
PENTACHLOROPHENOL

Characteristics

Pentachlorophenol (CAS No. 87-86-5) is a white, needle-like crystal solid that does not occur naturally. Pentachlorophenol is no longer manufactured in Canada, but it is imported for use primarily as a wood preservative. It is also used as a pesticide, herbicide, insecticide, fungicide, biocide, bactericide, and algacide, and as an additive to other products such as adhesives and drilling muds. Pentachlorophenol is not listed as a National Pollutant Release Inventory (NPRI) substance. Emissions of pentachlorophenol to the atmosphere result from its transportation, storage and use.

In the atmosphere, pentachlorophenol will be subject to photolysis and potentially photochemical reactions with hydroxyl radicals. It will be removed via wet and dry deposition, and may also be associated with particulate matter and settle out by gravitational settling. The detection limit for measurements in ambient air ranges from 0.2 pg/m³ to 200 ng/m³ and 1 to 100 ng/m³ by the US EPA Compendium Method TO4-A and TO-10A, respectively, depending on the nature of the analyte and the length of the sampling period.

Effects

With regard to acute (short-term) pentachlorophenol exposure in humans, irritation of eyes, nose, and throat was reported at concentrations greater than 1 mg/m³ (0.09 ppm) based on exposures reported as an 8-hour time weighted average. A rise in metabolic rate, hypothermia and effects on the central nervous system, respiratory system, cardiovascular system, liver and blood has also been reported; however, at exposure concentrations not specified. Studies on infants and children suggest a greater susceptibility of children to acute pentachlorophenol toxicity. Acute and sub-acute inhalation exposure of animals to pentachlorophenol has been reported to affect the respiratory system, blood, liver, kidney and adrenal system. Most of these effects have been observed based on exposure concentrations ranging from 3 to 21 mg/m³ (0.3 to 1.9 ppm) in studies where exposures occurred 4 hours/day, 6 days/week over 4 months.

In human occupational studies, chronic pentachlorophenol inhalation has been reported to be associated with effects on the respiratory system, endocrine system, central nervous system and reproductive system. Adverse effects on liver and blood were also reported. However, these occupational studies carried a high potential for confounding

exposure factors that limit their interpretation. Consequently, exposure concentrations relating to the reported effects are uncertain. No chronic inhalation animal studies were identified. Chronic animal ingestion studies reported effects on the liver and kidney at levels of 2-3 mg/kg of body weight/day (mg/kg/day); endocrine and reproductive system effects at levels from 1 mg/kg/day to 40 mg/kg/day; developmental effects from 10 to 60 mg/kg/day, and carcinogenicity at levels from 18 to 60 mg/kg/day.

Guidelines in Other Jurisdictions

Most of the agencies reviewed have short-term (1-hour and/or 24-hour) air quality guidelines for pentachlorophenol for acute exposure conditions (WBK, 2003). Ontario has a 30-min averaging time Maximum Point of Impingement level of $60 \mu\text{g}/\text{m}^3$ and a 24-hour average Ambient Air Quality Criterion of $20 \mu\text{g}/\text{m}^3$. Six US state agencies adopted short-term guidelines for pentachlorophenol from occupational exposure limits. One-hour guidelines range from 0.025 to $60 \mu\text{g}/\text{m}^3$ among the various agencies, while 24-hour guidelines range from 0.003 to $100 \mu\text{g}/\text{m}^3$ among the agencies.

Most of the agencies whose air quality guidelines were reviewed also have chronic (long-term) guidelines for pentachlorophenol. New Hampshire, Texas, and Vermont have a chronic guideline for health effects – using occupational exposure limits. Annual average guidelines range from 0.01 to $1.19 \mu\text{g}/\text{m}^3$ among the various agencies.

Alberta Ambient Air Quality Objectives

Pursuant to Section 14(1) of the *Environmental Protection and Enhancement Act*, based upon the available information, Alberta Environment hereby adopts:

- *From Texas, an acute, short-term Alberta Ambient Air Quality Guideline for pentachlorophenol of $5 \mu\text{g m}^{-3}$ (0.44 ppb) as a 1-hour average concentration, and*
- *From Texas, a chronic, long-term Alberta Ambient Air Quality Guideline for pentachlorophenol of $0.5 \mu\text{g m}^{-3}$ (0.04 ppb) as an annual average concentration.*

Reference

WBK & Associates Inc., 2003: *Assessment Report on Pentachlorophenol for Developing Ambient Air Quality Objectives*. Prepared for Alberta Environment. Edmonton, Alberta, Canada. 63 p.