# Methoxychlor

Methoxychlor is an organochlorine insecticide. It has not been registered for use by the U.S. Environmental Protection Agency (U.S. EPA) since 2003. The available data indicate that methoxychlor is persistent in the environment. It has been detected in freshwater fish caught in the U.S., and studies in shellfish, insect, algae, and fish indicate that methoxychlor can bioconcentrate. Methoxychlor has been detected in human biomonitoring studies in blood and breast milk. It has been used against flies, mosquitoes, cockroaches, chiggers, and a wide variety of other insects, and it has been used on agricultural crops (e.g., broccoli, squash) and livestock, and in barns, grain storage bins, home gardens, and on pets.

Methoxychlor passed the human and animal data screens, underwent a preliminary toxicological evaluation, and is being brought the Carcinogen Identification Committee for consultation. This is a compilation of the relevant studies identified during the preliminary toxicological evaluation.

**Epidemiological data**

- Population-based case-control study in white men with leukemia living in Iowa and Minnesota: Brown *et al.* (1990)

- Regression analysis of county-level pesticide use and breast cancer incidence in Hispanic women (using 1988-1999 California Cancer Registry data): Mills *et al.* (2006)

**Animal carcinogenicity data**

- Long-term feeding studies in mice
    - $B6C3F_1$ male and female mice (78 week treatment period + 15 weeks on control diet): NCI (1978); reviewed/re-analyzed by Reuber (1980)
    - BALB/c male and female mice (two-year exposure): as reviewed in Reuber (1979a and 1980) and referred to as "FDA studies," and as reviewed in U.S. EPA (2003) and referred to as "Nelson and Fitzhugh (1951)"
    - C3H male and female mice (two-year exposure): as reviewed in Reuber (1979a and 1980) and referred to as "FDA studies," and as reviewed in U.S. EPA (2003) and referred to as "Nelson and Fitzhugh (1951)"

- Long-term feeding studies in rats
    - Osborne-Mendel male and female rats (78 week treatment period + 34 weeks on control diet): NCI (1978); reviewed/re-analyzed by Reuber (1980)
    - Osborne-Mendel male and female rats (two-year exposure): as reviewed in Reuber (1979b and 1980) and referred to as "FDA studies," and as

reviewed in U.S. EPA (2003) and referred to as "Nelson and Fitzhugh (1951)"

- Other long-term studies, as reviewed in Reuber (1980), IARC (1979, pp. 266-268) or U.S. EPA (2003, Section II.A.3)
    - Osborne-Mendel male and female rats (27-month feeding studies): Deichmann *et al*. (1967)
    - Osborne-Mendel male and female rats (two-year feeding studies): Radomski *et al*. (1965)
    - Male and female rats (two-year feeding studies): Hodge *et al*. (1952)
    - C3H/Anf male and female mice (single subcutaneous injection, observed up to 14 months): Hodge *et al*. (1966)
    - C3H/Anf male and female mice (dermal application once per week for up to 14 months): Hodge *et al*. (1966)

**Other relevant data**

- Genotoxicity
    - Reviews: IARC (1979, pp. 270-271), CCRIS (2002), and U.S. EPA (2003, Section II.A.4)
    - Mouse lymphoma assay and Chinese hamster ovary cell assay: Oberly *et al.* (1993)

- Estrogenic activity: reviewed in U.S. EPA (2003, Sections I.A.4. and I.B.) and Reuber (1979a and 1980)

- Structure activity considerations: structural analog of DDT: Reuber (1980)

**Reviews**

- IARC (1979)

- U.S. EPA (2003)

**References**[1]

Brown LM, Blair A, Gibson R, Everett GD, Cantor KP, Schuman LM, Burmeister LF, Van Lier SF, Dick F (1990). Pesticide exposures and other agricultural risk factors for leukemia among men in Iowa and Minnesota. *Cancer Res* **50**(20):6585-91.

[1] Copies of these listed references, as either the abstract, the relevant sections of the publication, or the complete publication, have been provided to members of the Carcinogen Identification Committee. These references have been provided in the order in which they are discussed in this document.

Chemical Carcinogenesis Research Information System (CCRIS, 2002) http://toxnet.nlm.nih.gov (accessed on January 26, 2009).

International Agency for Research on Cancer (IARC, 1979). *IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Humans.* Vol. 20: Methoxychlor. IARC, World Health Organization, Lyon, France.

U.S. Environmental Protection Agency (U.S. EPA, 2003). Integrated Risk Information System, U.S. EPA, http://toxnet.nlm.nih.gov (accessed on January 26, 2009).

Mills PK, Yang R (2006). Regression analysis of pesticide use and breast cancer incidence in California Latinas. *J Environmental Health* **68**(6):15-22.

National Cancer Institute (NCI, 1978). Bioassay of methoxychlor for possible carcinogenicity. National Cancer Institute, U.S. Dept. of Health, Education and Welfare, Washington, DC. Technical Report Series No. 35.

Oberly TJ, Michaelis KC, Rexroat MA, Bewsey BJ, Garriott ML (1993). A comparison of the CHO/HGPRT+ and the L5178Y/TK+/- mutation assays using suspension treatment and soft agar cloning: Results for 10 chemicals. *Cell Biol Toxicol* **9**(3):243-57.

Reuber MD (1979a). Interstitial cell carcinomas of the testis in Balb/C male mice ingesting methoxychlor. *J Cancer Res Clin Oncol* **93**(2):173-9.

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Reuber MD (1980). Carcinogenicity and toxicity of methoxychlor. *Environ Health Perspect* **36**:205-19.