

Sources of Exposure

Toxicokinetics and Normal Human Levels

Biomarkers/Environmental Levels

ToxGuide™

for

DEET
(N,N-Diethyl-*meta*-Toluamide)

C₁₂H₁₇NO

CAS# 134-62-3
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U.S. Department of Health and Human Services

Agency for Toxic Substances and Disease Registry
www.atsdr.cdc.gov

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General Populations

- The primary route of exposure for the general population is dermal contact from intentional application to skin and clothing of commercial products containing DEET.
- Exposure to DEET can also occur when drinking water or showering with water that contains DEET.
- Levels of DEET in air and water are low.
- DEET has not been detected in soil.

Occupational Populations

- Workers in industries that manufacture and formulate DEET and DEET-containing products are likely to be at higher risk than the general population for DEET exposure.
- Employees at national parks who use DEET regularly during their seasonal work can be exposed to higher levels of this substance.

Toxicokinetics

- DEET that is ingested is almost completely absorbed through the gastrointestinal tract based on a study of rats.
- Significantly less enters the body when applied onto the skin (ranging from 4 to 17% of the applied dose, and this could be higher with different formulations).
- Most DEET is broken down in the body into other chemicals (metabolites) in the liver.
- DEET and its metabolites distribute widely inside the body, preferentially to the liver, lung, spleen, kidney, blood, and fat.
- DEET has been found in cord blood of pregnant animals, but at low levels in the fetus.
- Most DEET and metabolites are excreted quickly (within hours) through the urine. A small proportion is excreted in the feces.

Normal Human Levels

- National surveys of several thousand members of the U.S. general population were conducted in 2001-2002. The levels of DEET for over 90% of that group were low, below 0.11 µg/L of urine (below 0.27 µg/g creatinine).

Biomarkers

- DEET in urine may not be a reliable biomarker of exposure because the compound is rapidly metabolized after oral and dermal exposure. Urinary metabolites are more useful biomarkers of exposure.

Environmental Levels

Air

- There are no data regarding levels of DEET in air in the United States.
- DEET in rural and urban Canada ranged from 0.95 to 15.4 mg/m³ during the summer season.

Sediment and Soil

- There are no data regarding levels of DEET in sediment or soil.

Water

- Levels measured in 188 surface water samples throughout the United States within the last decade ranged from 0.013 to 0.66 µg/L.

Reference

Agency for Toxic Substances and Disease Registry . 2015. Toxicological Profile for DEET (N,N-Diethyl-*meta*-Toluamide) (Draft for public comment). Atlanta, GA: U.S. Department of Health and Human Services.

C₁₂H₁₇NO

Chemical and Physical Information

Routes of Exposure

Relevance to Public Health (Health Effects)

DEET is a liquid

- DEET (N,N-diethyl-*meta*-toluamide) is a white to amber-color liquid.
- DEET is the active ingredient in some common repellents widely used against biting pests such as mosquitoes and ticks.
- DEET formulations are typically used as sprays or mists, lotions and wipes and can be applied directly onto human skin or onto clothing.
- DEET has been previously and is currently sold as an ingredient in several common repellent products, including Skeeter Skat, Chigger-wash, as well as various Off!®, Repel, and Old Time Woodsman brand products and various Cutter brand products, such as Cutter All family, Cutter Dry, and Cutter Backwoods.

- Inhalation – Minor route of exposure for the general population.
- Oral – Minor route of exposure the general population through ingestion of contaminated water.
- Dermal – Principal route of exposure for the general population through application of consumer products containing DEET.

DEET in the Environment

- DEET can enter the air during spray applications.
- In air, DEET can be broken down by reactions with other chemicals.
- DEET enters aquatic systems as a result of human activities such as showering or bathing and laundering of clothes sprayed with insect repellents containing DEET.
- DEET in water can be degraded by aerobic microorganisms.
- DEET does not usually stay in the environment long.
- DEET does not bioconcentrate in aquatic systems.

Health effects are determined by the dose (how much), the duration (how long), and the route of exposure.

Minimal Risk Levels (MRLs)

Inhalation

- No acute-, intermediate- or chronic duration inhalation MRLs were derived for DEET.

Oral

- An MRL of 1 mg/kg/day has been derived for intermediate-duration oral exposure (15–364 days).
- No acute- or chronic-duration oral MRLs were derived for DEET.

Health Effects

- There have been sporadic reports over the last several decades of an association between excessive use of repellents containing DEET and adverse neurological effects including seizures, uncoordinated movements, agitation, aggressive behavior, low blood pressure, and skin irritation.
- Considering the intentional extensive consumer use of products containing DEET on the skin, the risk of health effects due to exposure to DEET appears to be quite low.

- The U.S. Department of Health and Human Services has not classified DEET as to its carcinogenicity. The U.S. EPA's Office of Pesticide Programs has classified DEET as a Group D chemical, not classifiable as a human carcinogen. The International Agency for Research on Cancer has not classified DEET as to its carcinogenicity.

Children's Health

- Some children exposed to insect repellents or lotions containing DEET have experienced the same type of neurological effects observed in adults (e.g., agitation, hypertonia, seizures, ataxia, restlessness, and uncontrolled limb movements).
- In the specific case of seizures, it should be noted that because a relatively high percentage (23–29%) of children are exposed to DEET in North America and because seizure disorders occur in 3–5% of children, it would not be unexpected to see an association just by chance.