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Retrieval and scientific interpretation of ecotoxicological information

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Dioxin Health Risk Assessment

The term *dioxin* or *dioxins* refers to a range of polychlorinated dibenzo-p-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs), and a range of coplanar polychlorinated biphenyls (PCBs) that have dioxin-like toxicity. Dioxins may cause cancer, disrupt the endocrine system and may cause reproductive and developmental effects. It has been shown that these compounds are extremely potent in producing a variety of effects in experimental animals based on traditional toxicology studies at levels several orders of magnitude lower than most chemicals of environmental concern.

South Africa is a Party to the Stockholm Convention on Persistent Organic Pollutants (POPs). In terms of this Convention, Parties must take measures to reduce, and if possible eliminate, emissions and unintentional production of dioxins, which are classified as POPs.

Despite a large volume of research over many years since the early 1980s, the exact molecular mechanisms of dioxin formation are still uncertain. The key sources of dioxin releases to air are from anthropogenic combustion processes and the production and use of chemicals contaminated with dioxins. Once released into the environment, dioxins may be transported over long distances as vapours or associated with particulates in the atmosphere. Eventually, dioxins partition to soils, surface waters, or plant vegetation as a result of dry or wet deposition. Dioxins are removed from the water column to a minor extent by volatilisation to the atmosphere, with binding to particulates and sediment, or bioaccumulation by aquatic biota being more significant processes. Dioxins deposited on soils will strongly adsorb to organic matter. Due to low water solubility and high lipophilicity, dioxins bio-concentrate in aquatic organisms and also in plants, although in the latter case foliar deposition and adherence are considered to be more significant. This inevitably leads to uptake and bioconcentration of dioxins in the food chain, which is the major source of human exposure.

Media and biota concentrations are used in conjunction with exposure factors (human intake factors) for quantification of total dioxin exposure. INFOTOX estimates the daily dioxin intake of adults and children, and of breast-fed infants through ingestion of contaminated mother's milk. Instead of cancer risk quantification, INFOTOX assesses potential human health risks in terms of body burdens and the relationship between daily intakes of dioxins and sensitive noncancer health endpoints, which method would also be protective in the assessment of cancer risks. INFOTOX has conducted studies on dioxins in air, animal feeds, fish, meat and milk.



Artist: Danie Smith