific criterion in the Agvet Codes.

### **Summary of review outcomes**

The recommendations of the review are that:

- label approvals be varied to strengthen use information, safety instructions and improve personal protection requirements; and
- the continued registration of C.S.S.P. Phosphorus Pig Poison (41130) be affirmed.

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## **1. INTRODUCTION**

The APVMA has reviewed the registration of products containing carbon disulfide (CS<sub>2</sub>) and the associated label approvals. This document provides information on the assessment process, the detailed assessment information and the regulatory decisions reached, as a result of the review of CS<sub>2</sub>.

### **1.1 Regulatory status of carbon disulfide in Australia**

At the commencement of the review, CS<sub>2</sub> was contained in two products registered for use in Australia. There was a grain fumigant, Ajax Carbon Disulfide Grain Fumigant Read-to-Use Liquid (41185), and a pig poison C.S.S.P. Phosphorus Pig Poison (41130). The history of both products predates the APVMA, and both were transitioned from the State registration system.

#### **Grain fumigant**

In December 2002 the APVMA suspended the registration and approvals of the grain fumigant as it was not satisfied that the continued use of this product in accordance with the instructions on the label would not be an undue hazard to the safety of people involved in its use or handling. The continued supply and use of this product was authorised by the APVMA provided that it was only used in accordance with new and comprehensive instructions issued by the APVMA. The primary reason for this action was the potential for the product to explode during use. Existing labels contained no information on ways to eliminate this hazard.

Submissions received during the public comment period raised new issues in relation to the grain fumigant. Specifically the potential for trade implications from continued use due to a lack of MRLs for carbon disulfide, concern that label warnings alone may not protect workers from the explosive hazards of the product and product users may require specific training before being allowed to use the product.

In December 2004 the APVMA, at the request of the registrant, cancelled the registration and label approvals of the grain fumigant. As there is no longer a grain fumigant product, from this point forward the review report will only discuss the assessment and findings for the pig poison.

#### **Pig poison**

The pig poison is an emulsion and contains 50.6 g/kg CS<sub>2</sub> and 40 g/kg phosphorus as the active constituents. It is used for the control of feral pigs. Approximately 60 g of the product is placed within a bait carcass (sheep, cattle, pigs, goat, kangaroo). The combination of CS<sub>2</sub> and phosphorus essentially burns the gastrointestinal tract of the pig once it has ingested the laced bait material. The product is registered for use in Queensland and the Northern Territory and is used in NSW under permit.

### **1.2 Reasons for carbon disulfide review**

The pig poison was reviewed due to possible toxicological effects related to CS<sub>2</sub> and concerns that labels did not contain adequate instructions in relation to the safe handling

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of the product and first aid in the event of an accident caused by the handling of the product.

### **1.3 Scope of the Review**

The product registration and label approvals for the CS<sub>2</sub> pig poison were placed under review by the APVMA because of the following specific concerns:

- Toxicology, including the potential for acute and chronic effects that might pose undue hazards to human health;
- Occupational health and safety, including the potential for undue hazards to workers (particularly due to the presence of phosphorus in the formulation); and
- Labels did not contain adequate instructions in relation to the safe handling of the product and first aid in the event of an accident caused by the handling of the product.

### **1.4 Regulatory options**

The basis for a reconsideration of the registration and approvals for a chemical is whether the APVMA is satisfied that the requirements prescribed by the Agvet Codes for continued registration and approval, as mentioned above, are being met. The requirements for product labels are that the label contains adequate instructions.

There can be three possible outcomes from the reconsideration. The APVMA may:

- be satisfied that the products and their labels continue to meet the prescribed requirements for registration and approval and therefore affirm the registrations and approvals;
- be satisfied that the conditions to which the registration or approval is currently subject can be varied in such a way that the requirements for continued registration and approval will be complied with and therefore vary the conditions of registration or approval; or
- not be satisfied that the requirements for continued registration and approval continue to be met and suspend or cancel the registration and/or approval.

## 2. CHEMICAL IDENTITY OF CARBON DISULFIDE ACTIVE CONSTITUENTS AND PRODUCTS

**Table 1: Active constituents**

Approved name	common	Carbon disulfide	Phosphorus (yellow)
<b>Empirical Formula</b>		CS <sub>2</sub>	P <sub>4</sub>
<b>CAS registry number</b>		75-15-0	7723-14-0
<b>Molecular weight</b>		76.14	123.88
<b>Appearance and physical state</b>		Clear, colourless or faintly yellow liquid	Colourless to yellow crystalline solid with waxy appearance
<b>Odour</b>		Unpleasant	Garlic-like
<b>Density (20 °C)</b>		1.26 g/mL	1.88 g/mL
<b>Vapour density relative to air</b>		2.63	4.42
<b>Vapour pressure</b>		48.21 kPa (@ 25 °C)	3.5 Pa (@ 20 °C)
<b>pH</b>		Not available	Not available
<b>Specific gravity</b>		1.263 @ 20°C	1.4 @ 20°C
<b>Boiling point</b>		46.3 °C @ 760 mmHg	280 °C @ 760 mmHg
<b>Flash point</b>		-30°C (closed cup)	Not available
<b>Flammability limits (in air)</b>		1.3% (lower), 50% (upper)	Not available
<b>Autoignition temperature</b>		90 °C	30 °C in moist air and 35-46 °C in dry air.
<b>Solubility</b>		Slightly soluble in water (2.94 g/L at 20 °C)  Miscible in anhydrous methanol, ethanol, ether, benzene, chloroform and carbon tetrachloride	Insoluble in water (3 mg/L at 15 °C)  Soluble in alkali, ether, chloroform, benzene, toluene, carbon disulfide

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**Table 2: End use products**

<b>Product name</b>	C.S.S.P. Phosphorus Pig Poison (41130)
<b>Appearance and physical state</b>	Brown emulsion with sweetish odour
<b>Vapour pressure</b>	Not determined
<b>pH</b>	Not determined
<b>Specific gravity</b>	1.4
<b>Boiling point</b>	100 °C
<b>Flash point</b>	43 °C
<b>Flammability limits (in air)</b>	Not determined

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### **3. TOXICOLOGY ASSESSMENT**

#### **3.1 Introduction**

Carbon disulfide is predominantly used as an industrial chemical in the production of viscose rayon fibres, carbon tetrachloride and cellophane, and as a solvent. It has also been used as a soil fumigant and as a fumigant insecticide for stored grain. Yellow or white phosphorus is used in rodenticides, fertilisers and in gas analysis.

In Australia, carbon disulfide is currently listed in Schedule 6 of the Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP). It has an Appendix E, Part 2 entry<sup>1</sup> and an Appendix F Part 3 entry<sup>2</sup>. Phosphorus, yellow (excluding its salts and derivatives) is in Schedule 7 of the SUSDP. It also has an Appendix F Part 3<sup>2</sup> entry and an Appendix G entry<sup>3</sup> for dilute preparations containing 1 mg/kg or 1 mg/L, or less. There is no Australian Acceptable Daily Intake (ADI) or Acute Reference Dose (ARfD) for either carbon disulfide or phosphorus (yellow).

#### **3.2 Exposure**

The pig poison is unlikely to pose an inhalational hazard when used outdoors or in well-ventilated areas, as suggested by the sponsor. The material safety data sheet (MSDS) states that respiratory protection is “not usually required” except when used indoors under poor ventilation, when a respirator fitted with an organic filter should be used. Besides the potential vapour hazard of this product, there is also the potential for dermal exposure and therefore hand-to-mouth transfer, particularly due to the ‘stickiness’ of the formulation.

#### **3.3 Product toxicity**

No product toxicity data were submitted for evaluation. The toxicity of the pig poison was estimated by extrapolation from the toxicity of the individual constituents. These estimated toxicities are summarised in Table 3 and 4 below. No data were provided on the physical or chemical properties of C.S.S.P Phosphorus Pig Poison such as its potential to generate vapours or its stability.

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1 Standard statements applying to poisons other than agricultural and veterinary chemicals

2 Warning statements and general safety directions for poisons other than agricultural and veterinary chemicals

3 Exempt from scheduling

**Table 3: C.S.S.P Phosphorus Pig Poison**

<b>Toxicity end point</b>	<b>Estimated toxicity</b>
Oral	High
Dermal	No data*
Inhalation	Low-Moderate
Skin irritation	Severe
Eye irritation	Severe
Skin sensitisation	No data

\* Product is likely to cause burns to the skin

**Table 4: Estimation of toxicity of active ingredients**

	<b>Carbon disulfide<sup>1</sup></b>	<b>Phosphorus<sup>4</sup></b>	<b>Extrapolated toxicity</b>
<b>Concentration (g/L) (product 41130)</b>	50.8	40.0	High
<b>Acute oral LD<sub>50</sub>(mg/kg bw)</b>	3188 (rats) 3020 (mice) 540-1080 (lethal dose in humans)	3.0 (rats) 4.8 (mice) 0.4 (lethal dose in infants)	
<b>Acute dermal LD<sub>50</sub> (mg/kg bw)</b>	ND	ND	ND
<b>Acute inhalation LC<sub>50</sub>(mg/m<sup>3</sup>)</b>	25,000 (rats) 690 (mice) 6200 (lowest lethal concentration in humans)	ND	Moderate
<b>Skin irritation</b>	Severe <sup>2</sup>	Severe <sup>5</sup>	ND
<b>Eye irritation</b>	Severe <sup>3</sup>	Severe	ND
<b>Skin sensitisation</b>	Severe	Severe	ND

ND = no data.

1 = Carbon disulfide is irritating to mucous membranes and the respiratory system. Carbon disulfide is neurotoxic in laboratory animals (neuropathy, behavioural and motor activity effects). In humans, carbon disulfide exposure has been associated with cardiovascular disease, neurotoxicity (predominantly peripheral neuropathy) and ophthalmoscopic effects (retinopathy). Studies in viscose rayon industry workers have indicated that acute exposures of 500-3000 mg/m<sup>3</sup> cause neurological and psychological symptoms, while prolonged exposures at concentrations greater than 30 mg/m<sup>3</sup> cause peripheral and central nervous system, behavioural and neuropathological effects.

2 = may cause chemical burns;

3 = may cause corneal erosions.

4 = phosphorus (yellow) fumes are highly irritating to the respiratory tract and can cause severe eye irritation.

5 = Skin contact may cause severe burns and blistering

### 3.4 Discussion

Low levels of CS<sub>2</sub> are naturally occurring flavour components of many foods. Many plants metabolise a range of naturally occurring sulphur compounds to CS<sub>2</sub> and the compound occurs, at the low micrograms per litre level, in the breath of normal human

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subjects. Carbon disulfide is also released into the atmosphere as a normal consequence of biological and geological processes.

Toxicological data were obtained from internal Office of Chemical Safety (OCS) databases of active and non-active constituents, the Registry of Toxic Effects of Chemical Substances (RTECs), Material Safety Data Sheets (MSDS), the European Commission's IUCLID dataset, the Agency for Toxic Substances and Disease Registry (ATSDR) and the International Program on Chemical Safety's (IPCS) INCHEM service.

The pig poison, which contains both phosphorus (yellow) and CS<sub>2</sub> as the active constituents, is considered to have high oral toxicity due predominantly to the toxicity of phosphorus (yellow). Although data was not available to establish an LD<sub>50</sub> for dermal exposure, the toxicity is considered to be high based on information that skin contact can cause burns. The product is likely to generate CS<sub>2</sub> vapours, which are highly irritating to mucous membranes and the respiratory tract. Both of the active constituents are severe eye and skin irritants and therefore the product is considered a severe eye and skin irritant.

### Poisons Schedule

On toxicological grounds, the existing Poisons Schedules for carbon disulfide (S6) and phosphorus (yellow) (S7) remain appropriate.

### First Aid Instructions

Existing First Aid Instructions for carbon disulfide and phosphorus (yellow), as they appear in the FAISDs Handbook, are as follows:

**Table 5: Existing first aid instructions**

<i>Carbon Disulfide</i>	
a	If poisoning occurs, contact a doctor or Poisons Information centre. Phone Australia 131126
e	Avoid giving alcohol
f	If skin contact occurs, remove contaminated clothing and wash skin thoroughly
g	Remove from contaminated area. Apply artificial respiration if not breathing
s	If in eyes, hold eyes open, flood with water for at least 15 minutes and see a doctor
<i>Phosphorus (yellow)</i>	
a	If poisoning occurs, contact a doctor or Poisons Information centre. Phone Australia 131126
f	If skin contact occurs, remove contaminated clothing and wash skin thoroughly

For carbon disulfide, the instruction "Avoid giving alcohol" (e) should be deleted because it is not supported by the data, and the instruction "If swallowed, do NOT induce vomiting. Give a glass of water" (c) should be added.

In light of the high oral toxicity of phosphorus (yellow), it is recommended that the existing instruction "If poisoning occurs, contact a doctor or Poisons Information centre. Phone Australia 131126" (a) be replaced with "If poisoning occurs get to a doctor or hospital quickly" (i). The instruction "If swallowed, do NOT induce vomiting. Give a glass of water" (c) should also be included. The severe eye irritancy potential of phosphorus (yellow) necessitates the added instruction "If in eyes, hold eyes open, flood

with water for at least 15 minutes and see a doctor” (s). All other existing instructions for each compound remain appropriate.

The amended First Aid Instructions for carbon disulfide and phosphorus (yellow) are as follows:

**Table 6: Amended first aid instructions**

<i>Carbon Disulfide</i>	
a	If poisoning occurs, contact a doctor or Poisons Information centre. Phone Australia 131126
c	If swallowed, do NOT induce vomiting. Give a glass of water
f	If skin contact occurs, remove contaminated clothing and wash skin thoroughly
g	Remove from contaminated area. Apply artificial respiration if not breathing
s	If in eyes, hold eyes open, flood with water for at least 15 minutes and see a doctor
<i>Phosphorus (yellow)</i>	
i	If poisoning occurs get to a doctor or hospital quickly
c	If swallowed, do NOT induce vomiting. Give a glass of water
f	If skin contact occurs, remove contaminated clothing and wash skin thoroughly
s	If in eyes, hold eyes open, flood with water for at least 15 minutes and see a doctor

### Warning Statements and General Safety Precautions

Existing Warning Statements and General Safety Precautions for carbon disulfide and phosphorus (yellow) as they appear in the FAISDs Handbook are as follows:

**Table 7: Existing warning statements and general safety precautions**

<i>Carbon Disulfide</i>	
12	Vapour is harmful to health on prolonged exposure
101	Avoid contact with eyes
104	Avoid contact with skin
108	Avoid breathing vapour
109	Use only in well ventilated areas
123	Keep away from heat, sparks and naked flames
<i>Phosphorus (yellow)</i>	
02	Corrosive
101	Avoid contact with eyes
104	Avoid contact with skin

These Warning Statements and General Safety Precautions remain appropriate.

### Safety Directions

There are currently no Safety Directions in the FAISD handbook for C.S.S.P Phosphorus Pig Poison. Based on a consideration of the toxicity for each constituent in the product, the following new entry is recommended.

**Table 8: New entry CSSP Pig Poison**

<i>Phosphorus (yellow) EM 45 g/L or less with carbon disulfide 55 g/L or less</i>	
100	Very dangerous
130 133	Poisonous if swallowed
207 162 164	Will damage the eyes and skin
160 163	May irritate the nose and throat
210 211 212	Avoid contact with eyes and skin and clothing
220 222	Do not inhale vapour
270	Open container in the open air
350	After use and before eating, drinking or smoking, wash hands, arms and face thoroughly with soap and water

**EM = emulsion.**

NOTE: An evaluation of the personal protective equipment (PPE) necessary for the safe use of C.S.S.P Phosphorus Pig Poison was performed by OCS(OHS).

**Table 9: Amended entry carbon disulfide**

<i>Carbon disulfide LD 1300 g/L or less</i>	
<del>400</del> <b>129 133</b>	<del>Very dangerous</del> <b>Harmful if swallowed</b>
<del>420 130 132 433</del>	<del>Product is</del> Poisonous if inhaled or swallowed
<del>464</del> <b>207</b> 162 164	Will <del>irritate</del> <b>damage</b> the eyes and skin
<b>161 163</b>	<b>Will irritate the nose and throat</b>
190	Repeated minor exposure may have a cumulative poisoning effect
<b>200</b>	<b>Specially dangerous on hot days</b>
210 211 212	Avoid contact with eyes and skin and clothing
220 222	Do not inhale vapour
260	The liquid can cause burns
<b>270</b>	<b>Open container in the open air</b>
<del>340 342</del>	<del>If product on skin, immediately wash area with soap and water</del>
350	After use and before eating, drinking or smoking, wash hands, arms and face thoroughly with soap and water

**LD = liquid**

### 3.5 Conclusions

The assessment of available information for CS<sub>2</sub> found that:

- the likely exposure profile of CS<sub>2</sub> and its inherent volatility, will not result in human exposure via the diet. As a result, no acceptable daily intake (ADI) or acute reference dose (ARfD) have been established;
- The existing first aid and safety directions are not considered appropriate. New and revised directions have been recommended (Section 7).

On the basis of toxicity it is concluded that the continued registration and approval of labels for products containing CS<sub>2</sub> will not pose a risk to human health.

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## 4. OCCUPATIONAL HEALTH AND SAFETY ASSESSMENT

### 4.1 Introduction

This assessment examined the occupational health and safety concerns associated with the pig poison and related primarily to the potential for dermal exposure.

### 4.2 Hazard Characterisation

#### Physicochemical hazards

Carbon disulfide is a liquid with flammable and explosive vapours. It has a boiling point of 46.3 °C and a flash point of -30 °C. It forms explosive mixtures with air from 1.0-50% (v/v). It is also spontaneously flammable and explosive when in contact with a flame or static electricity discharge.

Vapours are heavier than air and will travel to low-level areas e.g. sumps and drains. Carbon disulfide vapours may ignite by contact with an ordinary light bulb, a warm steam pipe or a hot exhaust pipe.

#### Health hazards – active constituent

Carbon disulfide has low oral acute toxicity ( $LD_{50}=3188$  mg/kg bw/day) in rats and the lethal oral dose in humans is 540-1080 mg/kg bw/day. It has low inhalation ( $LC_{50}=25000$  mg/m<sup>3</sup>) toxicity in rats; however, long-term inhalation exposure of humans to carbon disulfide vapour has been associated with irreversible peripheral neuropathy. In humans, the lowest lethal concentration is 6200 mg/m<sup>3</sup>. The toxicity of carbon disulfide at sub-acute doses is characterised by dizziness, headache, nausea, vomiting and psychiatric disturbances (IPCS 2000). Carbon disulfide is a severe skin and eye irritant and may cause chemical burns and corneal erosions. Carbon disulfide vapours are highly irritating to mucous membranes and the respiratory tract. Information on skin sensitisation potential of carbon disulfide is not available.

Carbon disulfide is absorbed primarily via the lungs but also through the skin. Extensive dermal absorption takes place from liquid and even gaseous carbon disulfide. Dutkiewicz and Baranowska (1967) reported that rates of absorption determined from analysis of aqueous solutions into which subjects had immersed their hands for 1 hour, ranged from 0.232 to 0.789 mg/m<sup>2</sup> per hour. In another study it was estimated that immersion of one hand for one hour in a washing bath solution containing 0.1 mg/L CS<sub>2</sub> at a viscose rayon plant resulted in the absorption of 17.5 mg of CS<sub>2</sub> (CEC, 1988).

Once absorbed, CS<sub>2</sub> is rapidly distributed in the blood stream. It can exist both as "free" form and bound to erythrocytes or plasma proteins. The erythrocyte:plasma ratio is usually 2:1. The bound form is the fraction that has reacted with amino acids to give thio-carbamates (in a reversible reaction). "Free" CS<sub>2</sub> is rapidly eliminated and is usually undetectable. For this reason the determination of CS<sub>2</sub> in blood is not a useful biomonitor for characterising exposure. The plasma elimination half-life is about 1 hour.

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Repeat dose studies for carbon disulfide were not submitted. There are numerous published reports on the repeat dose effect of CS<sub>2</sub>. Short-term oral exposure of restrained and anaesthetized rats to between 126 and 253 mg/kg bw/day had a cardio-depressive effect on electrophysiological and mechanical parameters and increased blood pressure (Hoffmann and Klapperstuck 1990 and Hoffmann and Muller, 1990). Carbon disulfide is neurotoxic in laboratory animals (neuropathy, behavioural and motor activity effects). In many medium- or long-term studies in rats, inhalation exposure to CS<sub>2</sub> levels of between 800 and 2500 mg/m<sup>3</sup> has been associated with reductions in nerve conduction velocity in the peripheral nerves or spinal cord (Gagnaire et al., 1986). Chronic exposure has also been reported to produce gastrointestinal, kidney, endocrine and eye disorders.

In a developmental study, rabbits were exposed by inhalation to 0, 187, 311, 934, 1868 or 3737 mg/cu.m CS<sub>2</sub>, six hours per day on gestation days 6-18. Embryonic effects (reduced mean fetal body weight, number of live fetuses and post-implantation loss) were seen in 1868 and 3737 mg/cu.m groups. In the highest dose group, there was a high incidence of developmental effects (increased cumulative skeletal and visceral malformations). The NOAEL for developmental effects was 934 mg/cu.m.

In another developmental study performed for NIOSH4 (Beliles et al., 1980), rabbits and rats were exposed to 0, 20 or 40 ppm (0, 62 or 125 mg/cm<sup>3</sup>, respectively) CS<sub>2</sub> for 7 hours/day, 5 days/week for 3 weeks prior to mating. Following mating, rats not exposed pre-gestationally were exposed to 20 or 40 ppm on days 0-18 or days 6-18 of gestation, and rabbits were exposed to 20 or 40 ppm on days 0-21 or days 7-21 of gestation. Similarly animals exposed pre-gestationally were divided into two groups that were exposed to the same concentrations as used in the pre-gestational exposure and exposed during gestation days 0-18 and 6-18 (rats) or 0-21 and 7-21 (rabbits). In both rats and rabbits, there were no significant effects on uterine contents, number of fetuses and no significant external, visceral, or skeletal malformations were observed. There was a slight but non-significant increase in resorption and reduction in live fetuses. This study showed a NOAEL of 40 ppm for maternal and developmental toxicity for rats and rabbits and for exposures lasting throughout gestation or during the post-implantation period.

Available data are not sufficient to assess carcinogenicity of CS<sub>2</sub>. In several *in vitro* studies, CS<sub>2</sub> did not show any evidence of genotoxicity.

In humans, CS<sub>2</sub> exposure has been associated with cardiovascular disease, neurotoxicity (predominantly peripheral neuropathy) and ophthalmoscopic effects (retinopathy).

In humans, the majority of the available epidemiological studies are for workers in the viscose rayon production industry, in which there is exposure to airborne CS<sub>2</sub> (CICAD, 2002). A retrospective mortality study of 223 viscose workers employed for more than 10 years and who were exposed to CS<sub>2</sub> levels above 20 ppm (62 mg/m<sup>3</sup>) revealed a statistically significant increase in cardiovascular mortality (Tiller et al. 1968). There are numerous early clinical reports of pronounced psychological and central nervous system damage following single or long-term exposure to high levels of CS<sub>2</sub> in the rubber and viscose rayon industries. Extended exposure under such conditions led to the recognition of chronic carbon disulfide intoxication, characterised by psychoses,

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polyneuropathy of the lower extremities, neurasthenic syndrome, optic neuritis and atherosclerotic vasculo-encephalopathy (CICAD, 2002).

The results of several studies confirm that human exposure to CS<sub>2</sub> at mean concentrations of 15-30 mg/m<sup>3</sup> is associated with reductions in motor nerve conduction velocity (MCV) and sensory nerve conduction velocity (SCV) in the peripheral nerves, most often in the lower limbs (CICAD 2002).

In one well-characterised study, there were significant reductions in mean peroneal MCV in workers exposed to CS<sub>2</sub> levels as low as 3 mg/m<sup>3</sup>, after adjustment for potential confounders (age, weight, height, glucose tolerance and cigarette and alcohol consumption). These workers also reported symptoms of neuro-behavioural ailments significantly more frequently, although there was no evidence of remarkable changes in psychological or psychomotor parameters (Putz-Anderson et al 1983).

Cardiovascular mortality was significantly greater in the most highly exposed workers in a cohort of 2939 male workers at a viscose rayon factory. Egeland et al. (1992) observed a significant association between increases in serum levels of low-density lipoprotein cholesterol and diastolic blood pressure with increasing exposure to CS<sub>2</sub>.

In most of the epidemiological studies in which mortality from causes other than cardiovascular failure was assessed, there was no consistent excess of mortality from cancer at any specific site or from all cancers combined (CICAD, 2002). The US EPA IRIS report states that CS<sub>2</sub> has not undergone a complete evaluation and determination under the US EPA IRIS program for evidence of human carcinogenic potential (US EPA IRIS Substance file – Carbon disulfide, 1998).

### **Health hazards - End use products**

Toxicological data were not submitted for the product. The toxicity of the product was estimated by extrapolating the toxicity of individual constituents in the product.

The pig poison is likely to have high oral toxicity. The product contains two active constituents, both of which are severe eye and skin irritants. There were no data available for dermal exposure or for skin sensitisation potential.

### **Hazard Classification**

Carbon disulfide [CAS 75-15-0] is on the NOHSC *List of Designated Hazardous Substances* (NOHSC 2003, Draft). It is classified as Toxic to Reproduction, Category 3. The risk phrases are as follows:

R11	Highly flammable
R62	Possible risk of impaired fertility
R63	Possible risk of harm to the unborn child
R48/23	Toxic: danger of serious damage to health by prolonged exposure through inhalation
R36/37/38	Irritating to eyes, respiratory system and skin

The following cut-off concentrations apply to carbon disulfide:

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Conc $\geq$ 20%:	R62; R63; R48/23; R36/37/38
1% $\geq$ Conc<20%:	R62; R63; R48/23
0.2% $\geq$ Conc<1%:	R48/20

Based on the concentration of hazardous substances in the product, the pig poison is classified as a hazardous substance. The following risk phrases apply to this product:

R23/25	Toxic by inhalation and if swallowed
R62	Possible risk of impaired fertility
R63	Possible risk of harm to the unborn child
R48/23	Toxic: danger of serious damage to health by prolonged exposure through inhalation
R36/38	Irritating to eyes and skin

### **4.3 Occupational Exposure**

#### **4.3.1 Exposure Information**

##### **Formulation and packaging**

The pig poison is formulated in Australia from CS<sub>2</sub> imported from overseas. The formulated product, a dark brown emulsion, is packaged in 1L steel containers (1.4kg).

Information on exposure during formulation of the pig poison is not available. During decanting and formulation it is reported that CS<sub>2</sub> is handled by first covering it with a water blanket.

##### **End use**

The database on occupational exposure to CS<sub>2</sub> in rayon fibre production is extensive. However exposure data for workers using CS<sub>2</sub> for animal baiting were not available.

Neither the UK Predictive Operator Exposure Model (POEM) nor the Pesticide Handler Exposure Database (PHED) surrogate exposure studies are suitable for predicting exposures to workers when applying CS<sub>2</sub> products for animal baiting. On this basis a qualitative evaluation of the acute risks was undertaken.

#### **4.3.2 Exposure assessment**

Exposure to the pig poison is possible when opening the container and applying the product to baits, for example, when placing it in the chest cavity, stomach and slits in meat of bait carcass (as described on the product label). Dilution of the product is not required. A known amount of product is applied to baits (animal carcasses) and left in areas which feral pigs frequent. Exposure is also possible from spillage and clean-ups.

The primary route of exposure to the pig poison is dermal. Inhalation of CS<sub>2</sub> vapour is unlikely as the product contains only 5% CS<sub>2</sub>, except if large amounts of product are

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used in poorly ventilated areas. However the product is normally used in open areas, reducing the risk for inhalation exposure to CS<sub>2</sub>. It is reported that the distinctive odour of the product acts as a deterrent to accidental ingestion. The CS<sub>2</sub> level in the product is also such that at normal levels the exposure standard set by NOHSC (31 mg/m<sup>3</sup>) would not be achievable. CS<sub>2</sub> in the product is not flammable.

#### 4.4 OHS Risk Assessment

The pig poison is considered to have high oral and dermal toxicity, due predominantly to the toxicity of phosphorus (yellow). It is a severe eye and skin irritant. Skin contact with the product can cause burns. Carbon disulfide vapours can be highly irritating to mucous membranes and the respiratory tract. However, the low CS<sub>2</sub> level in the product is such that, acute inhalation risks are considered low.

Information on repeated or long-term exposure to the pig poison is not available however repeated exposure is unlikely except during manufacture of the product.

#### Assessment of risk mitigation/control measures provided on product label

No PPE is recommended on the current product label for the pig poison. The risk assessment has identified that skin, eye and respiratory tract protection will be required when using this product. Workers will be required to wear cotton overalls buttoned to the neck and wrist, elbow-length PVC gloves and goggles and (if indoors) half facepiece respirator when applying the poison to the bait carcass.

#### 4.5 Discussion

This Section assesses current risk control measures in the context of requirements under the Agvet Codes and the NOHSC *National Model Regulations for Control of Workplace Hazardous Substances*.

#### Transport of carbon disulfide products

Carbon disulfide is listed in the *Australian Code of Practice for the Transport of Dangerous Goods by Road and Rail* (Department of Transport and Regional Services 1998) as follows:

UN Number	Proper Shipping Name	ADG Class	Subsidiary Risk Class	Hazchem Code
1131	Carbon disulfide	3 (flammable liquid)	6.1 (toxic substance)	3WE*

\* Hazchem Code 3WE (emergency response in case of leakage, spillage, fire): foam/risk of explosion/full protective clothing required/prevent any spillage from entering drains or water courses.

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Carbon disulfide and its products should be labeled and packaged according to the Australian Dangerous Goods (ADG) code. In particular, labels should depict the hazard diamond pictogram for a Class 3 flammable liquid.

### **Material Safety Data Sheets**

A Material Safety Data Sheet (MSDS) for the pig poison was provided by the registrant for assessment. The MSDS met the requirements of the *NOHSC National Code of Practice for the Preparation of Material Safety Data Sheets* [NOHSC:2011(1994b)]. However, the *Health Hazard Information* section does not adequately reflect the NOHSC hazard classification for CS<sub>2</sub> products.

The MSDS should adequately reflect the NOHSC hazard classification of CS<sub>2</sub> products and also contain the safety directions recommended for the pig poison. The accuracy of the MSDS information is the responsibility of the suppliers.

### **Exposure standards**

A review of the studies on the effect of carbon disulfide on human health revealed that exposure to carbon disulfide at concentrations as low as 13 mg/m<sup>3</sup> were associated with adverse health effects. The OCS (OHS) will recommend that NOHSC consider revising the exposure standard for carbon disulfide, which is currently established at 10 ppm (31 mg/m<sup>3</sup>, TWA) in view of the current toxicological and epidemiological data indicating adverse effects below this exposure level. In this recommendation, OCS will also request NOHSC to review the requirement for establishing a short-term exposure limit (STEL). A Minimum Alveolar Concentration (MAC) of 60 mg/m<sup>3</sup> (no more than 15 minutes) has been recommended by the WHO expert group (IPCS Poisons Information Monograph 102, undated).

### **Health surveillance**

Although NOHSC has not placed CS<sub>2</sub> or phosphorus on the Schedule for Health Surveillance (Schedule 3 - Hazardous Substances for which Health Surveillance is Required (NOHSC 1994)), the employer is responsible for providing health surveillance for workers where a risk of adverse health effects has been established as a result of the workplace assessment process.

## **4.6 Conclusions**

This assessment has identified that the current labels for carbon disulfide products do not contain adequate instructions for the safety of workers. However, these labels can be varied to include appropriate instructions in relation to the safe handling of the product and first aid in the event of an accident caused by the handling of the product.

On the basis that these changes are made it is concluded that the continued registration of the CS<sub>2</sub> pig poison would not be an undue hazard to the safety of people exposed to it during its handling.

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## 4.7 References

Beliles, RP, Brusick, DJ and Mecler FJ. 1980. Teratogenic-mutagenic risk of workplace contaminants: Trichloroethylene, perchloroethylene and carbon disulphide. Litton Bionetics report to NIOSH. PB82-185075, USA.

Dutkiewicz T. and Baranowska B. (1967). The significance of absorption of carbon disulphide through the skin in the evaluation of exposure. In: Toxicology of carbon disulphide. eds. H. Brieger and J. Teisinger Proceedings of a symposium, Prague, 15-17 September 1966. Amsterdam, Experta Medica Foundation, pp. 50-51.

Egeland GM, Burkhardt GA, Schnorr TM, Hornung RW, Fajen GM and Lee ST. 1992. Effects of exposure to carbon disulphide on low-density lipoprotein cholesterol concentration and diastolic blood pressure. *British Journal of Industrial Medicine*, 49: 287-293.

Gagnaire F, Simon P, Bonnet P and De Ceauriz J. 1986. The influence of simultaneous exposure to carbon disulphide and hydrogen sulphide on the peripheral nerve toxicity and metabolism of carbon disulphide in rats. *Toxicology Letters*, 34: 175-183.

Hoffman P and Klapperstuck M. 1990. Effects of carbon disulphide on cardiovascular function after acute and subacute exposure of rats. *Biomedica Biochemica Acta*, 49(1): 121-128.

Hoffman P and Muller S. 1990. Subacute carbon disulphide exposure modifies adrenergic cardiovascular actions in rats. *Biomedica Biochemica Acta*, 49(1): 115-120.

International Chemical Safety Card 0022 – Carbon Disulphide. International Programme on Chemical Safety (IPCS) 2000. International Labour Organisation website:

[http://www.ilo.org/public/English/protection/safework/cis/products/icsc/dtasht/\\_icsc00/icsc0022.htm](http://www.ilo.org/public/English/protection/safework/cis/products/icsc/dtasht/_icsc00/icsc0022.htm).

International Programme on Chemical Safety Poisons Information Monograph 102 – Carbon Disulphide. International Programme on Chemical Safety (IPCS) undated. IPCS Inchem website: <http://www.inchem.org/documents/pims/chemical/pim102.htm>

Johnson BL, Boyd J, Burg JR, Lee ST, Xintaras C and Albright BE. 1983. Effects on the peripheral nervous system of workers' exposed to carbon disulphide. *Neurotoxicology*. 4(1): 53-66.

National Occupational Health and Safety Commission (1994a) *Control of Workplace Hazardous Substances* [NOHSC:1005(1994), 2007(1994)], AusInfo, Canberra.

National Occupational Health and Safety Commission (1994b) *National Code of Practice for the Preparation of Material Safety Data Sheets* [NOHSC:2011(1994)], AusInfo, Canberra.

National Occupational Health and Safety Commission (1995) *Exposure Standards for Atmospheric Contaminants in the Occupational Environment, Guidance Note*

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[NOHSC:3008(1995)] and *National Exposure Standards* [NOHSC: 1003(1995)], AusInfo, Canberra.

National Occupational Health and Safety Commission (2002a) *Approved Criteria for Classifying Hazardous Substances* [NOHSC:1008(2002)], AusInfo, Canberra.

National Occupational Health and Safety Commission *List of Designated Hazardous Substances* (2003, Draft)

Office of Chemical Safety (2003), Evaluation report on Carbon Disulphide, February 2003.

Putz-Anderson V, Albright BE, Lee ST, Johnson BL, Chrislip DW, Taylor BJ, Brightwell WS, Dickerson N, Culver M, Zentmeyer D and Smith P. 1983. A behavioural examination of workers exposed to carbon disulphide. *Neurotoxicology*, 4(1): 67-78.

Tan, X., Bi, Y., Su Y., Yan J. and Wang F. 1999. Candidate EPA NIOSH method for determining carbon disulphide in air with capillary gas chromatography by orthogonal design. *Biomedical Chromatography*, 13: 58-542.

Tan, X., Wang F., Bi, Y., He J., Su Y., Braekman L., De Bacquer D. and Vanhoorne, M. 2001. Carbon disulphide exposure assessment in a Chinese viscose filament plant. *Intl. J. Hyg. Environ. Health*, 203:465-471.

Tiller JR, schilling RSF and Morris JN. 1968. Occupational toxic factoring mortality from coronary heart disease. *British Medical Journal*, 4: 407-411.

US EPA IRIS Substance file – Carbon disulphide, 1998.  
[URL: <http://www.epa.gov/iris/subst/0217.htm>].

WHO (2002). Concise International Chemical Assessment Document 46 - Carbon disulphide (CICAD 46). World Health Organisation, Geneva 2002. World Health Organisation website: [http://www.who.int/pcs/cicad/full\\_text/cicad46\\_carbon\\_disulphide.pdf](http://www.who.int/pcs/cicad/full_text/cicad46_carbon_disulphide.pdf).

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## 5. SUMMARY OF PUBLIC SUBMISSIONS

The carbon disulfide draft review report was released for public comment in September 2004. Its availability was announced on the APVMA website, APVMA gazette and direct mail to review participants. Four submissions were received that dealt specifically with the pig poison. From the responses received the following key issues were identified: adequacy of label instructions; effects on target and non-target animals; product safety; alternatives and animal humaneness concerns. These are discussed below.

Listed below are the respondents' views on the issue ('Comments') and the APVMA's response to the comments ('Outcome'). All responses received have been taken into consideration in revising the draft report to produce this report.

### LABEL INSTRUCTIONS

#### *Comments*

- Label instructions are inadequate. They contain no information on control of use for each jurisdiction and should at least state those conditions on use that are common to all states.
- Instructions regarding the application rate of the product (60g in chest cavity, stomach and slits in meat of bait carcass) are ambiguous and could imply that you need 60g product in each part of the carcass.
- The label application rate does not make allowances for different size carcasses. In NSW carcasses include cattle, sheep, pigs, goats and kangaroos.
- The label contains relatively crude directions that may increase the likelihood of sub-lethal poisoning and non-target impacts.
- No information is provided on the effectiveness of current labelling requirements or the adherence to these requirements in the field.

#### *Outcome*

*The APVMA agrees that current labelling for the pig poison is inadequate. The review recommendations will require additional instructions for use to appear on the label. These will be derived from instructions that appear on the permit for use of the pig poison in NSW and include comprehensive information for the use of the product including distance restrictions, notification requirements and poison notice requirements. This will be relevant for use in all jurisdictions.*

*In addition first aid instructions and safety directions will be updated and the wording of the directions for use will be amended to remove the ambiguity that respondents consider exist with the current directions. The revised directions for use statement will read "distribute approximately 60g of the product evenly through chest cavity, stomach and slits in meat of bait carcass".*

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## PRODUCT SAFETY

### *Comments*

- The draft report indicated that there was a lack of both toxicology and occupational health and safety data supporting the continued registration of the product under the conditions under which it is used.
- There was no data provided for the toxicology of the product or for dermal exposure or skin sensitisation potential with information on exposure during formulation of the pig poison unavailable.
- Without such information on repeated or long-term exposure, how can re-registration be justified? How can there be sufficient data on any aspect of CSSP use and safety to allow re-registration. Unless the manufacturer is prepared to obtain relevant data on the safety of this compound, it should be de-registered, particularly given that there are viable alternatives.
- Reported that many landholders use this product on an ad-hoc basis when there is an indication of feral pig activity on part of their property. This could result in quite frequent applications at times and it is highly unlikely that a landholder working in a hot environment and using a product on an ad hoc basis (possibly permanently kept in a vehicle for use as needed on large properties), is going to don any protective gear. The report indicates that in pig poison form, CS<sub>2</sub> and yellow phosphorus vapour is harmful. Coating a pig carcass in a hot environment will give off such vapour and put the health of workers at risk.
- In terms of the potential harmful effects of the use of the pig poison on humans, there seems to be little basis in the review report for the reaffirmation of this poison. Compared to other reviews there is a significant lack of data on the safety or the toxicology of the pig poison in the conditions under which it is used. No data were provided for the toxicology of the product or for dermal exposure or skin sensitisation potential. Information on exposure during formulation of the pig poison is not available. Given the clear hazards associated with the active ingredients of this poison, it would appear that the lack of data on the risks of CSSP to humans is reason enough not to continue its registration.
- The distribution of this product is totally unregulated and anyone can purchase it direct from the manufacturer or rural resellers. This instantly poses a much greater level of OH&S risk (as well as all the other risks) than a vertebrate poison such as 1080 that is heavily regulated by State Governments.
- It is inconsistent to place such rigorous requirements on the 1080 review (which I believe have been addressed with the provision of extensive data), and then not apply these to another vertebrate toxin.

### *Outcome*

*In the absence of new data a qualitative assessment of existing information was undertaken for both the toxicology and occupational health and safety aspects associated with the pig poison. This is a conservative assessment approach and*

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*concluded that the product could be used safely, not posing a risk to workers. These assessments have recommended changes to labels that strengthen instructions to protect those that come into contact with the product during handling and use.*

## **NON-TARGET ANIMAL EFFECTS**

### ***Comments***

- The report does not review the precise threat that the pig poison residues in carcasses could pose to non-target species.
- There are no comprehensive studies that have been done to determine impacts of the pig poison on non-target animals but some anecdotal reports of poisoning of crows, wedge tail eagles, butcherbirds and magpies are available.
- Even if used according to the label the risk of non-target impact is high.
- Because of the ease of availability of the product and lack of control by government authorities as with 1080, there is the potential for it to be administered in a haphazard and dangerous way. Surfaces of carcasses may be coated with an amount far exceeding that recommended, with the inevitable result of considerable non-target animal damage. This is different to 1080 meat baits where the 1080 is injected and centrally located (more controlled) so only larger non-target animals eating a whole bait or multiple baits would be adversely affected.

### ***Outcome***

*The scope of the review did not cover this aspect of the product registration. However the concerns in relation to non-target effects are noted. At this time the APVMA does not have evidence that the use of the pig poison is having impacts on non-target animals. If new information is provided, the APVMA will undertake further investigations to determine whether a review should be initiated.*

## **PRODUCT EFFICACY**

- The pig poison used in ways that are not conducive to the effective control of feral pigs, used in an ad-hoc way by landholders rather than as a coordinated approach like 1080.
- The main argument put forward for the continued use of the pig poison was that landholders in remote areas, where government-supplied 1080 baits are not easily available, require access to an off-the-shelf toxin. However this type of use is not consistent with effective vertebrate pest control.
- For the sake of efficacy, control of mobile pest animals such as feral pigs needs to be conducted over large areas i.e. coordinated programs involving many landholders. Having access to a take-home poison that is not controlled/distributed by government authorities, allows individual landholders to

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target pigs in an ad-hoc way over small areas, which is not conducive to effective control.

- In order for control programs to be effective in reducing the impact of feral pigs, they need to be coordinated across large geographical areas with cooperation between all affected landholders. The supply and use of the pig poison to individuals on an ad-hoc basis is not an effective way of tackling the feral pig problem.
- Without a central distribution point the opportunity to provide users with advice on feral pig control and appropriate control strategies is lost as there is no government involvement in the process.

### **Outcome**

*The scope of the review did not cover this aspect of the product registration. However the concerns relating to the efficacy of the pig poison are noted. At this time the APVMA does not have evidence that the use of the pig poison is not efficacious in the control of feral pigs. If new information is provided, the APVMA will undertake further investigations to determine whether a review should be initiated.*

## **ALTERNATIVES**

### **Comments**

- The justification for the continued registration of the pig poison is not clear, particularly where there are already viable alternative control techniques such as trapping, shooting and the use of 1080 meat baits.

### **Outcome**

*As part of its overall regulatory functions, the APVMA has an interest in the availability of alternative control measures, including other chemical products. However, those factors cannot be considered in deciding whether to affirm, vary, suspend or cancel registrations or approvals following a review. Rather the APVMA must focus upon the legislative criteria for the product subject to the review and whether its ongoing use is safe and effective.*

*In the case of the pig poison, the legislative criteria for human health and worker safety have been met. The basis for this is discussed in the report.*

## **ANIMAL HUMANENESS CONCERNS**

### **Comment**

- A number of respondents made reference to the National Consultative Committee on Animal Welfare (1992) who had raised concerns about the humaneness of the pig poison.
- The draft review report has not given due consideration to animal humaneness issues as has been done with the review of 1080.

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- There is clear evidence that the pig poison is inhumane causing prolonged and severe suffering and its use should not continue.
  - Although it is accepted that feral animals cause considerable damage and population reduction is necessary, measures must aim to protect the animal from cruelty and unnecessary pain and suffering.
  - The continued use of the pig poison disregards one of the fundamental purposes of the Queensland Animal Care and Protection Act 2001 which states that animals must be protected from unjustifiable, unnecessary and unreasonable pain. The use of the pig poison does not meet this test.

**Outcome**

*The scope of the review did not cover this aspect of the product registration. However the concerns in relation to animal humaneness are noted. Should new information be provided, the APVMA will undertake further investigations to determine whether a review should be initiated.*

*The Queensland Animal Care and Protection Act (2001) has provision to deal with the use of substances that may pose unacceptable levels of pain to an animal. This is state legislation and can only be invoked by state authorities.*

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## 6. OVERSEAS REGULATORY STATUS

Australia is one of the few countries in which CS<sub>2</sub> is registered for use. Some countries have listed CS<sub>2</sub> as a banned or restricted chemical (either withdrawn by the registrant or regulatory action taken to remove it from the market). Details on the exact reasons for this are not readily available.

Registration of CS<sub>2</sub> as a grain fumigant has been withdrawn in most countries. It appears as though the last known use of CS<sub>2</sub> as a grain fumigant in the USA was in 1987.

The commission of European Communities no longer recognises CS<sub>2</sub> as an active constituent for the purpose of plant protection with CS<sub>2</sub> classified as an obsolete pesticide. Certain chemicals are designated by the World Health Organization (WHO) as believed obsolete or discontinued for use as pesticides. WHO states, "It is difficult, in some cases, to be sure whether or not all commercial activity in a substance has ceased; some of these materials are known to be still in use for non-agricultural purposes."

Australia appears to be the only country that uses carbon disulfide as a vertebrate poison (pigs only).

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## 7. REVIEW OUTCOMES

### 7.1 Variations

The requirements for continued approval of a label for containers for a chemical product are that the label contains adequate instructions. The review identified that existing labels did not contain adequate instructions to ensure safety to workers and public health. However it is concluded that the conditions of label approval for the product C.S.S.P Phosphorus Pig Poison (41130), label approval no. 41130/0802, can be varied in a manner that will satisfy the APVMA. The details of the variations are noted below (7.3).

### 7.2 Affirmations

Following variation of the labels, the APVMA affirmed the registration of product C.S.S.P. Phosphorus Pig Poison (41130).

### 7.3 Label Variations

The following new instructions are to appear on the product label.

#### **Directions for use**

Distribute approximately 60g of the product evenly through chest cavity, stomach and slits in meat of bait carcass.

#### **MINIMUM DISTANCE RESTRICTIONS FOR LAYING CSSP PHOSPHORUS PIG POISON BAITS.**

1. **Property Boundary:** No bait shall be laid within 5 metres from any property boundary.
2. **Habitation (means the dwelling or other place where any person, other than of the owner/occupier carrying out the baiting lives):** No bait shall be laid within 500 metres of a habitation.
3. **Domestic water supply (means the water line or small dams from which water is pumped or the draw off point from wells, bores, ect):** No bait shall be laid within 100 metres of a domestic water supply. Large water storage facilities such as dams, can be ground baited to within 10 metres of the water line.
4. **Public roads:** No bait shall be laid within 200 metres of a public road.

#### **EXCLUDED AREAS- WHERE CSSP PHOSPHOROUS PIG POISON BAITS MAY NOT BE LAID.**

CSSP Phosphorous Pig Poison baits must not be laid in areas where distance restrictions cannot be met.

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### **Public notification**

Before laying baits at least 3 days notice must be given to anyone whose property boundaries fall within 4 kilometres of the outer most baiting line on the property which is to be baited. Notification can be given by telephone or personal contact, or, where this is not possible by mail, or by public notice in a local newspaper.

### **Notices**

The landholder must put up notices immediately before laying CSSP Phosphorous Pig Poison or poisoned bait material on the property. These notices must remain up for at least 4 weeks, and must be placed:

1. At every entry to the property;
2. At the entrance to the actual poisoning site;
3. At the extremities of property boundaries where the property is a public thoroughfare; and
4. At all bait stations.

The notices may be obtained from the Rural Lands Protection Boards and must specify that pigs are being poisoned, and the date of poisoning.

### **Bait material**

CSSP can only be used on carcasses of sheep, cattle, pigs, goats and kangaroos.

### **When to poison**

It is often difficult to get feral pigs to find or take baits when there is abundant green feed. The best time to poison is when grasses and other herbage are dry and pigs are hungry.

### **Bait placement**

Feral pigs almost always follow pads (trails). Carcasses should be placed near major pads, particularly near watering points. A trail of grain can be used to draw pigs onto the bait. Grain that has been soaking in water for several days is often effective. If grain is to be used as the attractant, stock will have to be moved from the paddock to be poisoned. Clear any flammable material from within 3m of the bait to reduce fire risk.

### **Bait and carcass recovery**

To the extent possible, baited carcasses must be recovered at the end of a baiting campaign and be destroyed by burning or burial according to the requirements of the State or Territory in which use has occurred.

To the extent possible, animal carcasses must be recovered during and for 14 days after a baiting campaign and be destroyed by burning or burial according to the requirements of the State or Territory in which use has occurred.

Any incidents where it is suspected that non-target animals may have been poisoned by C.S.S.P Phosphorus Pig Poison, must be notified to State authorities.

### **Risk to domestic dogs**

Take care to avoid accidental poisoning of domestic pets, particularly in closer settled farming areas. It is advisable to tie up or muzzle dogs during poisoning operations.

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**Safety directions**

(refer to directions noted below).

**First aid**

(refer to directions noted below).

## 8. AMENDMENTS TO STANDARDS

In addition to the review outcomes noted above, the following changes to current standards have been made.

### First aid instructions

The current First Aid Instructions for carbon disulfide and phosphorus (yellow) will be amended as follows:

Amended entry for carbon disulfide (a,c,f,g,s)

- If poisoning occurs, contact a doctor or Poisons Information centre. Phone Australia 131126.
- If swallowed, do NOT induce vomiting. Give a glass of water.
- If skin contact occurs, remove contaminated clothing and wash skin thoroughly.
- Remove from contaminated area. Apply artificial respiration if not breathing.
- If in eyes, hold eyes open, flood with water for at least 15 minutes and see a doctor.

Amended entry for Phosphorus (yellow) (i,c,f,s)

- If poisoning occurs get to a doctor or hospital quickly.
- If swallowed do NOT induce vomiting. Give a glass of water.
- If skin contact occurs, remove contaminated clothing and wash skin thoroughly.
- If in eyes, hold eyes open, flood with water for at least 15 minutes and see a doctor.

### Safety directions

The Safety Directions for phosphorus (yellow) will be amended as follows:

<b>New Entry</b>	
Phosphorus (yellow) EM 45 g/L or less with carbon disulfide 55 g/L or less	Hazard Codes: 162 164 160 163 210 211 212 220 222 270 350  Personal protection: 294 298a (if indoor) 300 360 361 366 370

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This translates into the following Safety Directions:  
Very dangerous. Poisonous if swallowed. Will damage the eyes and skin. May irritate the nose and throat. Avoid contact with eyes and skin and clothing. Do not inhale vapour. Open container in the open air. After use and before eating, drinking or smoking, wash hands, arms and face thoroughly with soap and water. When opening the container and using the product, wear cotton overall buttoned to the neck and wrists or equivalent clothing, elbow-length PVC gloves, chemical resistant footwear and (if indoor) half facepiece respirator. After each day's use wash gloves and contaminated clothing. Do not re-use footwear until thoroughly aired.

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**APPENDIX 1: PRODUCTS INCLUDED IN THE REVIEW**

<b>Product Number</b>	<b>Product Name</b>	<b>Registrant</b>	<b>Label approval Numbers</b>
41130	C.S.S.P. Phosphorus Pig Poison	F. H. Treweeke Pty Limited	41130/0802
41185 <sup>Φ</sup>	Ajax Carbon Disulfide Grain Fumigant Read-to-Use Liquid	Asia Pacific Specialty Chemicals Limited	Ψ

Φ Product registration cancelled at the request of the registrant, December 2004.

Ψ Labels transitioned from the States and so not having an approval number.