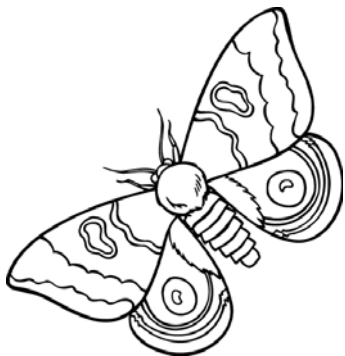


Malathion

O,O-Dimethyl S- 1,2-(diethoxycarbamyl) ethyl phosphorodithioate Fact Sheet



General

Malathion is an organophosphate insecticide. One of the most commonly used organophosphates, it has a wide range of uses including agriculture, stored grain and forests. It is used to control a large variety of pests, including mosquitoes, grasshoppers, gypsy moths, Mediterranean fruit flies, mites, aphids, spider mites, and scales.¹ It is applied via ground and aerial sprays, aerosols, foggers, baits, paints, pet collars, animal dips, animal dust bags, and cattle feed blocks.

How It Works

Malathion works by attacking the nervous system; it is essentially a nerve poison. Specifically, it inhibits the action of an enzyme called acetylcholinesterase (AChE).² AChE works to break down another chemical, acetylcholine, which is essential in

transmitting impulses between nerves. Therefore, when malathion is used, AChE becomes unable to break down acetylcholine, which consequently accumulates in nerve cells. This abnormal acetylcholine build-up can cause incoordination, rapid twitching, incoordination, paralysis and death.³⁴

Malathion's toxicity is increased by its break-down products and contaminating chemicals. For instance, as malathion reacts and breaks down within an organism or in sunlight, one of the chemicals released is malaoxon. Malaoxon is 40 times more toxic than malathion, and is the primary source of malathion's toxicity.⁵ In addition, there are 11 chemicals that are created in the malathion production process which can often be found in malathion products for purchase. These side chemicals may not only work in concert with malathion to increase its toxicity, but they can inhibit enzymatic systems in the liver that actually function to detoxify some of these extra 11 contaminants.⁶

Health Effects

All organophosphates, including malathion, are highly toxic to insects, animals and humans. Malathion's acute LD50 for rats (the amount of a chemical required to kill 50% of a test population) ranges between 1522mg and 1945mg/kg of body weight. To equate this measure with humans, a dose of approximately 5 oz. would be fatal to a 70 kg, chemically-sensitive human.

Malathion is mutagenic, carcinogenic⁷, has been implicated in vision loss, kidney damage⁸, and lung damage.⁹ It has been shown to cause DNA abnormalities^{10 11}, and has been linked to child leukemia, aplastic anemia and adult leukopenia.¹² Acute (short term) effects of malathion include headaches, nausea, dizziness, salivation, tearing, urination, diarrhea, convulsions, muscle weakness, incoordination, abdominal cramps, blurred vision, pupil constriction, abnormal eye movement, slowed heart beat, depressed respiratory system, skeletal muscle damage, paralysis and coma.^{13 14 15} Studies on quail and rabbit have indicated that the acute danger from malathion exposure may be much higher if inhaled: they showed that AChE inhibition was 15 to 20 times greater from an inhaled dose of malathion as compared to an oral dose.

Malathion can also have a significant effect on intestinal health. One study showed that pregnant woman who had been exposed to aerial spraying of malathion during their second trimester gave birth to children with 2.5 times more gastrointestinal disorders.¹⁶ Lab studies on rats have shown that a single exposure can severely impair the healthy functioning of the intestine.¹⁷

Risks to Wildlife

Malathion is an indiscriminate pesticide which kills a wide range of non-target species. It is extremely toxic to bees, for example.¹⁸ Malathion is of moderate toxicity to a variety of bird species and ranges from moderate to high toxicity for water organisms, including fish.¹⁹ Malathion does not usually bioconcentrate (accumulate in organisms' tissues), but some aquatic species have shown evidence of bioconcentration.²⁰

Effectiveness Against Mosquitoes

The effectiveness of malathion as a tool for mosquito control decreases over time because mosquitoes build up resistance to it. In addition, application procedures can be ineffective. For instance, when malathion is applied via ultra low volume spraying by mist blowers, hydraulic sprayers or aircraft, only about one drop in 1000 will actually hit the mosquito. Since it takes three drops to kill a mosquito, this not only means that spraying often fails to kill the target organism, but virtually all of the pesticide ends up on non-target species.

Conclusions

When considering pesticides for community mosquito control programs, even for West Nile Virus, malathion is a poor choice. It has been linked to birth defects, a wide range of cancers, and other health problems in humans and non-target wildlife species. The great irony is that it is not very effective. If communities want to reduce mosquito numbers, their first line of defence must be prevention. Prevention can be as easy as eliminating standing water – see the Sierra Club of Canada's *Non-Toxic Mosquito Control Fact Sheet* for ideas. If in an extreme attempt at prevention is not successful, applying Bti (*Bacillus thuringiensis israeliensis*, a biological general-use pesticide) is far more effective and nearly non-toxic to both humans and animals.

¹ Brenner, L. Malathion Fact Sheet. *Journal of Pesticide Reform* 12 (4). Winter 1992.

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³ Tucker, J.W. and C.Q. Thompson. 1987. Dangers of using organophosphorus pesticides and diesel oil in fish ponds. *Aquaculture Magazine* 13 (3): 62-63.

⁴ Gallo, M.A. ; Lawryk, N.J. Organic Phosphorus Residues. *Handbook of Pesticide Toxicology*; Hayes, W.J., Laws, E.R., Eds.; Academic: San Diego, CA; 1991; Vol. 2, pp 917-1123.

⁵ Borwn, M.A. ; Petreas, M.X. ; Okamoto, H.S. ; Mischeke, T.M. ; Stephens, R.D. Monitoring of Malathion and its Impurities and Environmental Transformation Products on Surfaces and in Air Following Aerial Application. *Environmental Science Technology*. 1993, 27, 388-397.

⁶ Brenner, L. Malathion Fact Sheet. *Journal of Pesticide Reform* 12 (4). Winter 1992.

⁷ Cantor, K.P. et al. 1992. Pesticides and other risk factors for non-Hodgkin's lymphoma among men in Iowa and Minnesota. *Cancer Research*. 52: 2447-2455.

⁸ Albright, R.K., Kram, Barry W., White, Robert P.. 1983. Kidney Failure after man sprays Malathion in home. *Journal of the American Association*. 250 (18), Nov. 11, 1983.

⁹ "Lung damage occurs from single oral dose of Malthion". Division of Toxicology & Physiology, University of California. *Toxicology*. 26: 73-79, 1983.

¹⁰ "Human genes 'broken-off' DNA molecule by Malathion". Genetics Laboratory, University of Vermont. *Cancer Research* 56, 2393-2399, May 15, 1996.

¹¹ Balaji, M. & Sasikala, K. 1993. Chromosome damage occurs to human blood cells, *Mutation Research* , 301: 13-17.

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¹³ Rosebaum, E.A. et al. 1988. Early biochemical changes produced by Malathion in toad embryos. *Archive Environmental Contamination Toxicology*. 17: 831-835.

¹⁴ Cabellero de Castro, A.C. et al. 1991. Effect of malathion on *Bufo arenarum* Hansel development. *Biochemistry Phrmocology*. 41 (4): 491-495.

¹⁵ Abdel Reheem, S., M.H. Belal, and G. Gupta. 1991. Photosynthesis inhibition of soybean leaves by insecticides. *Environmental Pollution*. 74:245-250.

¹⁶ "Intestinal Disorders in Children Born After California Spraying." Department of Preventive Medicine, University of Southern California. *Epidemiology* 3(1):32-39, 1992.

¹⁷ Wali, R.K., Singh, R., Dudeja, P.K., Sarkar, A.K. & Mahmood. 1984. Intestinal Problems in Test Animals Exposed to Malathion. *Bulletin of Environmental Contamination Toxicology* 33: 289-294.

¹⁸ US Environmental Protection Agency, Office of Pesticide Programs, Washington, DC. Malathion Preliminary Risk Assessments: Environmental Fate and Effects. <http://www.epa.gov/pesticides/op/malathion.htm>

¹⁹ US Environmental Protection Agency, Office of Pesticide Programs, Washington, DC. Malathion Preliminary Risk Assessments: Environmental Fate and Effects. <http://www.epa.gov/pesticides/op/malathion.htm>

²⁰ US Environmental Protection Agency, Office of Pesticide Programs, Washington, DC. Malathion Preliminary Risk Assessments: Environmental Fate and Effects. <http://www.epa.gov/pesticides/op/malathion.htm>