

Toxicological Profile for 2,4-D

Chemical Formulation & Use Profile 2,4-Dichlorophenoxyacetic acid, commonly known as 2,4-D, is a post-emergent, selective control herbicide used to control broad leaf weeds in agriculture, forestry and in home lawns and gardens. Worldwide, it is the most extensively used herbicide, and third most widely used in the U.S.¹² 2,4-D belongs to the phenoxy class of herbicides, and is produced in a variety of forms, including: acid, salt, amine and ester.

Human Health Risk Summary

Acute Effects: Brief exposure to 2,4-D via inhalation can result in coughing, burning of the respiratory tract, dizziness and potential loss of some muscle function.³ Following ingestion, nausea, diarrhea, vomiting, and other digestive tract problems may occur.⁴⁵ Dermal exposure may result in skin irritation and inflammation. Eye exposure via direct contact or aerial exposure may result in severe eye damage.⁶ Following high level or recurrent exposure to 2,4-D, nervous system damage may occur.⁷

Chronic Effects: Carcinogenicity: 2,4-D has been linked to several forms of cancer, primarily lymphoma and non-Hodgkin's lymphoma, as well as tumors of the lung, liver, kidney and brain.⁸⁹¹⁰

Reproductive & Developmental Toxicity: The California Office of Environmental Health Hazard Assessment (OEHHA) has "formally identified" 2,4-D and its associated compounds to be reproductive toxicants, and has announced its intent to list 2,4-D as a Proposition 65 listed reproductive and/or developmental hazard, based on the USEPA Reregistration Eligibility for 2,4-D.¹¹¹² Prolonged exposure to 2,4-D has been associated with reduced sperm counts and increased sperm abnormality in both humans and animals.¹³¹⁴ A correlation between an increase in birth defects and use of phenoxy herbicides in agricultural communities has been demonstrated.¹⁵ 2,4-D has been strongly linked to **extensive and profound developmental neurotoxicity** and other fetal growth retardation in laboratory animals and human cell cultures, suggesting similar effects to humans via exposure during pregnancy or early childhood.¹⁶¹⁷¹⁸¹⁹²⁰²¹²² **Endocrine Disruption:** In laboratory studies, 2,4-D exposure has led to thyroid hormone disruption, reduction in sex organ size, and disruption of metabolism generally.²³ Human studies have also shown hormonal disruptions.²⁴ **Mutagenicity:** Several studies have concluded that exposure to 2,4-D caused chromosomal aberrations (breaks and/or rearrangement) in both animal and human subjects.²⁵²⁶²⁷²⁸ 2,4-D is also considered a peroxisome proliferating compound, and has demonstrated the ability to disrupt gene expression and cell division, which could cause disruptions to organ system development as well as promote the replication of cancer cells primarily in the human liver.²⁹³⁰³¹

Ecological Hazard Summary

Environmental Fate: Depending on the formulation, the half-life of 2,4-D in soil environments ranges from less than 7 days to over 60 days. However, because 2,4-D has a very low soil-adsorption coefficient, it is likely to leach to aquatic environments, where its half-life ranges from 13 to over 300 days depending on the aquatic conditions.³² Inappropriate aerial applications of 2,4-D can cause airborne drift of the compound to non-target environments and impact plants and animals therein. It has been shown to be one of the most common pesticides to result in non-target applications due to drift nationwide.³³

Risk to Non-Target Flora & Fauna: Because of its ability to disrupt plant growth, even extremely low exposures to 2,4-D can kill non-target plant species.³⁴ The compound has also been shown to have variable toxicity to insects, birds, amphibians and mammals, and **relatively high toxicity to fish species**, resulting in reproductive and development deficits, as well as mortality at higher levels.³⁵³⁶

Toxicity of Inert Ingredients While 2,4-D may be contaminated with literally dozens of toxic substances, perhaps the worst example is TCDD or dioxins in general. Dioxins are widely recognized as one of **the most toxic** substances present in the environment.³⁷ Dioxins are known to cause cancer and reproductive and developmental damage in both humans and animals at extremely low levels of exposure.³⁸

Summary 2,4-D and its associated compounds are of particular concern to human health and the environment, due to: 1) evidence of carcinogenicity, reproductive/developmental effects, endocrine system effects, and genotoxicity to humans; 2) potential adverse effects to non-target plant and animal species; and 3) the potentially severe impact of its contaminants (particularly dioxins) on humans and animals alike.

Common Commercial Names

Aqua Kleen, Barrage, Demise, Esteron, Lawn-Keep, Malerbane, Planotox, Plantgard, Weed-B-Gone, Weedone.

References

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