SIDS INITIAL ASSESSMENT PROFILE

CAS No.	89-72-5
Chemical Name	2-sec-Butylphenol
Structural Formula	HO

SUMMARY CONCLUSIONS OF THE SIAR

Physical-chemical properties

2-sec-Butylphenol is a pale yellow clear liquid. Melting point and boiling point are 16 °C and 228 °C respectively. Density is 0.9804 g/m³ at 25 °C. Vapour pressure at 25 °C extrapolated from the experimental value is 109 Pa. Partition coefficient between octanol and water (log K_{ow}) is 3.49 and water solubility is 1520 mg/L at 20 °C. Dissociation constant (pKa) is 10.48 at 25 °C shows that 2-sec-butylphenol exists primarily as its neutral species in the environment at pH values between 6 and 9. Soil adsorption coefficient (log K_{oc}) is 3.242.

Human Health

No specific studies were conducted on absorption, distribution, metabolism, or excretion in mammals. Death was observed in acute oral and dermal toxicity tests, and 2-sec-butylphenol was considered to be absorbed via the gastrointestinal tract or skin.

Oral LD₅₀ values were >500 and <1000 mg/kg bw (in corn oil) in male and female Crj:CD(SD) rats (OECD TG 401), > 200 and < 2000 mg/kg bw (in arachis oil) in SD rats (OECD TG 401), 340 mg/kg (undiluted) in CD male and female rats, and > 600 and < 2400 mg/kg bw in guinea pigs. Effects were observed on body posture, behavior, and respiration, and pathological lesions in the digestive and respiratory organs in rats. Dermal LD₅₀ values were 5560 mg/kg bw in rabbits and >1500 and < 3000 mg/kg bw in guinea pigs. The inhalation LC₅₀ value for 4-h exposure was >1.78 mg/L (vapor) in rats.

In rabbits, 2-sec-butylphenol caused corrosion in four reliable skin irritation assays (one study was conducted following OECD TG 404, the other three studies did not follow OECD Guidelines) and irreversible eye irritation by the Draize method.

Neither experimental data in animals nor human case reports were available for skin sensitization. The OECD QSAR application tool box showed a negative result on skin sensitization by three kinds of profiling analysis (protein binding by OASIS, protein binding by OECD, Protein Binding Potency) which predict the potential of a chemical to bind to protein.

In a repeated-dose oral toxicity study in rats, following OECD TG 422, 2-sec-butylphenol was administered by gavage to 13 animals/sex/dose at 0 (vehicle, corn oil), 12, 60, and 300 mg/kg bw/day for 42 days (males) or from 14 days before mating until the third day of lactation (females; total, 49 days). No death was observed in either sex. Treatment-related effects such as transient salivation after dosing, decreased activity, prone lateral position, ataxic gait, and incomplete eyelid opening were observed at dose levels of 300 mg/kg bw/day. Some of these clinical signs such as salivation and decreased locomotor activity were also observed in males administered 60 mg/kg bw/day. Increase in relative liver weight was observed in males and females at a dose level of 300 mg/kg bw/day. Histopathological examination of the liver revealed hypertrophy of the centrilobular hepatocytes in males administered 300 mg/kg bw/day but not in females treated with the same dose. No treatment-related effects on body weight, food consumption, hematological findings, biochemical findings, or macroscopic findings were observed at any dose. Based on the clinical signs in males at 60 mg/kg bw/day and the clinical signs and the

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effects on the liver in females at 300 mg/kg bw/day, the no-observed-adverse-effect levels (NOAELs) for repeated-dose oral toxicity were considered to be 12 and 60 mg/kg bw/day for male and female rats, respectively.

In a bacterial reverse mutation assay performed according to OECD TG 471 and 472 and two other studies, 2-sec-butylphenol was negative in *Salmonella typhimurium* and *Escherichia coli* WP2*uvrA* with and without metabolic activation. In an *in vitro* chromosomal aberration test (OECD TG 473 and Japanese guidelines for screening mutagenicity of chemicals) in Chinese hamster lung fibroblast (CHL/IU) cells, it was positive with and without metabolic activation. In an *in vivo* micronucleus assay performed in rats according to OECD TG 474 in rats, 2-sec-butylphenol was negative. Based on these results, 2-sec-butylphenol was considered to be non genotoxic *in vivo*.

No data was available on the carcinogenicity of 2-sec-butylphenol.

2-sec-Butylphenol was investigated in a reproductive and developmental toxicity screening test conducted in rats according to OECD TG 422. 2-sec-Butylphenol was administered by gavage to 13 animals/sex/dose at 0, 12, 60, and 300 mg/kg bw/day for 42 days (males) and from 14 days before mating until the third day of lactation (females; total, 49 days). No adverse effects on reproductive/developmental parameters were observed at any dose level tested. Based on these results, the NOAEL for reproductive and developmental toxicity was considered to be 300 mg/kg bw/day.

2-sec-Butylphenol may have properties that are hazardous for human health (skin/eye irritation and repeated-dose toxicity). Adequate screening data are available to characterize the human health hazard for the purposes of the Cooperative Chemicals Assessment Programme.

Environment

2-sec-Butylphenol entering in the atmosphere is expected to be degraded by hydroxyl radicals. Using AOPWIN (version 1.92a), a calculated half-life time of 0.242 days and a rate constant of 44.1×10^{-12} cm³/molecule-sec are obtained for the indirect photo-oxidation of 2-sec-butylphenol by reaction with hydroxyl radicals in air. Concentration of hydroxyl radicals was assumed to be 1.5×10^{6} OH/cm³ and time frame of hydroxyl radicals is 12 hours/day.

2-sec-Butylphenol is not hydrolyzed due to the lack of hydrolysable functional groups. A study according to OECD test-guideline 111 showed no hydrolysis of 2-sec-butylphenol in water at pH 4, 7 and 9 in 50 $^{\circ}$ C after five days.

An OECD test guideline 301C test was conducted in compliance with GLP on 2-sec-butylphenol with activated sludge at a test concentration of 100 mg/L. The test result showed 0 % biodegradation by BOD after four weeks. The low degradation observed might be caused by toxicity to micro-organisms at the concentration tested. EC_{50} value of 2-sec-butylphenol to the micro-organims is < 100 mg/L according to a study following OECD test guideline 209 without GLP compliance. Another study according to OECD test guideline 301D in compliance with GLP at both test concentrations of 1.5 mg/L and 3.0 mg/L showed 63 % biodegradation by BOD within a 10-day window after four weeks with an inoculum obtained from a municipal sewage treatment plant. An inherent biodegradation study with OECD test guideline 302C without GLP compliance indicated 90-91 % biodegradation by BOD after four weeks. Overall, 2-sec-butylphenol is considered to be readily biodegradable.

In a study performed according to OECD test-guideline 305 with carp exposed to 2-sec-butylphenol, bio-concentration factors of 27 and 16 were obtained for concentrations of 1 μ g/L and of 10 μ g/L respectively for a 28-day exposure period. Using an octanol-water partition coefficient (log Kow) of 3.49, a bio-concentration factor of 101.5 was calculated with BCFBAF, version 3.00. This chemical is not expected to bioaccumulate.

Fugacity modelling (level III) for 2-sec-butylphenol was conducted using EPISUITE, version 4.0. When equal and continuous release to air, water and soil is assumed, 2-sec-butylphenol is mainly distributed in water and soil compartments. If released to the water compartment only, 2-sec-butylphenol stays in the water compartment. A Henry's law constant of 10.8 Pa.m³/mole at 20/25 °C suggests that volatilization of 2-sec-butylphenol from water is expected to be moderate.

The following acute toxicity test results have been determined for aquatic species:

Fish [Oryzias latipes]:	96 h LC_{50} = 6.0 mg/L (nominal, semistatic), OECD-TG 203
Daphnid [Daphnia magna]:	48 h EC ₅₀ = 4.0 mg/L (nominal, semistatic), OECD-TG 202
	48 h EC ₅₀ = 3.7 mg/L (measured, static), OECD-TG 202

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Shrimp[Crangon septemspinosa]:	96 h LC ₅₀ = 1.3 mg/L (measured, semistatic)	
Algae[Pseudokirchneriella subcapitata]:	72 h $ErC_{50} = 6.9 \text{ mg/L}$ (nominal, growth rate, static),	
	OECD-TG 201	
	72 h $ErC_{50} = 10 \text{ mg/L}$ (measured, growth rate, static),	
	OECD-TG 201	
	72 h EbC ₅₀ = 3.6 mg/L (nominal, area under growth curve, static),	
	OECD-TG 201	
Micro-organisms:	3 h EC ₅₀ < 100 mg/L, OECD-TG 209	
The following chronic toxicity test results have been determined for aquatic species:		
Daphnid [Daphnia magna]:	21 d LOEC = 1.0 mg/L (nominal, semistatic), OECD-TG 211	
	21 d NOEC = 0.32 mg/L (nominal, semistatic), OECD-TG 211	
Algae[Pseudokirchneriella subcapitata]:	72 h NOErC = 1.8 mg/L (nominal, growth rate, static),	
	OECD-TG 201	
	72 h NOErC = 0.82 mg/L (measured, growth rate, static),	
	OECD-TG 201	
	72 h NOEbC = 1.8 mg/L (nominal, area under growth curve,	
	static),OECD-TG 201	

2-sec-Butylphenol possesses properties indicating a hazard for the environment (acute aquatic toxicity values between 1 and 10 mg/L for fish, invertebrate and algae and chronic toxicity below 1 mg/L for invertebrate). This chemical is considered to be readily biodegradable and has a low potential for bioaccumulation. Adequate screening-level data are available to characterize the hazard to the environment for the purposes of the OECD Cooperative Chemicals Assessment Programme.

Exposure

Total amounts of production and import of 2-sec-butylphenol in 2007 and 2008 reported in Japan (sponsor country) were 421 and 265 tonnes/year, respectively. Worldwide production volumes are not available.

2-sec-Butylphenol is obtained with high selectivity by reaction of phenol with n-butenes at 250-300 °C using gamma- aluminum trioxide as catalyst and at a pressure of 3.5×10^6 - 8.0×10^6 Pa which keeps both reactants in the liquid phase. 2-sec-Butylphenol is used as a chemical intermediate in preparation of resins, plasticizers, surface-active agents. In Japan (sponsor country), 2-sec-butylphenol is used as a raw material in agrochemicals and liquid-crystal materials.

No detailed information concerning the release during manufacturing and processing was obtained. 2-sec-Butylphenol may result in a limited release to the environment as this chemical is used as an intermediate or raw material.

Although this chemical is to be produced in a closed system, occupational exposure through inhalation of vapour and dermal route is anticipated when a worker handles this chemical directly.

As 2-sec-butylphenol is used as an intermediate or a raw material, no consumer exposure is expected.

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