

Cresol/Cresylic Acid

CRESOL/CRESYLIC ACID (A) o-CRESOL m-CRESOL p-CRESOL

1319-77-3, 95-48-7, 108-39-4, 106-44-5

Hazard Summary

Ambient air contains low levels of cresols from automobile exhaust, power plants, and oil refineries. Acute (short-term) inhalation exposure by humans to mixed cresols results in respiratory tract irritation, with symptoms such as dryness, nasal constriction, and throat irritation. Mixed cresols are also strong dermal irritants. No information is available on the chronic (long-term) effects of mixed cresols in humans, while animal studies have reported effects on the blood, liver, kidney, and central nervous system (CNS), and reduced body weight, from oral and inhalation exposure to mixed cresols. Several animal studies suggest that o-cresol, m-cresol, and p-cresol may act as tumor promoters. EPA has classified o-cresol, m-cresol, and p-cresol as Group C, possible human carcinogens.

Please Note: The main sources of information for this fact sheet are EPA's IRIS (4), which contains information on oral chronic toxicity and the [RfD](#), and the carcinogenic effects of cresols, and the Agency for Toxic Substances and Disease Registry's (ATSDR's) Toxicological Profile for Cresols. (1)

Uses

- Mixed cresols are used as disinfectants, preservatives, and wood preservatives. (1)
- o-Cresol is used as a solvent, disinfectant, and chemical intermediate. (1)
- m-Cresol is used to produce certain herbicides, as a precursor to the pyrethroid insecticides, to produce antioxidants, and to manufacture the explosive, 2,4,6-nitro-m-cresol. (1)
- p-Cresol is used largely in the formulation of antioxidants and in the fragrance and dye industries. (1)

Sources and Potential Exposure

- Mixed cresols may be found in ambient air; sources are car exhaust, electrical power plants, municipal solid waste incinerators, oil refineries, and cigarettes. (1)
- People in residential areas where homes are heated with coal, oil, or wood may be exposed to mixed cresols in the air. (1)
- Some foods, such as tomatoes, ketchup, asparagus, cheeses, butter, bacon, and smoked foods, as well as beverages, such as red wine, raw and roasted coffee and black tea, contain mixed cresols. (1)
- Occupational exposure to mixed cresols may also occur at workplaces where mixed cresols and/or cresol containing products are produced or used. (1)

Assessing Personal Exposure

- Mixed cresols can be measured in the urine of exposed individuals.

Health Hazard Information

Acute Effects:

- Acute inhalation exposure by humans to mixed cresols results in respiratory tract irritation, with symptoms such as dryness, nasal constriction, and throat irritation. Mixed cresols are also strong dermal irritants. Ingestion of high levels of mixed cresols by humans has resulted in effects on the respiratory system, gastrointestinal system, blood, liver, kidney, and CNS. (1,2)
- Animal studies have reported respiratory tract and eye irritation, and effects on the liver, kidney, and CNS from acute inhalation exposure to mixed cresols. (1)
- Acute animal tests in rats have shown mixed cresols to have **moderate** acute toxicity, while o-cresol, m-cresol, and p-cresol have been shown to have **high** acute toxicity from oral exposure. (3)

Chronic Effects (Noncancer):

- No information is available on the chronic effects of mixed cresols in humans. (1)
- Animal studies have reported effects on the blood, liver, kidney, and CNS, as well as reduced body weight, from oral and inhalation exposure to mixed cresols. (1,5)
- EPA has not established a Reference Concentration (RfC) or a Reference Dose (RfD) for mixed cresols. (4)
- The California Environmental Protection Agency (CalEPA) has established a chronic reference exposure level of 0.004 milligrams per cubic meter (mg/m³) for mixed cresols based on bone marrow effects in rats. The CalEPA reference exposure level is a concentration at or below which adverse health effects are not likely to occur. It is not a direct estimator of risk, but rather a reference point to gauge the potential effects. At lifetime exposures increasingly greater than the reference exposure level, the potential for adverse health effects increases. (5)
- EPA has not established an RfC for o-, m-, or p-cresol. (5-7)
- The RfD for o-cresol and m-cresol is 0.05 milligrams per kilogram body weight per day (mg/kg/d) based on decreased body weights and neurotoxicity in rats. The RfD is an estimate (with uncertainty spanning perhaps an order of magnitude) of a daily oral exposure to the human population (including sensitive subgroups) that is likely to be without appreciable risk of deleterious noncancer effects during a lifetime. (5,6)
- EPA has high confidence in the studies on which the RfDs are based because they provided adequate toxicological endpoints that included both general toxicity and neurotoxicity; medium confidence in the database because there are adequate supporting subchronic studies but lacking chronic toxicity and reproductive studies; and, consequently, medium confidence in the RfD. (5,6)
- The provisional RfD for p-cresol is 0.005 mg/kg/d based on neurological and respiratory effects in rabbits. The provisional RfD is a value that has had some form of Agency review, but it does not appear on IRIS. (8)

Reproductive/Developmental Effects:

- No information is available on the reproductive or developmental effects of mixed cresols in humans. (1)
- Animal studies have reported developmental effects, but only at maternally toxic doses, and no reproductive effects from oral exposure to mixed cresols. (1)

Cancer Risk:

- Only anecdotal information is available on the carcinogenic effects of mixed cresols in humans. (4-7)
- The only available oral animal study is a 13-week study that suggested that p-cresol may act as a promotor for tumors of the forestomach. (1)
- Several dermal animal studies have suggested that o-cresol, m-cresol, and p-cresol may act as tumor promotors. (1,4-7)
- EPA has classified o-cresol, m-cresol, and p-cresol as Group C, possible human carcinogens. (5-7)

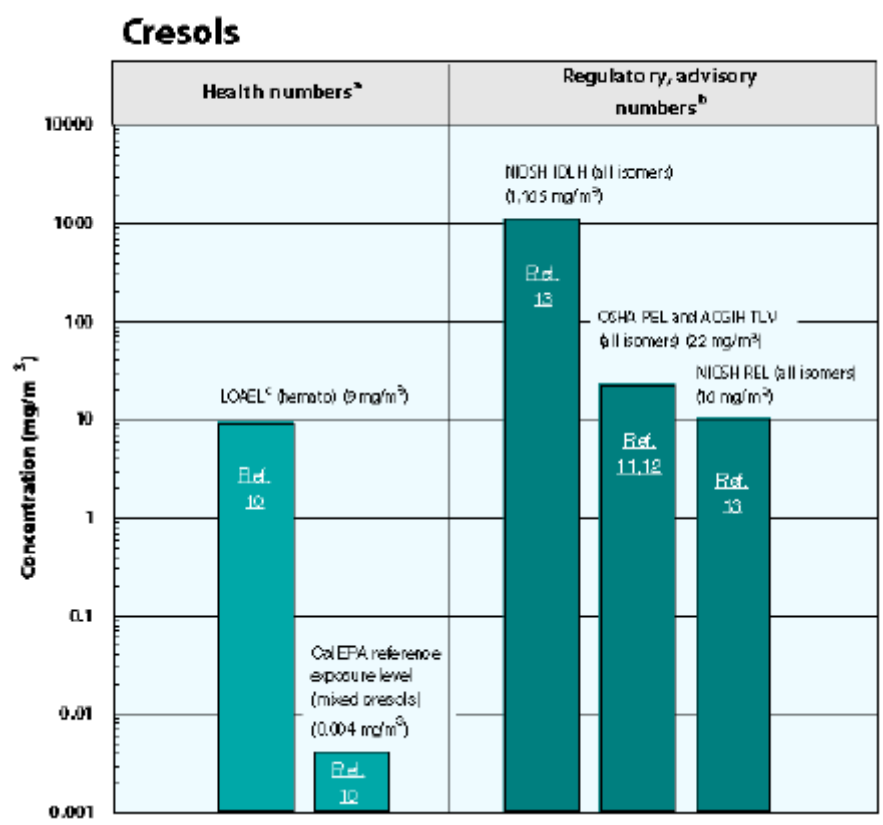
Physical Properties

- Mixed cresols are colorless solids, but usually they occur as a brown liquid mixture. (1)
- Mixed cresols have a medicinal odor; the odor threshold for m-cresol is 0.00028 parts per million (ppm). (1,9)
- The chemical formula for cresol is C₇H₈O, and the molecular weight is 108.14 g/mol. (1)
- The primary synonym for o-cresol is 2-methylphenol; m-cresol is 3-methylphenol, and p-cresol is 4-methylphenol. (5-7)
- The vapor pressures, at 25 °C, for o-cresol, m-cresol, and p-cresol are 0.299 mm Hg, 0.138 mm Hg, and 0.11 mm Hg, respectively. (1)
- The octanol/water partition coefficients (log K_{ow}) for o-cresol, m-cresol, and p-cresol are 1.95, 1.96, and 1.94, respectively. (1)

Conversion Factors:

To convert concentrations in air (at 25 °C) from ppm to mg/m³: $mg/m^3 = (ppm) \times (\text{molecular weight of the compound}) / (24.45)$. For cresols: 1 ppm = 4.42 mg/m³.

Health Data from Inhalation Exposure



ACGIH TLV--American Conference of Governmental and Industrial Hygienists' threshold limit value expressed as a time-weighted average; the concentration of a substance to which most workers can be exposed without adverse effects.

NIOSH IDLH--National Institute of Occupational Safety and Health's immediately dangerous to life or health limit; NIOSH recommended exposure limit to ensure that a worker can escape from an exposure condition that is likely to cause death or immediate or delayed permanent adverse health effects or prevent escape from the environment.

NIOSH REL--NIOSH's recommended exposure limit; NIOSH-recommended exposure limit for an 8- or 10-h time-weighted-average exposure and/or ceiling.

OSHA PEL--Occupational Safety and Health Administration's permissible exposure limit expressed as a time-

weighted average; the concentration of a substance to which most workers can be exposed without adverse effect averaged over a normal 8-h workday or a 40-h workweek.

The health and regulatory values cited in this factsheet were obtained in December 1999.

^a Health numbers are toxicological numbers from animal testing or risk assessment values developed by EPA.

^b Regulatory numbers are values that have been incorporated in Government regulations, while advisory numbers are nonregulatory values provided by the Government or other groups as advice. OSHA numbers are regulatory, whereas NIOSH and ACGIH numbers are advisory.

^c This LOAEL is from the critical study used as the basis for the CalEPA reference exposure level.

Summary created in April 1992; Updated in January 2000

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A. * This fact sheet refers to the mixture of all three isomers of cresols as "mixed cresols" and the isomers by their individual names.