

Hazard to children:
brain cancer, endocrine
disruption, immune
suppression, allergies;
later in life other
cancers, reproductive
problems



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Use: carbamate
insecticide.

Residues: in food,
drinking water.

Bans: EU - because of
toxic breakdown
products, carcinogenic,
high risk to birds,
mammals, aquatic
organisms, beneficial
insects.¹

Manufacture: made
from methyl isocyanate,
the chemical
responsible for the
Bhopal tragedy.

Acute toxicity:
moderate toxicity,
neurotoxin at low levels
of exposure. Symptoms
include nausea,
sweating, stomach
cramps, headache,
muscle weakness,
diarrhoea, seizures,
coma, death. Also
causes acute rhinitis.

Chronic toxicity:
damage to lungs, liver,
kidney.²

Cancer: US EPA - likely
human carcinogen;³
childhood brain cancer;⁴
melanoma;^{5 6} non-
Hodgkin's lymphoma;⁷
multiple myeloma;⁸
prostate cancer;⁹ non-
Hodgkin's lymphoma.¹⁰

Genotoxicity:
genotoxic in human
cells.^{11 12}

Endocrine disruption:
endocrine disruptor
(EU);¹³ oestrogenic;¹⁴
affects thyroid hormone
receptors;¹⁵ stimulates
breakdown of
testosterone in males.¹⁶

Reproduction: birth
defects at high doses in
animals;² reduced
sperm count and
mobility, increased
abnormal sperm
(mice),³ and DNA
damage in carbaryl-
exposed workers.¹²

Immune:
Immunotoxic,¹⁷⁻¹⁹ and
can enhance allergic
responses.²⁰

Environmental effects:
Aquatic: very highly
toxic to invertebrates
and fish.²¹

Terrestrial: highly toxic
to bees and beneficial
insects;²¹ extremely
toxic to earthworms.²²

Environmental fate:
Detected in rain²³ and
well water²⁴ in US.

References:

- ¹ EC. 2006. Review report for the active substance carbaryl. SANCO/10049/06-rev.0.
- ² EXTONET. 1996. <http://extonet.orst.edu/pips/carbaryl.htm>.
- ³ NPIC. 2003. Carbaryl Technical Factsheet. National Pesticide Information Centre, US.
- ⁴ Zahm SH, Ward MH. 1998. Pesticides and childhood cancer. *Environ Health Perspect* 106(Suppl 3):893-908.
- ⁵ Weichenthal S, Moase C, Chan P. 2010. A review of pesticide exposure and cancer incidence in the agricultural health study. *Environ Health Perspect* 118:1117-25.
- ⁶ Mahajan R, Blair A, Coble J, Lynch CF, Hoppin JA, Sandler DP, Alavanja MC. 2007. Carbaryl exposure and incident cancer in the Agricultural Health Study. *Int J Cancer* 15;121(8):1799-805.
- ⁷ Zheng T1 Zahm SH, Cantor KP, Weisenburger DD, Zhang Y, Blair A. 2001. Agricultural exposure to carbamate pesticides and risk of non-Hodgkin lymphoma. *J Occup Environ Med* 43(7):641-9.
- ⁸ Pahwa P, Karunanayake CP, Dosman JA, Spinelli JJ, McDuffie HH, McLaughlin JR. 2012. Multiple myeloma and exposure to pesticides: a Canadian case-control study. *J Agromed* 17(1):40-50.
- ⁹ Band PR, Abanto Z, Bert J, Lang B, Fang R, Gallagher RP, Le ND. 2011. Prostate cancer risk and exposure to pesticides in British Columbia farmers. *Prostate* 71(2):168-83.
- ¹⁰ Cantor KP, Blair A, Everett G, Gibson R, Burmeister LF, Brown LM, Schuman L, Dick FR. 1992. Pesticides and other agricultural risk factors for non-Hodgkin's lymphoma among men in Iowa and Minnesota. *Cancer Res* 52(9):2447-55.
- ¹¹ Delescluse C, Ledirac N, Li R, Piechocki MP, Hines RN, Gidrol X, Rahmani R. 2001. Induction of cytochrome P450 1A1 gene expression, oxidative stress, and genotoxicity by carbaryl and thiabendazole in transfected human HepG2 and lymphoblastoid cells. *Biochem Pharmacol* 61(4):399-407.
- ¹² Xia Y, Cheng S, Bian Q, Xu L, Collins MD, Chang HC, Song L, Liu J, Wang S, Wang X. 2005. Genotoxic effects on spermatozoa of carbaryl-exposed workers. *Toxicol Sci* 85(1):615-23.
- ¹³ EU. 2008. EU Regulation 1272/2008/EC.
- ¹⁴ Mnif W, Hassine AI, Bouaziz A, Bartegi A, Thomas O, Roig B. 2011. Effect of endocrine disruptor pesticides: a review. *Int J Res Public Health* 8(6):2265-303.
- ¹⁵ Sun H, Shen OX, Xu XL, Song L, Wang XR. 2008. Carbaryl, 1-naphthol and 2-naphthol inhibit the beta-1 thyroid hormone receptor-mediated transcription in vitro. *Toxicology* 249(2):238-42.
- ¹⁶ Dieringer CS, Thomas JA. 1974. Effects of carbaryl on the metabolism of androgens in the prostate and liver of the mouse. *Environ Res* 7(3):381-6.
- ¹⁷ Ladics GS, Smith C, Heaps K, Loveless SE. 1994. Evaluation of the humoral immune response of CD rats following a 2-week exposure to the pesticide carbaryl by the oral, dermal, or inhalation routes. *J Toxicol Environ Health* 42(2):143-56.
- ¹⁸ Casale GP, Vennerstrom JL, Bavari S, Wang TL. 1993. Inhibition of interleukin 2 driven proliferation of mouse CTLL2 cells, by selected carbamate and organophosphate insecticides and congeners of carbaryl. *Immunopharmacol Immunotoxicol* 15(2-3):199-215.
- ¹⁹ Singh BP, Singhal L, Chauhan RS. 2007. Immunotoxicity of carbaryl in chicken. *Indian J Exp Biol* 45(10):890-5.
- ²⁰ Dong W, Gilmour MI, Lambert AL, Selgrade MK. 1998. Enhanced allergic responses to house dust mite by oral exposure to carbaryl in rats. *Toxicol Sci* 44(1):63-9.
- ²¹ ERMA NZ. Undated. Carbaryl Evaluation Sheet: Candidates for Reassessment Priority Listing. Environmental Risk Management Authority, Wellington.
- ²² Wang Y, Wu S, Chen L, Wu C, Wang Q, Zhao X. 2012. Toxicity assessment of 45 pesticides to the epigeic earthworm *Eisenia fetida*. *Chemosphere* 88(4):484-91.
- ²³ Vogel JR, Majewski MS, Capel PD. 2008. Pesticides in rain in four agricultural watersheds in the United States. *J Environ Qual* 37(3):1101-15.
- ²⁴ CAL EPA. 2008. Sampling for Pesticide Residues in California Well Water. California Environmental Protection Agency. <http://www.cdpr.ca.gov/docs/emon/pubs/ehapreps/eh0801.pdf>.