tert-butyl catechol: Human health tier II assessment

26 October 2018

Chemicals in this assessment

Chemical Name in the Inventory	CAS Number
1,2-Benzenediol, 4-(1,1-dimethylethyl)-	98-29-3
1,2-Benzenediol, (1,1-dimethylethyl)-	27213-78-1

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

Grouping Rationale

The chemicals, 1,2-benzenediol, 4-(1,1-dimethylethyl)- (CAS No. 98-29-3) and 1,2-benzenediol, (1,1-dimethylethyl)- (CAS No. 27213-78-1) are assessed together in this report because of their close structural similarities and metabolically related characteristics. Similar or identical metabolites are expected. These chemicals have been grouped together for assessment due to their similar toxicological properties and uses.

The following synonyms and their corresponding CAS numbers will be used in this assessment:

- 4-tert butylcatechol (4-TBC) (CAS No. 98-29-3); and
- tert butylcatechol (TBC) (CAS No. 27213-78-1).

Import, Manufacture and Use

Australian

No specific Australian use, import, or manufacturing information has been identified.

International

The following international uses have been identified through the European Union (EU) Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) dossiers; Galleria Chemica; the Substances and Preparations in Nordic countries (SPIN) database; the European Commission Cosmetic Ingredients and Substances (CosIng) database; the OECD High Production Volume chemical program (OECD HPV); the US Environmental Protection Agency's Aggregated Computer Toxicology Resource (ACToR); the US National Library of Medicine's Hazardous Substances Data Bank (HSDB); European Chemicals agency (ECHA); and National Toxicology Program Toxicity Report Series on p-tert-butylcatechol (NTP, 2002).

The chemicals have reported site-limited uses, including as an:

- intermediate in commercial products such as rubber gloves, medical prostheses, photoprocessing, fiberglass-reinforced polyester products, shoe adhesives and resins etc; and
- antioxidant, stabiliser and polymerisation inhibitor for styrene, butadiene, neoprene and other olefins;

Restrictions

Australian

No known restrictions have been identified.

International

The chemical, 4-TBC is listed on the following (Galleria Chemica):

- EU Cosmetics Regulation 1223/2009 Annex II—List of substances prohibited in cosmetic products;
- New Zealand Cosmetic Products Group Standard—Schedule 4: Components cosmetic products must not contain;
- Health Canada List of prohibited and restricted cosmetic ingredients (The Cosmetic Ingredient 'Hotlist'); and
- The Association of South East Asian Nations (ASEAN) Cosmetic Directive Annex II Part 1— List of substances which must not form part of the composition of cosmetic products.

No known international restrictions have been identified for TBC.

Existing Worker Health and Safety Controls

Hazard Classification

The chemicals are not listed on the Hazardous Chemical Information System (HCIS) (Safe Work Australia).

Exposure Standards

Australian

No specific exposure standards are available.

International

The following exposure standards are identified for 4-TBC (Galleria Chemica).

An exposure limit of 2 mg/m^3 short-term exposure limit (MAK/occupational exposure limit (OEL) in different countries such as Russia, Belarus and Germany.

Temporary Emergency Exposure limits (TEELs) defined by the US Department of Energy (DOE) are reported as:

TEEL-1 = 0.18 mg/m^3;

TEEL-2 = 2 mg/m^3; and

TEEL-3 = 560 mg/m^3

Health Hazard Information

Limited data are available for TBC (CAS No. 27213-78-1). Therefore, health hazard information available for 4-TBC (CAS No. 98-29-3) is considered appropriate, as an analogue for read across, to derive the local and systemic hazards of the chemicals in this group.

Toxicokinetics

The chemical, 4-tert-butylpyrocatechol (4-TBC) is well absorbed following oral and dermal routes of exposure. Dermal absorption is dose dependent. The chemical is not expected to bioaccumulate in the tissues. TBC reached peak concentrations in plasma one hour after an oral dose of 200 mg/kg bw and in two hours after a dermal application of 60 mg/kg bw (NTP, 2002).

In a study conducted according to OECD Test Guideline (TG) 417, male Fischer 344 (F344/N) rats (n=4/sex/dose) were administered a single oral dose of radiolabelled chemical at 2200 or 1000 mg/kg bw. Around 90 % of the administered oral dose was recovered, indicating high oral absorption rate. The major route of excretion was via urine, primarily as conjugates and other polar metabolites. Negligible amounts of radioactivity was found in the gastrointestinal tract tissues (NTP, 2002; REACH).

In a similar study, four male B6C3F1 mice were administered a single dose of radiolabelled chemical at 300 mg/kg bw by gavage. Around 50 % of the administered dose was excreted by 24 hours and around 90 % by 72 hours, primarily via urine. Tissues did not show high concentrations of the radioactivity, but faeces showed a relatively high concentration of radioactivity (NTP, 2002; REACH).

Acute Toxicity

Oral

The chemicals have moderate to low acute toxicity based on results from animal tests following oral exposure, warranting hazard classification (see **Recommendation** section). The median lethal dose (LD50) for 4-TBC in rats is 815 mg/kg bw (REACH).

In an acute oral toxicity study conducted according to OECD TG 401, Sprague Dawley (SD) rats (n= 5/sex/dose) were administered a single dose of 4-TBC (95 % purity) in paraffin oil at 490, 680, 800 or 1200 mg/kg bw and 2000 mg/kg bw (males) and 680 or 880 mg/kg bw and 2000 mg/kg bw (females). Mortality observed in males were 0 % (490 mg/kg bw); 20 % (680 mg/kg bw); 60 % (880 mg/kg bw); 100 % (1200 mg/kg bw) and 100 % (2000 mg/kg bw) and in females were 0 % (680 mg/kg bw); 60 % (880 mg/kg bw) and 100 % (2000 mg/kg bw). Other effects included decrease in body weight gain and signs of ulceration in the stomach at all treatment doses. The LD50 in rats was determined to be 815 mg/kg bw (REACH).

In another oral study, 4-TBC (85 % purity) was administered as a single oral dose to SD rats (n=5/sex/dose) at 0, 519, 615, 721 or 869 mg/kg bw. Mortality observed was 0 % (0 mg/kg bw); 0 % (519 mg/kg bw); 20 % (615 mg/kg bw); 20 % (721 mg/kg bw) and 80 % (869 mg/kg bw). All animals exhibited decreased activity, lethargy or coma, piloerection and siarrlorrhoea (hypersalivation) and delayed growth. Necropsy examination revealed congestive areas with desquamation in the mucosa of the non-glandular stomach and adhesion between liver, spleen, stomach, diaphragm and abdominal wall. The LD50 was 817–821 mg/kg bw (REACH).

Dermal

The chemicals have moderate acute toxicity based on results from animal tests following dermal exposure, warranting hazard classification (see **Recommendation** section). The median lethal dose (LD50) in rats is 1331 mg/kg bw.

In an acute dermal study, conducted according to OECD TG 402 in SD rats (n=5/sex/dose), 4-TBC in paraffin oil was applied to the skin at 500, 750, 1120 or 1690 and 2000 mg/kg bw in males and 750 or 1120 and 2000 mg/kg bw in females for 24 hours via semiocclusive patch. Mortality was recorded as 100 % (2000 mg/kg bw, both sexes); in males 0 % (500 mg/kg bw); 0 % (750 mg/kg bw); 60 % (1120 mg/kg bw) and 40 % (1690 mg/kg bw) and in females 40 % (750 mg/kg bw) and 60 % (1120 mg/kg bw). Clinical signs included sedation, hyperkinesia, dyspnoea and signs of severe cutaneous reactions in all treated animals. An LD50 of 1331 mg/kg bw (95 % confidence intervals of 954–1863 mg/kg bw) was determined (REACH).

A dose of 2003 mg/kg bw 4-TBC applied to the skin of rabbits (semiocclusive) for 24 hours induced no mortality in male rabbits and 80 % mortality in females. Reported effects were subdued behaviour, lethargy, coma, prostration, ptosis, watery eyes and piloerection. These effects were reversible on day 3–4 of the treatment. Cutaneous effects observed on day 2–14 included erythema, visible oedema and eschar followed by dryness and desquamation. The LD50 from this study was >2003 mg/kg bw (REACH).

Inhalation

The chemicals are of low acute toxicity following inhalation exposure based on the limited data available. No median lethal concentration (LC50) values are available for the chemical.

Corrosion / Irritation

Corrosivity

Studies were performed in accordance with OECD test guidelines. The results showed that the chemicals are corrosive to rabbit skin and eyes, warranting hazard classification (see **Recommendation** section).

In a skin irritation study conducted according to OECD TG 404, male hybrid albino New Zealand White (NZW) rabbits were treated dermally with 0.5 mL undiluted 4-TBC (85 % in water), under a semiocclusive patch for 4 hours. All rabbits exhibited severe erythema and moderate to severe oedema with mean scores of 4 and 3.34, respectively. Severe erythema was not reversible after 14 days (REACH).

In another study on three NZW rabbits, 0.5 g 4-TBC was applied (details not provided) to the skin of animals (semiocclusive patch) for three mins. All animals showed necrosis with slight oedema, which persisted on two treatment sites up to day 14 post-exposure (REACH).

The chemical, 4-TBC has been reported to induce severe dermal irritation when applied to the skin of rabbits at 500 mg for 24 hours (NTP, 2002).

In an eye irritation study in rabbit, 4-TBC (50 µg) was found to be highly irritating with conjunctivitis and marked-to-dense corneal opacity observed at 24, 48 and 72 hours after application (REACH). Effects were reversible within the observation period.

In an OECD TG 405 study on six male NZW rabbits, 0.1 mL 4-TBC (85 % in water) was reported to cause severe corneal opacity (mean score 4), iris lesions (mean score 2), moderate to severe chemosis (mean score 4) and conjunctival redness (mean score 3) in all treated animals. The effects were not reversible after 21 days post-exposure (REACH).

In a limited data study (details not provided), 4-TBC was reported to cause severe eye irritation when applied as a 50 mg dose to rabbit eyes (NTP, 2002; REACH).

Sensitisation

Skin Sensitisation

The chemicals are considered to be moderate to strong skin sensitisers based on the positive results seen in a single guinea pig maximisation test (GPMT) and local lymph node assay (LLNA), warranting hazard classification (see **Recommendation** section).

In a guinea pig maximisation study (full details not provided), 25 µL of 4-TBC (16.7 %) were applied to the skin of Dunkin-Hartley guinea pigs (n=24 females) which had previously been induced with the chemical at 3.4 % (2–3 weeks before). Challenge results at 7.50 % and 10 % showed positive sensitisation reactions in up to 20/24 animals(REACH).

In an LLNA conducted according to OECD TG 429, 4-TBC was considered to be a skin sensitiser in female CBA mice. The chemical (85 % in water, in a mixture of ethanol/water) at concentrations of 1, 2.5 or 5 % was topically applied once a day for three days. Stimulation indices of 15.35, 47.05 and 63.26 were reported, respectively. An EC3 value of <1 % was determined (REACH).

In another study in mice, 0.3 mL solution of 4-TBC in DMSO (30:70) was applied three times at a 48-hour interval on the skin of hairless mice. The chemical induced glutathione reductase activity along with development of melanosomes with altered ultrastructure (pheomelanogenesis) followed by melanocyte degeneration and loss of skin pigment (NTP, 2002).

Observation in humans

The positive animal data are supported by the human clinical studies detailed below.

The chemical is reported to be skin sensitiser causing dry, reddish, oedematous contact dermatitis in 4/9; 5/8; 6/6, 4/40, 6/65, 3/29 and 13/294 subjects in various occupational patch studies (REACH).

In various case studies allergic dermatitis with depigmentation and leukoderma on the hands, arms and face were reported in workers exposed to the chemical or the products containing the chemical (NTP, 2002).

Repeated Dose Toxicity

Oral

Based on the available data, the chemicals are not expected to be harmful to health following repeated oral exposure.

In a 14-week repeated dose toxicity study, F344/N rats (n=10/sex/dose) were orally administered 4-TBC in diet at concentrations of 0, 781, 1562, 3125, 6250 or 12500 ppm (equivalent to 0, 70, 135, 270, 525 and 1030 mg/kg bw in males and 0, 70, 145, 265, 555 and 1010 mg/kg bw in females). No mortality was recorded. Significant reduction (-4.5 % to -23 %) in the mean body weights of males at ≥ 1562 ppm and in females at ≥ 3125 ppm, as compared to the controls, was observed. All rats in 6250 and 12500 ppm dose groups on day 4 showed increased haematocrit values, haemoglobin concentrations and erythrocyte counts, indicating erythrocytosis. A transient hepatic effect was demonstrated by increased alanine aminotransferase activities in all treated groups. All treated animals showed significant incidences of hyperkeratosis of the forestomach and the incidence of hyperplasia of the forestomach epithelium significantly increased in males and females exposed to ≥ 3125 ppm. A no observed adverse effect level (NOAEL) of 781 ppm (equivalent to 70 mg/kg bw/day) was established (NTP, 2002; REACH).

In a 14-week study conducted according to OECD TG 408, groups of B6C3F1 mice (n= 10/sex/dose) were administered 4-TBC mixed in feed at concentrations of 0, 781, 1562, 3125, 6250 or 12500 ppm (equivalent to doses of 0, 150, 300, 635, 1300 and 2815 mg/kg bw in males and 0, 135, 300, 610, 1400 and 2440 mg/kg bw in females). No mortality was recorded. Significant reduction (-6 % to -22 %) in the mean body weights in males and females at 6250 ppm and above was observed. Haematology parameters and feed consumption were not altered significantly. All treated females at 12500 ppm showed significant incidence of hyperkeratosis of the forestomach epithelium. Significant increased incidence of hyperplasia of the forestomach epithelium was observed in males at 12500 ppm and in females at 6250 and 12500 ppm. A no observed effect level (NOEL) of 1562 ppm (equivalent to 300 mg/kg bw/day) was reported based on decreased body weights (NTP, 2002; REACH).

Dermal

No data are available.

Inhalation

No data are available.

Genotoxicity

Based on the weight of evidence from the available *in vitro* and *in vivo* genotoxicity studies, the chemicals are not considered to be genotoxic. Some *in vitro* genotoxicity tests indicated positive results, but all *in vivo* tests were negative.

In vitro studies

The available *in vitro* studies gave both positive and negative results for the chemical, 4-TBC (NTP, 2002; REACH).

In a bacterial reverse mutation assay conducted according to OECD TG 471, the chemical gave negative results in *Salmonella typhimurium* strains TA98, TA100, TA1535, TA 1537 and TA1538, at concentrations up to 1000 µg/plate with metabolic activation; and at concentrations up to 250 µg/plate without metabolic activation (NTP, 2002; REACH).

In a bacterial reverse mutation assay (OECD TG 471), the chemical gave negative results in *S. typhimurium* strain TA100 at concentrations up to 500 µg/plate with metabolic activation (NTP, 2002; REACH).

In a mammalian chromosome aberration assay (OECD TG 473), the chemical did not induce any increase in the chromosomal aberrations test in Chinese hamster ovary (CHO) cells at concentrations up to 20 µg/mL, with and without metabolic activation (NTP, 2002; REACH).

In an in vitro mammalian gene mutation study (OECD TG 490), positive mutagenic results were observed with the chemical in L5178Y mouse lymphoma cells, in the presence of metabolic activation, at concentrations up to 40 µg/mL (NTP, 2002; REACH).

In vivo studies

The available *in vivo* studies gave negative results (NTP, 2002; REACH).

In a mammalian erythrocyte micronucleus test (OECD TG 474), the chemical was intraperitoneally administered to five male F344/N rats as daily injections for three days at doses of 0, 125, 250 or 300 mg/kg bw/day. No clinical signs of toxicity and no increase in micronucleus incidences were observed (NTP, 2002; REACH).

In another micronucleus test in B6C3F1 mice, the chemical was not mutagenic (NTP, 2002; REACH).

Carcinogenicity

Based on the available data, the chemicals are not expected to be carcinogenic.

In a one-year study, two groups of rats (Group 1 and 2) were administered 4-TBC (1.5 %) in diet for 51-weeks. Group 1 was pre-treated with 150 mg/kg dose of an initiating agent (N-methyl-N'-nitro-N-nitroso guanidine (MNNG)) via stomach tube. All 16 animals from group 1 had hyperplasia of the forestomach; papilloma (15/16); carcinoma *in situ* (4/16); and squamous cell carcinoma (12/16). Group 2 animals had hyperplasia of the forestomach and 1/16 had papilloma. Based on the lack of response in the uninitiated animals, lack of relevance of the target organ (forestomach), the route of exposure and the mode of action of tumour-promoting activity, the chemical is not considered to be carcinogenic in humans (NTP, 2002; REACH).

Reproductive and Developmental Toxicity

Based on the limited information available, the chemicals cause specific reproductive or developmental toxicity, warranting hazard classification (see **Recommendation** section).

In a 14-week combined repeated dose-reproductive toxicity study, F344/N rats (n=10/sex/dose) were orally administered 4-TBC in diet at doses of 0, 781, 1562, 3125, 6250 or 12500 ppm (equivalent to 0, 70, 135, 270, 525 and 1030 mg/kg bw/day in males and 0, 70, 145, 265, 555 and 1010 mg/kg bw/day in females). Significantly reduced absolute left cauda epididymis (15 %), epididymis (10 %) and testes weights (9 %) were observed in male rats at 12500 ppm. The number of spermatid heads per testes and epididymal sperm motility of males in this group were significantly reduced. Females in the 6250 and 12500 ppm dose groups had decreased numbers of cycling with decrease in regular oestrous cycles. Length of oestrous cycles were concentration dependent. Females in the higher dose groups had significantly longer oestrous cycles as compared to the control values. The NOEL for reproductive toxicity was 6250 ppm (525 mg/kg bw/day) for males and <3125 ppm (265 mg/kg bw/day) for females (NTP, 2002; REACH).

In a 14-week repeated dose toxicity study conducted according to OECD TG 408, groups of B6C3F1 mice (n= 10/sex/dose) were orally administered 4-TBC at doses of 0, 781, 1562, 3125, 6250 or 12500 ppm (equivalent to doses of 0, 150, 300, 635, 1300 or 2815 mg/kg bw/day in males and 0, 135, 300, 610, 1400 or 2440 mg/kg bw/day in females). No mortality was recorded. No significant, biologically relevant reproductive effects were seen in male mice. High dose females (12500 ppm) had significantly longer oestrous cycles as compared to the controls (+19 %). The NOEL for reproductive toxicity was 12500 ppm (2815 mg/kg bw/day) for males and 6250 ppm (1400 mg/kg bw/day) for females (NTP, 2002; REACH).

Risk Characterisation

Critical Health Effects

The critical health effects for risk characterisation include systemic acute effects (acute toxicity from oral and dermal exposure) and local effects (corrosivity, skin sensitisation). At high doses, there may be effects in fertility.

Public Risk Characterisation

Given the uses identified for the chemicals, it is unlikely that the public will be exposed. Hence, the public risk from the chemicals in this group are not considered to be unreasonable.

Occupational Risk Characterisation

During product formulation, oral, dermal and ocular 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 chemical at lower concentrations could also occur while using formulated products containing the chemical. The level and route of exposure will vary depending on the method of application and work practices employed.

Given the critical systemic acute and local health effects, the chemicals could pose an unreasonable risk to workers unless adequate control measures to minimise oral, dermal and ocular exposure are implemented. The 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.

The data available support an amendment to the hazard classification in the HCIS (Safe Work Australia) (see **Recommendation** section).

NICNAS Recommendation

Assessment of the chemicals in this group is considered to be sufficient provided that risk management recommendations are implemented and all requirements are met under workplace health and safety and poisons legislation as adopted by the relevant state or territory.

Regulatory Control

Public Health

Work Health and Safety

The chemicals in this group are recommended for classification and labelling aligned with the Globally Harmonized System of Classification and Labelling of Chemicals (GHS) as below. This does not consider classification of physical hazards and environmental hazards.

From 1 January 2017, under the model Work Health and Safety Regulations, chemicals are no longer to be classified under the Approved Criteria for Classifying Hazardous Substances system.

Hazard	Approved Criteria (HSIS)[a]	GHS Classification (HCIS)[b]
Acute Toxicity	Not Applicable	Harmful if swallowed - Cat. 4 (H302) Harmful in contact with skin - Cat. 4 (H312)
Irritation / Corrosivity	Not Applicable	Causes severe skin burns and eye damage - Cat. 1A (H314)
Sensitisation	Not Applicable	May cause an allergic skin reaction - Cat. 1A (H317)
Reproductive and Developmental Toxicity	Not Applicable	Suspected of damaging fertility - Cat. 2 (H361f)

[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 chemicals should be used according to the instructions on the label.

Advice for industry

Control measures

Control measures to minimise the risk from oral, 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 chemical is used. Examples of control measures that could minimise the risk include, but are not limited to:

- using closed systems or isolating operations;
- health monitoring for any worker who is at risk of exposure to the chemical, if valid techniques are available to monitor the effect on the worker's health;
- air monitoring to ensure control measures in place are working effectively and continue to do so;

- minimising manual processes and work tasks through automating processes;[5]
- 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 chemical.

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 chemical 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 the chemicals has not been undertaken as part of this assessment.

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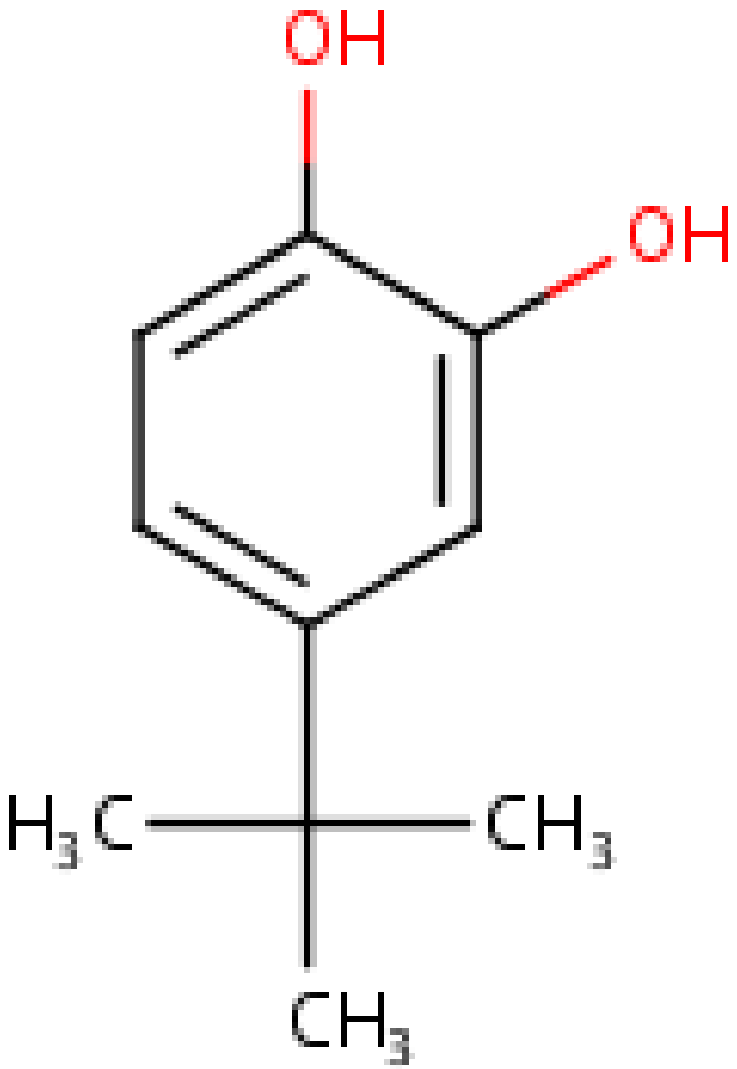
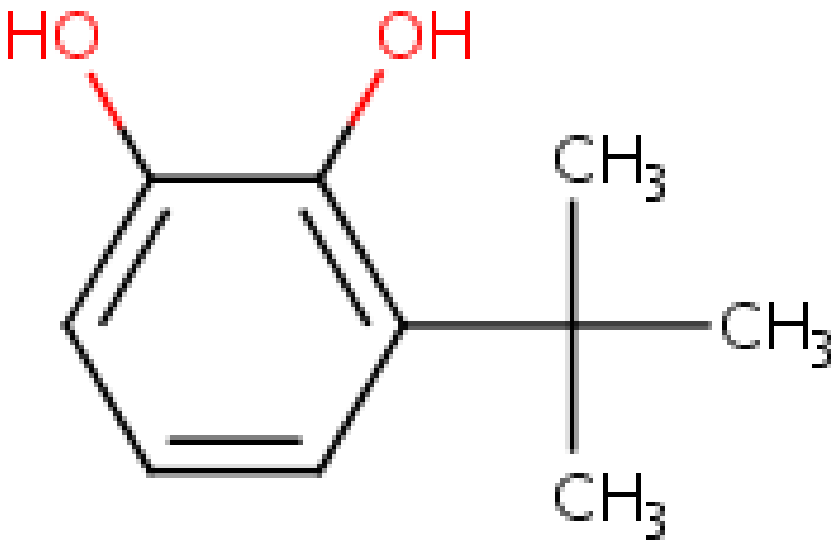
Last Update 26 October 2018

Chemical Identities

Chemical Name in the Inventory and Synonyms	**1,2-Benzenediol, 4-(1,1-dimethylethyl)-** 4-tert-butyl pyrocatechol p-tert-butylcatechol 4-TBC
CAS Number	98-29-3
Structural Formula	

	
Molecular Formula	C10H14O2
Molecular Weight	166.2

Chemical Name in the Inventory and Synonyms	**1,2-Benzenediol, (1,1-dimethylethyl)-** tert-butylcatechol (TBC)
CAS Number	27213-78-1
Structural Formula	

	
Molecular Formula	C10H14O2
Molecular Weight	166.2

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