

# Coal tar pitch volatiles

Immediately Dangerous to Life or Health Concentrations (IDLH)

May 1994

**CAS number:** 65996-93-2

**NIOSH REL:** 0.1 mg/m<sup>3</sup> (cyclohexane-extractable fraction) TWA; NIOSH considers coal tar pitch volatiles to be potential occupational carcinogens as defined by the OSHA carcinogen policy [29 CFR 1990].

**Current OSHA PEL:** 0.2 mg/m<sup>3</sup> (benzene-soluble fraction) TWA

**1989 OSHA PEL:** Same as current PEL

**1993-1994 ACGIH TLV:** 0.2 mg/m<sup>3</sup> (benzene-soluble fraction) TWA, A1

**Description of Substance:** Black or dark-brown amorphous residue.

**LEL:** . . Unknown

**Original (SCP) IDLH:** 700 mg/m<sup>3</sup> [\*Note: "Effective" IDLH = 400 mg/m<sup>3</sup> — see discussion below.]

**Basis for original (SCP) IDLH:** Redmond et al. [1972] have shown that the major health effects resulting from long-term repeated exposure to coal tar pitch volatiles (CTPV) are cancer of the lung, kidney, and skin; however, no studies have been made on carcinogenic effects by any route from single short-term exposure to CTPV that could relate to a 30-minute IDLH. Therefore, reliance must be placed on comparative data of single versus repeated carcinogenic doses of benzo(a)pyrene [B(a)P], a known component of CTPV. Bingham [1971] reported that B(a)P applied in a single dose of 2 mg to the skin of mice yielded tumors in 10% to 20% of the animals whereas 0.01 mg B(a)P applied in a noncarcinogenic solvent applied to the skin 3 times/week for 50 weeks yielded tumors in 50% of the animals. Thus, a single dose producing about 1/3 the number of tumors was 200 times the repeated 3 times/week dose. Using this factor and the value of 0.6 mg/m<sup>3</sup> CTPV reported by Mazumdar et al. [1975] as safe for coke oven workers, a total dose IDLH of 120 mg CTPV (as benzene solubles) is calculated; by using 7.5 liters as the minute volume of coke oven workers and a 75% lung retention of CTPV a 30-minute IDLH is calculated to be about 700 mg/m<sup>3</sup> (as benzene solubles). However, because of the assigned protection factor afforded by each device, 400 mg/m<sup>3</sup> (i.e., 2,000 × the PEL) is the concentration above which only the "most protective" respirators are permitted.

**Short-term exposure guidelines:** None developed

## ACUTE TOXICITY DATA

### Lethal concentration data:

Species	Reference	LC <sub>50</sub> (ppm)	LC <sub>Lo</sub> (ppm)	Time	Adjusted 0.5-hr LC (CF)	Derived value
Pyrene						
Rat	Potapova et al. 1971	170 mg/m <sup>3</sup>	-----	?	?	?

### Lethal dose data:

Species	Reference	Route	LD <sub>50</sub> (mg/kg)	LD <sub>Lo</sub> (mg/kg)	Adjusted LD	Derived value
Pyrene						
Rat	Potapova et al. 1971	oral	2,700	-----	18,900 mg/m <sup>3</sup>	1,890 mg/m <sup>3</sup>
Mouse	Potapova et al. 1971	oral	800	-----	5,600 mg/m <sup>3</sup>	560 mg/m <sup>3</sup>
Anthracene						
Mouse	Nogochy 1969	oral	-----	>17,000	>119,000 mg/m <sup>3</sup>	>11,900 mg/m <sup>3</sup>
Phenanthrene						
Mouse	Rakhmanina 1964	oral	700	-----	4,900 mg/m <sup>3</sup>	490 mg/m <sup>3</sup>

**Other animal data:** The major health effects resulting from long-term repeated exposure to coal tar pitch volatiles (CTPV) are cancer of the lung, kidney, and skin [Redmond et al. 1972]; however, no studies have been made on carcinogenic effects by any route from single short-term exposure to CTPV that could relate to a 30-minute IDLH. Therefore, reliance must be placed on comparative data of single versus repeated carcinogenic doses of benzo(a)pyrene [B(a)P], a known component of CTPV. It has been reported that B(a)P applied in a single dose of 2 mg to the skin of mice yielded tumors in 10% to 20% of the animals whereas 0.01 mg B(a)P applied in a noncarcinogenic solvent applied to the skin 3 times/week for 50 weeks yielded tumors in 50% of the animals [Bingham 1971]. Thus, a single dose producing about 1/3 the number of tumors was 200 times the repeated 3 times/week dose. Using this factor and the value of 0.6 mg/m<sup>3</sup> CTPV reported as safe for coke oven workers [Mazumdar et al. 1975], a total dose IDLH of 120 mg CTPV (as benzene solubles) is calculated; by using 50 liters as the minute volume of workers and 100% lung retention of CTPV, a 30-minute IDLH is calculated to be about 80 mg/m<sup>3</sup> (as benzene solubles).

**Human data:** None relevant for use in determining the revised IDLH.

**Revised IDLH:** 80 mg/m<sup>3</sup> (as the benzene-soluble fraction)

**Basis for revised IDLH:** The revised IDLH for coal tar pitch volatiles is 80 mg/m<sup>3</sup> (as the benzene-soluble fraction) based on toxicity data in animals [Bingham 1971; Mazumdar et al. 1975; Redmond et al. 1972] (see discussion above). [Note: NIOSH recommends as part of its carcinogen policy that the "most protective" respirators be worn for coal tar pitch volatiles at concentrations above 0.1 mg/m<sup>3</sup> (cyclohexane-extractable fraction).]

## REFERENCES:

1. Bingham E [1971]. Thresholds in cancer inductions. If they do exist, do they shift? *Arch Environ Health* 22:692-695.
2. Mazumdar S, Redmond C, Sollecito W, Sussman N [1975]. An epidemiological study of exposure to coal tar pitch volatiles among coke oven workers. *J Air Pollut Control Assoc* 25(4):382-389.
3. Nagochy PA [1969]. Comparative study of the toxicity of pure and technical anthracene. *Gig Tr Prof Zabol* 13(5):59 (in Russian).
4. Potapova AN, Kapitulsky VB, et al. [1971]. Toxicological evaluation of pyrene. *Gig Tr Prof Zabol* 15(2):59 (in Russian).
5. Rakhmanina NL [1964]. Establishing standards for the phenanthrene and pyrene contents in water bodies. *Gig Sanit* 29(6):19-23 (translated).
6. Redmond CK, Ciocco A, Lloyd JW, Rush HW [1972]. Long-term mortality study of steel workers. VI. Mortality from malignant neoplasms among coke oven workers. *J Occup Med* 14(8):621-629.