Peroxide, dibenzoyl: Human health tier II assessment

01 July 2016

CAS Number: 94-36-0

Preface

This assessment was carried out by staff of the National Industrial Chemicals Notification and Assessment Scheme (NICNAS) using the Inventory Multi-tiered Assessment and Prioritisation (IMAP) framework.

The IMAP framework addresses the human health and environmental impacts of previously unassessed industrial chemicals listed on the Australian Inventory of Chemical Substances (the Inventory).

The framework was developed with significant input from stakeholders and provides a more rapid, flexible and transparent approach for the assessment of chemicals listed on the Inventory.

Stage One of the implementation of this framework, which lasted four years from 1 July 2012, examined 3000 chemicals meeting characteristics identified by stakeholders as needing priority assessment. This included chemicals for which NICNAS already held exposure information, chemicals identified as a concern or for which regulatory action had been taken overseas, and chemicals detected in international studies analysing chemicals present in babies' umbilical cord blood.

Stage Two of IMAP began in July 2016. We are continuing to assess chemicals on the Inventory, including chemicals identified as a concern for which action has been taken overseas and chemicals that can be rapidly identified and assessed by using Stage One information. We are also continuing to publish information for chemicals on the Inventory that pose a low risk to human health or the environment or both. This work provides efficiencies and enables us to identify higher risk chemicals requiring assessment.

The IMAP framework is a science and risk-based model designed to align the assessment effort with the human health and environmental impacts of chemicals. It has three tiers of assessment, with the assessment effort increasing with each tier. The Tier I assessment is a high throughput approach using tabulated electronic data. The Tier II assessment is an evaluation of risk on a substance-by-substance or chemical category-by-category basis. Tier III assessments are conducted to address specific concerns that could not be resolved during the Tier II assessment.

These assessments are carried out by staff employed by the Australian Government Department of Health and the Australian Government Department of the Environment and Energy. The human health and environment risk assessments are conducted and published separately, using information available at the time, and may be undertaken at different tiers.

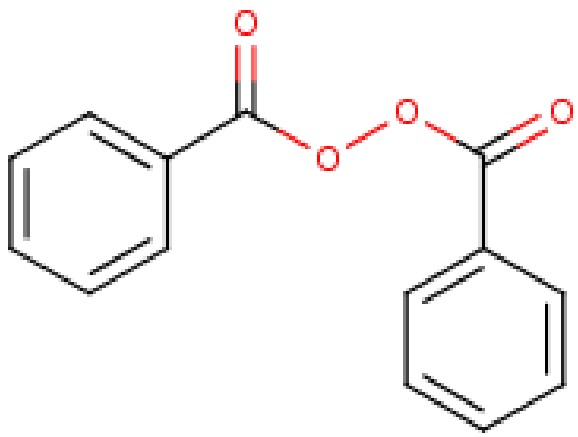
This chemical or group of chemicals are being assessed at Tier II because the Tier I assessment indicated that it needed further investigation.

For more detail on this program please visit:www.nicnas.gov.au

Disclaimer

Acronyms & Abbreviations

Chemical Identity

Synonyms	dibenzoyl peroxide benzoyl peroxide BPO
Structural Formula	
Molecular Formula	C14H10O4
Molecular Weight (g/mol)	242.23
Appearance and Odour (where available)	Colourless to white crystals or a granular powder with a faint, benzaldehyde-like odour.
SMILES	C(=O)(c1ccccc1)OOC(=O)c1ccccc1

Import, Manufacture and Use

Australian

Whilst the chemical was reported as being introduced under previous mandatory and/or voluntary calls for information, the use category was described as 'other' (substances whose technical functions are not described elsewhere).

The chemical has reported non-industrial use, with several acne treatment products containing the chemical, which is listed on the Australian Register of Therapeutic Goods (ARTG).

International

The following international uses have been identified through:

- the European Union (EU) Registration, Evaluation, Authorization and Restriction of Chemicals (REACH) dossiers;
- the Organisation for Economic Co-operation and Development Screening information data set (OECD SIDS);
- Galleria Chemica; the Substances and Preparations in Nordic countries (SPIN) database;
- the European Commission Cosmetic Ingredients and Substances (CosIng) database;
- the United States (US) Personal Care Products Council International Nomenclature of Cosmetic Ingredients (INCI) Dictionary;
- the US National Library of Medicine's Hazardous Substances Data Bank (HSDB) and various international assessments (NTP, 1996; IARC, 1999; OECD, 2002; SCCNFP, 2002; Haz-Map; HPD).

This chemical has a reported cosmetic use including in artificial nail builders; in manicuring preparations; in nail extenders; and in face and neck preparations. 'Benzoyl peroxide is used as a chemical initiator for polymerisation of the powder component of dry acrylic polymers and pigments of the 2 component artificial nail systems. It is at a maximum concentration in the powder of 2 % and as maximum concentration of 0.7 % at the start of the polymerisation process' (SCCNFP, 2002).

The chemical has reported potential domestic use including in paints; lacquers and varnishes; adhesives; and fillers.

The chemical has reported domestic use, up to a concentration of 50 %, in a single wood filler product (HPD).

The chemical has reported commercial and site-limited uses including as an initiator in polymer production (e.g. acrylates, expandable styrene); in rubber curing; producing textile sizing agents; and as a finishing agent for some acetate yarns.

The chemicals have reported non-industrial use including as a food bleaching agent and as a topical acne treatment.

Restrictions

Australian

The chemical is listed in the *Poisons Standard—the Standard for the Uniform Scheduling of Medicines and Poisons* (SUSMP) in Schedules 2 and 4 for therapeutic use and Schedule 5 for non-therapeutic uses.

Schedule 5

'BENZOYL PEROXIDE **except**:

(a) when included in Schedule 2 or 4; or

(b) in preparations containing 5 per cent or less of benzoyl peroxide' (SUSMP, 2015).

Schedule 5 chemicals are described as 'Substances with a low potential for causing harm, the extent of which can be reduced through the use of appropriate packaging with simple warnings and safety directions on the label.' Schedule 5 chemicals are labelled with 'Caution' (SUSMP, 2015).

International

The chemical is listed on the following (Galleria Chemica):

- Association of South East Asian Nations (ASEAN) Cosmetic Directive Annex III—Part 1 List of substances which cosmetic products must not contain except subject to restrictions and conditions laid down;
- EU Regulation (EC) No 1223/2009 of the European Parliament and of the Council of 30 November 2009 on cosmetic products—Annex III—List of Substances which cosmetic products must not contain except subject to the restrictions laid down; and
- New Zealand Cosmetic Products Group Standard—Schedule 5—Table 1: Components cosmetic products must not contain except subject to the restrictions and conditions laid down.

Under these regulations, use in artificial nail systems is restricted to professional use only with a maximum concentration limit of 0.7 % after mixing. Products must be labelled with 'For professional use only', 'Avoid skin contact' and 'Read directions for use carefully'.

The chemical is also listed on the following:

- Canadian List of prohibited and restricted cosmetic ingredients (The Cosmetic Ingredient "Hotlist"), permitted at concentrations equal to or less than 10 % for use only as a catalyst in products to be applied to the fingernails or in hair dyes. The chemicals is not permitted in products to be applied to the skin;
- Philippines Restricted Ingredients For Use In Cosmetics—List of substances which must not form part of the composition of cosmetic products; and
- Thailand Cosmetic Act—Prohibited Substances.

Existing Work Health and Safety Controls

Hazard Classification

The chemical is classified as as hazardous, with the following risk phrases for human health in the Hazardous Substances Information System (HSIS) (Safe Work Australia):

- Xi; R36 (eye irritation); and
- Xi; R43 (skin sensitisation).

Exposure Standards

Australian

The chemical has an exposure standard of 5 mg/m^3 time weighted average (TWA) (HSIS).

International

The chemical, benzoyl peroxide, has an exposure limit of 5 mg/m^3 (TWA) in different countries such as Argentina, Austria, Canada, China, Croatia, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hong Kong, Hungary, Iceland, Indonesia, Ireland, Italy, Malaysia, Mexico, New Zealand (NZ), Nicaragua, Norway, Peru, Philippines, Poland, Portugal, Singapore, South Africa, the Slovak Republic, Switzerland, Spain, Taiwan, the United Arab Emirates (UAE), the United Kingdom (UK), Uruguay, and Venezuela.

In the United States (US), an 8-hour TWA threshold limit value of 5 mg/m^3 for occupational exposure to the chemical was recommended by the American Conference of Governmental Industrial Hygienists (ACGIH) with annotation for skin irritation (IARC, 1999). The level is recommended 'to minimize the potential for dermal, mucous membrane, and upper respiratory tract irritation' (ACGIH, 2011).

Health Hazard Information

Toxicokinetics

The chemical is bioavailable through oral, dermal and inhalation routes. Organic peroxides, such as this chemical, are generally absorbed in the gastrointestinal tract, metabolised in the liver, distributed in different tissues in the body and then eliminated in the urine and faeces. Enzymes such as cytochrome P450s are suggested to facilitate the metabolism of organic peroxides (EURAR, 2008; NTP; Wiley VCH).

Rapid conversion of the chemical to benzoic acid (CAS No. 65-85-0) occurs in the skin of humans and animals, with the unchanged form of the chemical undetectable in systemic circulation. The resulting metabolite is absorbed through the blood vessels in the dermis, enters into the circulation, is rapidly cleared through the kidney and excreted in the urine (OECD SIDS, 2002).

In the presence of metals and heat, the chemical decomposes to free radicals such as benzoyloxyl and phenyl radicals. Covalent binding of benzoyloxyl radicals in vitro to macromolecules has been reported (IARC, 1999). Formation of reactive free radical intermediates could induce lipid peroxidation, which ultimately results in DNA damage including alkali-labile DNA single strand breaks, DNA-protein cross-links, and decrease nucleic acid synthesis (Wiley VCH).

Acute Toxicity

Oral

The chemical has low acute toxicity based on results from animal tests following oral exposure. The median lethal dose (LD50) in rats is >5000 mg/kg bw. No deaths occurred in treated animals and only piloerection was observed as a treatment-related effect (OECD SIDS, 2002; REACH).

Dermal

No data are available. The chemical is rapidly converted to benzoic acid in the skin. Based on the data for benzoic acid, the chemical is considered to have low acute toxicity following dermal exposure (NICNAS).

Inhalation

Limited data are available. However, an acute inhalation toxicity study in male Spartan albino rats reported a median lethal concentration (LC50) of >24.3 mg/L. This study was performed according to the OECD Test Guideline (TG) 403. Although mortality did not occur, the exposure to the chemical induced clinical changes during a whole body exposure for four hours. These included salivation, squinting of the eyes, breathing difficulty, excessive shedding of tears (lacrimation), erythema, changes in respiratory rates, motor activity and ocular irritation (OECD SIDS, 2002; REACH).

Corrosion / Irritation

Skin Irritation

The chemical is reported to slightly irritate the skin in animal studies, particularly following repeated exposure. The effects were not sufficient to warrant a hazard classification.

In a skin irritation study (complying with the OECD TG 404) in New Zealand albino rabbits, dermal exposure of 500 mg of the chemical for four hours did not cause skin irritation during the 72-hour observation period (REACH). However, the irritant potential of the chemical was observed in other studies. Following 24 hours of exposure (under occlusive condition) to either 100 % or 10 % of benzoyl peroxide (in a propylene glycol solution), slight erythema was noted in guinea pigs. In rabbit studies (strain unspecified), skin irritation was observed in animals exposed to 10 %, 15 % or 30 % of the chemical for 24 hours (under occlusive conditions). In these studies, the dose required to produce irritation in half of the animals after a 24-hour exposure (ID50) was 2.52 % (OECD SIDS, 2002). In mice (strain unspecified), changes in skin cells (keratinocytes) were identified following exposure to 100 µL of a solution containing 10 % of the chemical to the entire back of the animals for six months. These changes included clear variations in the skin cells shape and size, and a focal serous crust was observed on the epidermis (OECD SIDS, 2002).

Eye Irritation

The chemical is classified as hazardous with the risk phrase 'Irritating to eyes' (Xi; R36) in the HSIS (Safe Work Australia). While the available data do not support this classification, in the absence of more comprehensive information, there is insufficient evidence to support a recommendation to amend this classification

In a study equivalent to OECD TG 405, benzoyl peroxide produced slight eye irritation following exposure (REACH; Wiley VCH). In this study, 0.1 mL of benzoyl peroxide (78 % purity) was instilled into the conjunctival sac of one eye of each rabbit. Following the exposure, some of the treated eyes were washed with water continuously for two minutes. The results indicated that if the eyes were washed within five minutes of exposure, benzoyl peroxide did not cause irritation. However, in the unwashed eyes, irritation in the form of corneal opacity, conjunctivitis, and swelling of the chemically-exposed eyes was observed. The average cornea, conjunctivae and chemosis scores (at 24, 48 and 72 hours) were 0.3, 0.55 and 0.46 respectively (REACH). All effects were reversible within seven days after exposure ceased (REACH; Wiley VCH).

Sensitisation

Skin Sensitisation

The chemical is classified as hazardous with the risk phrase ‘May cause sensitisation by skin contact’ (R43) in the HSIS (Safe Work Australia). The positive results reported in several OECD TG-compliant skin sensitisation tests support this classification.

Positive results were obtained in five independent local lymph node assays (LLNA) in female CBA/Ca or CBA/JHsd mice (OECD SIDS, 2002). In these assays (OECD TG 429 compliant), the induction concentrations tested were 0.5 %, 1.0 %, 2.5 %, 5.0 % and 10 %. The chemical, at all concentrations including the lowest of 0.5 %, produced stimulation indices (SI) significantly greater than three, indicating a strong skin sensitisation potential.

The chemical also produced positive skin sensitisation reactions in guinea pig Buehler tests (OECD TG 406). The chemical (unknown purity) was applied topically under an occlusive patch (OECD SIDS, 2002; REACH). On the challenge phase, 42 % of the treated animals displayed positive dermal reactions.

Observation in humans

The chemical has produced positive results in several patch tests performed on patients with leg ulcers or acne. Positive responses were reported in 16/30 patients who were exposed to 1 %, 0.5 % or 0.25 % of the chemical and 22/30 patients at a 1 % concentration. Several other studies reported positive results at a 1 % concentration (OECD SIDS, 2002).

In a human maximisation test, four formulations containing either 5 % or 10 % of the chemical (in a gel) were tested in 50 Caucasian college students. The results showed that 38/50 subjects developed skin sensitisation and the sensitised subjects reacted to all four formulations (OECD SIDS, 2002).

Occupational exposure to the chemical, such as in bakers and dentists, has been demonstrated to cause allergic reactions (OECD SIDS, 2002).

Over a period of 44 years, the American Food and Drug Administration (FDA) received 131 reports from both consumers and manufacturers about allergic and hypersensitivity-related adverse reactions associated with products containing benzoyl peroxide and salicylic acid. About 42 % of these reactions occurred within minutes to 24 hours of use. 'Forty percent of these reports described severe allergy symptoms such as throat tightness, shortness of breath, wheezing, low blood pressure, fainting or collapse. Isolated instances of hives, itching of face or body (even of parts of the body where the person did not apply the medication), and swelling of eyes, face and lips were also reported. Based on the information reported, FDA cannot determine if these reactions were triggered by the products' active ingredients, the inactive ingredients, or a combination of both' (US FDA, 2014).

Repeated Dose Toxicity

Oral

Based on the limited data available, repeated oral exposure to the chemical is not considered to cause serious damage to health.

In an OECD TG 422-compliant combined repeat-dose and reproduction/developmental toxicity study, Sprague Dawley (SD) rats (n = 10) were exposed to 0, 250, 500 and 1000 mg/kg bw/day of benzoyl peroxide suspended in corn oil (oral gavage) for 29 days for males and 41–51 days for females. Alterations in the reproductive parameters were observed at 1000 mg/kg bw/day (see **Reproductive and Developmental Toxicity**). No deaths or other significant effects were reported (OECD SIDS, 2002).

In Kunming mice, daily exposure (in the diet) to 200 mg/kg bw/day of the chemical for 42 days induced changes in liver enzymes and antioxidants (REACH). No mortality or other toxic effects were reported.

Dermal

No data are available. The chemical is rapidly converted to benzoic acid in the skin. Based on data for benzoic acid (NICNAS), the chemical is not likely to cause serious damage to health from repeated dermal exposure.

Inhalation

No data are available.

Genotoxicity

Based on the weight of evidence from the available in vitro and in vivo genotoxicity studies, the chemical is not considered to be genotoxic.

In vitro, the chemical induced DNA strand breaks in human bronchial epithelial cells. However, the chemical was negative in the following:

- in bacterial reverse mutation assays (Ames tests) in *Salmonella typhimurium* strains TA 97, TA 98, TA 100, TA 102, TA 104, TA 1535, TA 1537 with or without metabolic activation (OECD SIDS, 2002; REACH);
- in a mammalian cell gene mutation (thymidine kinase locus) assay in mouse lymphoma L5178Y cells with and without metabolic activation (REACH); and
- in a chromosomal aberration test in Chinese hamster lung (CHL) cells without metabolic activation (IARC, 1999; OECD SIDS, 2002).

In vivo, the chemical gave negative results in the following:

- a mammalian erythrocyte micronucleus test in female ICR mice intraperitoneally (i.p.) injected with doses up to 200 mg/kg bw; and
- a dominant lethal assay in ICR mice (i.p. injection) at doses of 54 and 62 mg/kg bw (IARC, 1999; OECD SIDS, 2002).

Carcinogenicity

Carcinogenicity studies have been conducted to investigate the potential for tumour initiation and/or promotion of the chemical. Whilst the chemical alone did not induce tumours in rats or mice, evidence for tumour promoting activity has been reported.

Several mid- to long-term dermal and oral studies (52–120 weeks) have been conducted to evaluate the carcinogenic and photocarcinogenic potential of benzoyl peroxide in rats (albino), mice (B6C3F1, Car-R, Oslo hairless, SENCAR strains) and Syrian hamsters (IARC, 1992; NTP, 1996; OECD SIDS, 2002). These studies found no evidence to suggest direct carcinogenic effects.

However, benzoyl peroxide was reported to promote skin tumours (papillomas) in some studies when applied to mice (Oslo hairless and SENCAR strains) pre-exposed to other known tumour-inducing carcinogens such as 7,12-dimethylbenz(a)anthracene (DMBA) and N-methyl-N'-nitro-N-nitrosoguanidine (MNNG) and ultraviolet (UV) irradiation. In other studies, CD-1 and B6C3F1 mice strains were found to be less sensitive to effects of the chemical (IARC, 1999; OECD SIDS, 2002).

The chemical was reported to promote the 7,12-dimethylbenz(a)anthracene (DMBA)-initiated skin tumours in Syrian hamsters. However, this study was not guideline-compliant (OECD, SIDS 2002).

In humans, cases of skin and lung tumours were reported in individuals with occupational exposure to benzoyl peroxide (IARC, 1999). In a cancer surveillance program in the Unites States, 4/7 male chemists with a history of benzoyl peroxide exposure had malignant melanoma (IARC, 1999). Lung cancers were also identified in two men who were primarily involved in producing benzoyl peroxide in a factory in Japan (IARC, 1985). However, a carcinogenic effect could not be attributed directly to benzoyl peroxide because these workers were also exposed to benzoyl chloride (IARC, 1985; IARC, 1999). No association with carcinogenicity was found when the chemical was used in acne medication in several population-based case studies (IARC, 1999; OECD, 2002).

The International Agency for Research on Cancer (IARC) concluded that the chemical is 'not classifiable as to its carcinogenicity to humans' (Group 3), based on inadequate evidence for carcinogenicity in humans and limited evidence for carcinogenicity in animal testing.

Reproductive and Developmental Toxicity

In an OECD TG 422-compliant combined repeated dose and reproduction/developmental toxicity study, SD rats (n = 10) were fed a daily diet containing 0, 250, 500 and 1000 mg/kg bw/day of benzoyl peroxide suspended in corn oil. Exposure periods were 29 days for males and 41–51 days for females (two weeks before mating to lactation day three) (OECD SIDS, 2002). The results demonstrated that exposure to 1000 mg/kg bw/day of the chemical induced changes in rat reproductive organs. These included alterations in the weight of the left testes and epididymis of male rats; degenerative testicular changes such as apoptosis (cell death); and the presence of multinucleated giant cells (swollen cells). In female rats, slight alterations in the uterus were also seen. There were no effects on precoital time, rate of copulation, fertility or gestation period. At this dose, toxic effects were also identified in the offspring including external, soft tissue and skeletal abnormalities. There was a significantly

higher incidence of runts (small and weak offspring) at 1000 mg/kg bw/day. A no observed adverse effect level (NOAEL) of 500 mg/kg bw/day was reported in this study (OECD SIDS, 2002; REACHc).

Risk Characterisation

Critical Health Effects

The critical health effects for risk characterisation are skin sensitisation and hypersensitivity-related adverse reactions. The chemical could cause skin and eye irritation, particularly following prolonged exposure. Whilst developmental effects were observed in animals, these were only seen at very high doses.

Public Risk Characterisation

Although use in cosmetic and/or domestic products in Australia is not known, the chemical is reported to be used in these products overseas.

The major cosmetic use is expected to be in nail enhancement products at low concentrations. Whilst the chemical may be used in products applied to the face and neck, the majority of these are expected to be therapeutic goods. When used in nail enhancement products, short-term small volume skin contact in the immediate vicinity of the fingernail could occur. However, the chemical is present at low concentrations and is mainly consumed (has undergone complete reaction) during the polymerisation process, minimising exposure. Penetration through the nail plate is considered negligible.

The chemical could be present in domestic products up to a concentration of 50 %. The chemical is currently listed on Schedule 5 of the SUSMP for preparations >5 %. A number of warning statements, first aid instructions and safety directions relating to skin and eye contact apply.

The current controls are considered adequate to minimise the risk to public health posed by domestic and cosmetic products containing the chemical; therefore, the chemical is not considered to pose an unreasonable risk to public health.

Occupational Risk Characterisation

During product formulation, exposure might occur, particularly where manual or open processes are used. These could include transfer and blending activities, quality control analysis, and cleaning and maintaining equipment. Worker exposure to the chemicals at lower concentrations could also occur while using formulated products containing the chemicals. The level and route of exposure will vary depending on the method of application and work practices employed.

Given the critical systemic local health effects, the chemicals could pose an unreasonable risk to workers unless adequate control measures to minimise dermal exposure are implemented. In addition, organic peroxides are strong oxidising agents and highly unstable when heated, and this could cause serious explosion and fire hazards. Hence, chemicals should be appropriately classified and labelled to ensure that a person conducting a business or undertaking (PCBU) at a workplace (such as an employer) has adequate information to determine the appropriate controls.

Based on the available data, the hazard classification in the HSIS (Safe Work Australia) is considered appropriate.

NICNAS Recommendation

Current risk management measures are considered adequate to protect public and workers' health and safety, provided that all requirements are met under workplace health and safety and poisons legislation as adopted by the relevant state or territory. No further assessment is required.

Regulatory Control

Work Health and Safety

The chemical is recommended for classification and labelling under the current approved criteria and adopted GHS as below. This assessment does not consider classification of physical hazards and environmental hazards.

Hazard	Approved Criteria (HSIS)[a]	GHS Classification (HCIS)[b]
Irritation / Corrosivity	Irritating to eyes (Xi; R36)*	Causes serious eye irritation - Cat. 2A (H319)
Sensitisation	May cause sensitisation by skin contact (Xi; R43)*	May cause an allergic skin reaction - Cat. 1 (H317)

[a] Approved Criteria for Classifying Hazardous Substances [NOHSC:1008(2004)].

[b] Globally Harmonized System of Classification and Labelling of Chemicals (GHS) United Nations, 2009. Third Edition.

[*] Existing Hazard Classification. No change recommended to this classification

Advice for consumers

Products containing the chemical should be used according to the instructions on the label.

Advice for industry

Control measures

Control measures to minimise the risk from dermal and ocular exposure to the chemicals should be implemented in accordance with the hierarchy of controls. Approaches to minimise risk include substitution, isolation and engineering controls. Measures required to eliminate, or minimise risk arising from storing, handling and using a hazardous chemical depend on the physical form and the manner in which the chemicals are used. Examples of control measures which could minimise the risk include, but are not limited to:

- air monitoring to ensure control measures in place are working effectively and continue to do so;
- health monitoring for any worker who is at risk of exposure to the chemical[s], if valid techniques are available to monitor the effect on the worker's health;
- minimising manual processes and work tasks through automating processes;
- work procedures that minimise splashes and spills;
- regularly cleaning equipment and work areas; and
- using protective equipment that is designed, constructed, and operated to ensure that the worker does not come into contact with the chemicals.

Guidance on managing risks from hazardous chemicals are provided in the *Managing risks of hazardous chemicals in the workplace—Code of practice* available on the Safe Work Australia website.

Personal protective equipment should not solely be relied upon to control risk and should only be used when all other reasonably practicable control measures do not eliminate or sufficiently minimise risk. Guidance in selecting personal protective equipment can be obtained from Australian, Australian/New Zealand or other approved standards.

Obligations under workplace health and safety legislation

Information in this report should be taken into account to help meet obligations under workplace health and safety legislation as adopted by the relevant state or territory. This includes, but is not limited to:

- ensuring that hazardous chemicals are correctly classified and labelled;
- ensuring that (material) safety data sheets ((M)SDS) containing accurate information about the hazards (relating to both health hazards and physicochemical (physical) hazards) of the chemicals are prepared; and
- managing risks arising from storing, handling and using a hazardous chemical.

Your work health and safety regulator should be contacted for information on the work health and safety laws in your jurisdiction.

Information on how to prepare an (M)SDS and how to label containers of hazardous chemicals are provided in relevant codes of practice such as the *Preparation of safety data sheets for hazardous chemicals—Code of practice* and *Labelling of workplace hazardous chemicals—Code of practice*, respectively. These codes of practice are available from the Safe Work Australia website.

A review of the physical hazards of these chemicals has not been undertaken as part of this assessment.

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