ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

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Analysis of Dioxins

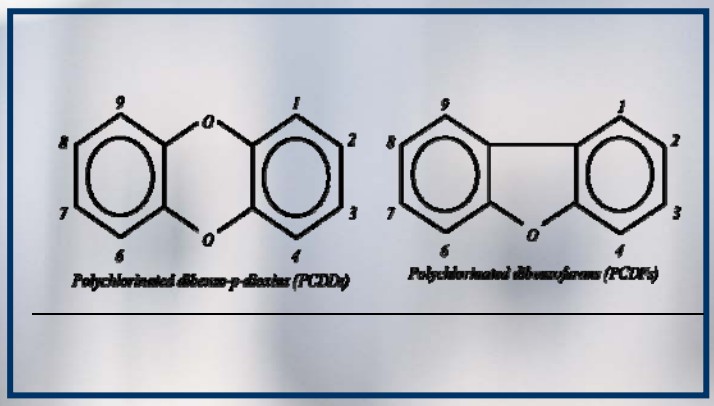
Part 1 – What are dioxins and why are they of concern?

What are Dioxins?

"Dioxins" are a group of highly toxic, closely related compounds which exhibit similar chemical and biological characteristics.

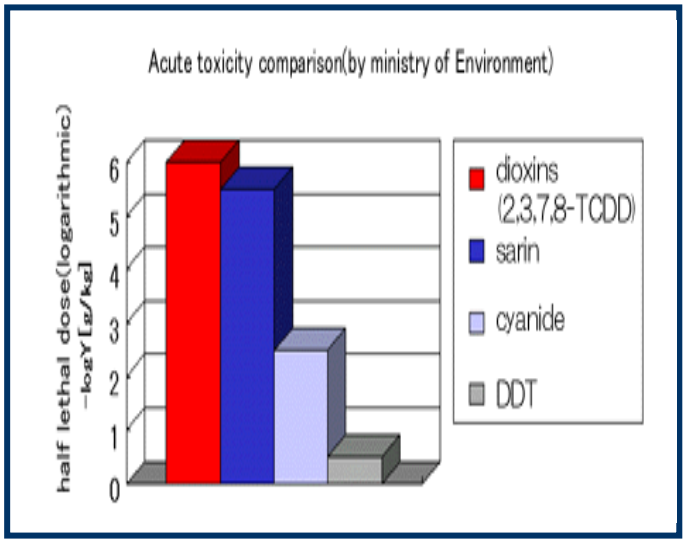
Polychlorinated dibenzo-*p*-dioxins (PCDDs) and **Polychlorinated dibenzofurans (PCDFs)** are generally grouped together as "Dioxins".

There are 210 of these compounds that differ in the number of chlorines and their positions (1 to 9) around the dibenzo structure. (See diagram)



Seventeen of these compounds (also known as congeners) exhibit an acute toxic effect, all of which have chlorine present in the 2,3,7 and 8 positions and then in additional positions as the number of chlorines exceeds four.

The compound **2,3,7,8-Tetrachlorodibenzo-*p*-dioxin (TCDD)** is the dioxin congener with the highest acute toxicity. This congener is considered to be the most toxic of all man-made substances and is the fifth most toxic naturally occurring compound known to man. (See comparison data at right.)



Dioxins are **not** produced commercially but exist as by products of combustion and certain industrial processes. They are released into the atmosphere through **combustion** processes where chlorine is present.

- Incineration of commercial and municipal waste
- Burning of fuels like oil, coal and wood
- Forest fires
- Vehicle exhaust emissions.

Right solutions….
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Dioxins are also introduced into the environment through **industrial** processes,

- Bleaching in the pulp and paper industry
- As a by product of organochlorine compound manufacture, eg PCBs, OC pesticides
- Improper disposal of transformer oils
- Oil refining

Why are Dioxins of concern?

Dioxins are highly fat-soluble, difficult to metabolise and tend to accumulate in the fatty tissues of food-producing animals. This leads to bio-accumulation in the food chain, increasing human exposure levels. Dioxins have been found in meat, dairy and fish products as well as in human breast milk.

Dioxins and related compounds bind to aryl hydrocarbon (Ah) receptor proteins of cells in the body, causing a toxic response.

Examples of toxic effects are chloracne, reproductive problems and carcinogenicity.

Current USEPA Superfund criteria for Contract Required Quantitation Limits are 10 – 100pg/l for water and 1 – 10 pg/g for soils.

The ALS HRMS laboratory in Brisbane holds **NATA accreditation** for the analysis of Dioxins in various matrices.

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