DIMETHYL HYDROGEN PHOSPHITE

Data were last evaluated in IARC (1990).

1. Exposure Data

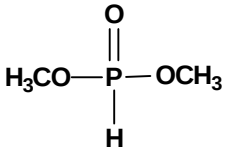
1.1 Chemical and physical data

1.1.1 *Nomenclature*

Chem. Abstr. Serv. Reg. No.: 868-85-9

Chem. Abstr. Name: Dimethyl phosphonate

1.1.2 *Structural and molecular formulae and relative molecular mass*



$C_2H_7O_3P$ Relative molecular mass: 110.05

1.1.3 *Physical properties* (for details, see IARC, 1990)

(*a*) *Boiling point:* 170–17°C at 2.6 kPa

(*b*) *Conversion factor*: $mg/m^3 = 4.52 \times ppm$

1.2 Production, use and human exposure

Dimethyl hydrogen phosphite is used as a flame retardant on nylon 6 fibres, as a chemical intermediate in the production of pesticides and in lubricant additives and adhesives. No data on occupational exposure levels were available. A potential source of exposure to this chemical is from its occurrence as a degradation product of the chemical intermediate trimethyl phosphite and of pesticides such as trichlorphon and malathion (IARC, 1990).

2. Studies of Cancer in Humans

No data were available to the Working Group.

3. Studies of Cancer in Experimental Animals

Dimethyl hydrogen phosphite was tested for carcinogenicity by oral administration in one strain of mice and in one strain of rats. In rats, it caused an increase in the incidence of alveolar/bronchiolar carcinomas in animals of each sex and of squamous-cell carcinomas of the lung and of papillomas and carcinomas of the forestomach in males (IARC, 1990).

4. Other Data Relevant to an Evaluation of Carcinogenicity and its Mechanisms

4.1 Absorption, distribution, metabolism and excretion

No data were available to the Working Group.

4.2 Toxic effects

4.2.1 *Humans*

No data were available to the Working Group.

4.2.2 *Experimental systems*

As previously summarized, rats treated with 200 mg/kg bw dimethyl hydrogen phosphite by gavage developed chemical pneumonia, and lung adenomatous and alveolar epithelial hyperplasia. They also showed hyperkeratosis, submucosal oedema and hyperplasia of the forestomach and urinary bladder calculi. Serum angiotensin-converting enzyme level and soluble forestomach nonprotein sulfhydryls were increased, whereas renal and hepatic microsomal cytochrome P450 activity and some phase II enzyme activities in liver, kidney, lung and stomach remained unchanged.

In mice, hepatocellular vacuolization, cardiac mineralization, lung congestion, and testicular calcification and atrophy were reported (IARC, 1990).

4.3 Reproductive and developmental effects

No data were available to the Working Group.

4.4 Genetic and related effects

4.4.1 *Humans*

No data were available to the Working Group.

4.4.2 *Experimental data* (see Table 1 for references)

In single studies, dimethyl hydrogen phosphite induced sister chromatid exchanges and chromosomal aberrations in Chinese hamster ovary cells in culture and mutations in mouse cells in culture but did not induce sex-linked recessive lethal mutations in

Table 1. Genetic and related effects of dimethyl hydrogen phosphite

Test system	Result[a]		Dose (LED or HID)[b]	Reference
	Without exogenous metabolic system	With exogenous metabolic system		
SA0, *Salmonella typhimurium* TA100, reverse mutation	–	–	5000	US National Toxicology Program (1985)
SA5, *Salmonella typhimurium* TA1535, reverse mutation	–	–	5000	US National Toxicology Program (1985)
SA7, *Salmonella typhimurium* TA1537, reverse mutation	–	–	5000	US National Toxicology Program (1985)
SA9, *Salmonella typhimurium* TA98, reverse mutation	–	–	5000	US National Toxicology Program (1985)
DMX, *Drosophila melanogaster*, sex-linked recessive lethal mutations	–		1500 ppm inj.	Woodruff *et al*. (1985)
DMX, *Drosophila melanogaster*, sex-linked recessive lethal mutations	–		650 ppm feed	Woodruff *et al*. (1985)
URP, Unscheduled DNA synthesis, rat primary hepatocytes *in vitro*	–[c]	NT	1	Shaddock *et al*. (1990)
G5T, Gene mutation, mouse lymphoma L5178Y cells, *tk* locus *in vitro*	–	+	2100	McGregor *et al*. (1988)
SIC, Sister chromatid exchange, Chinese hamster ovary CHO cells *in vitro*	+	+	250	Tennant *et al*. (1987)
CIC, Chromosomal aberrations, Chinese hamster ovary CHO cells *in vitro*	+	+	1600	Tennant *et al*. (1987)

[a] +, positive; –, negative; NT, not tested

[b] LED, lowest effective dose; HID, highest ineffective dose; in-vitro tests, µg/mL; in-vivo tests, mg/kg bw/day; inj., injection

[c] UDS induced in Aroclor-induced rat hepatocytes

Drosophila melanogaster. It was not mutagenic to bacteria in the presence or absence of an exogenous metabolic system.

Dimethyl hydrogen phosphite has been reported to induce unscheduled DNA synthesis in hepatocytes of rats that had been treated with Aroclor or 3-methylcholanthrene.

5. Evaluation

No epidemiological data relevant to the carcinogenicity of dimethyl hydrogen phosphite were available.

There is *limited evidence* for the carcinogenicity of dimethyl hydrogen phosphite in experimental animals.

Overall evaluation

Dimethyl hydrogen phosphite is *not classifiable as to its carcinogenicity to humans (Group 3).*

6. References

IARC (1990) *IARC Monographs on the Evaluation of Carcinogenic Risks to Humans*, Volume 48, *Some Flame Retardants and Textile Chemicals, and Exposures in the Textile Manufacturing Industry*, Lyon, pp. 85–93

McGregor, D.B., Brown, A., Cattanach, P., Edwards, I., McBride, D. & Caspary, W.J. (1988) Responses of the L5178T tk^+/tk^- mouse lymphoma cell forward mutation assay. II: 18 coded chemicals. *Environ. mol. Mutag.*, **11**, 91–118

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