

Dioxins (2,3,7,8-Tetrachlorodibenzo-*p*-dioxin)

Incident management

Key Points

Identity

- The term dioxins refers to a group of 75 compounds with similar chemical structures but greatly varying toxicity
- The most toxic dioxin is TCDD and most of the available data refer to this compound

Fire

- Not flammable
- Decomposes when exposed to UV light
- Emits toxic fumes of hydrogen chloride and chlorine when heated to decomposition or on exposure to UV light

Health

- Dioxins are toxic by inhalation or ingestion
- Ingestion of dioxins can lead to adverse effects on the skin, including chloracne, skin rashes or discolouration and excessive body hair
- High levels may give rise to changes in the blood and urine, liver damage or changes in hormonal levels
- Other effects of exposure to very high levels of dioxins include vomiting, diarrhoea, lung infections and damage to the nervous and immune systems
- TCDD is classified as a causing cancer in humans
- TCDD produces a range of toxic effects on reproduction relating to both fertility and developmental toxicity

Environment

- Avoid release into the environment
- Inform Environment Agency of substantial incidents

Hazard Identification

Standard (UK) Dangerous Goods Emergency Action Codes

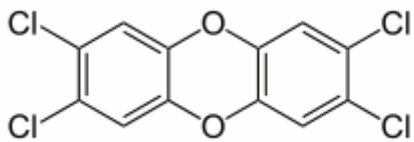
UN		Data not available
EAC		
APP		
Hazards	Class	
	Sub risks	
HIN		

UN – United Nations number; EAC – Emergency Action Code; APP – Additional Personal Protection; HIN - Hazard Identification Number

Chemical Hazard Information and Packaging for Supply Classification

Classification		Data not available
Risk phrases		
Safety phrases		

Physicochemical Properties

CAS number	1746-01-6
Molecular weight	322
Empirical formula	C ₁₂ H ₄ Cl ₄ O ₂
Common synonyms	Dioxin; TCDD
State at room temperature	Solid
Volatility	Vapour pressure negligible at 25°C
Specific gravity	1.8 at 20°C (water = 1)
Flammability	Non-flammable
Lower explosive limit	Not applicable
Upper explosive limit	Not applicable
Water solubility	Not soluble in water at 25°C. Low solubility in organic solvents
Reactivity	Decomposes when exposed to UV light
Reaction or degradation products	Releases toxic fumes of hydrogen chloride and chlorine upon decomposition by heating or exposure to UV light
Odour	Odourless
Structure	

References^(a,b,c)

^a Dioxins (HAZARDTEXT® Hazard Management). In: Klasco RK (Ed): TOMES® System. Thomson Micromedex, Greenwood Village, Colorado (accessed 02/2007).

^b The Merck Index (14th Edition). Entry 9084: TCDD, 2006.

^c The Dictionary of Substances and their Effects. Ed. S Gangolli. Second Edition, Volume 3, 1999.

Threshold Toxicity Values

EXPOSURE VIA INGESTION	
mg	SIGNS AND SYMPTOMS
-	Data not available

Published Emergency Response Guidelines

Emergency Response Planning Guideline (ERPG) Values

	Listed value (ppm)	Calculated value (mg m ⁻³)
ERPG-1*	Data not available	
ERPG-2**		
ERPG-3***		

* Maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hr without experiencing other than mild transient adverse health effects or perceiving a clearly defined, objectionable odour.

** Maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hr without experiencing or developing irreversible or other serious health effects or symptoms which could impair an individual's ability to take protective action.

*** Maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hr without experiencing or developing life-threatening health effects.

Acute Exposure Guideline Levels (AEGLs)

	ppm				
	10 min	30 min	60 min	4 hr	8 hr
AEGL-1 [†]	Data not available				
AEGL-2 ^{††}					
AEGL-3 ^{†††}					

[†] The level of the chemical in air at or above which the general population could experience notable discomfort.

^{††} The level of the chemical in air at or above which there may be irreversible or other serious long-lasting effects or impaired ability to escape.

^{†††} The level of the chemical in air at or above which the general population could experience life-threatening health effects or death.

Exposure Standards, Guidelines or Regulations

Occupational standards

WEL	LTEL(8 hour reference period): No guideline value specified
	STEL(15 min reference period): No guideline value specified

Public health guidelines

DRINKING WATER QUALITY GUIDELINE	No guideline value specified
AIR QUALITY GUIDELINE^(a)	A guideline value was not proposed as direct inhalation exposures constitute only a small proportion of total exposure
SOIL GUIDELINE VALUE AND HEALTH CRITERIA VALUES^(b)	Tolerable Daily Intake <small>oral</small> 2 pg kg ⁻¹ bw day ⁻¹
	Mean Daily Intake <small>oral</small> 126 pg day ⁻¹
	Tolerable Daily Soil Intake Adult: 0.4 pg kg ⁻¹ bw day ⁻¹ Child: 0.4 pg kg ⁻¹ bw day ⁻¹

WEL – Workplace exposure limit; LTEL - Long-term exposure limit; STEL – Short-term exposure limit

^a Air Quality Guidelines for Europe. World Health Organization Regional Office for Europe, Copenhagen WHO Regional Publications, European Series, No. 91, Second Edition, 2000.

^b Department for Environment, Food and Rural Affairs (DEFRA). Contaminants in Soil: Collation of Toxicological Data and Intake Values for Humans. Dioxins, Furans and Dioxin-Like PCBs, 2003.

Health Effects

Major route of exposure^(a)

- Toxic by inhalation or ingestion.

Immediate signs or symptoms of acute exposure

- In the case of ingestion, acute symptoms are unlikely.
- Adverse effects on the skin, including chloracne, skin rashes, discolouration or excessive body hair may occur some days after exposure.
- Exposure to high concentrations may give rise to changes in the blood and urine, liver damage or changes in hormonal levels, as well as vomiting, diarrhoea, lung infections and damage to the nervous and immune systems.

TOXBASE - <http://www.toxbase.org>

^a TOXBASE: Dioxins and furans – as ITEQ – SEPA, 2005.

Decontamination and First Aid

Important Notes

- Ambulance staff, paramedics and emergency department staff treating chemically-contaminated casualties should be equipped with Department of Health approved, gas-tight (Respirex) decontamination suits based on EN466:1995, EN12941:1998 and prEN943-1:2001 , where appropriate.
- Decontamination should be performed using local protocols in designated areas such as a decontamination cubicle with adequate ventilation.

Dermal exposure^(a)

- Remove patient from exposure.
- The patient should remove all clothing and personal effects.
- Double-bag soiled clothing and place in a sealed container clearly labelled as a biohazard.
- Brush away any adherent solid particles from the patient.
- Wash hair and all contaminated skin with copious amounts of water (preferably warm) and soap for at least 10-15 minutes. Decontaminate open wounds first and avoid contamination of unexposed skin.
- Pay special attention to skin folds, axillae, ears, fingernails, genital areas and feet.

Ocular exposure^(b)

- Remove patient from exposure.
- Remove contact lenses if necessary and immediately irrigate the affected eye thoroughly with water or 0.9% saline for at least 10-15 minutes.
- Patients with corneal damage or those whose symptoms do not resolve rapidly should be referred for urgent ophthalmological assessment.

Inhalation

- Remove patient from exposure.
- Ensure a clear airway and adequate ventilation.
- Give oxygen to symptomatic patients.
- Apply other supportive measures as indicated by the patient's clinical condition.

Ingestion

- Give oxygen to patients with respiratory symptoms.
- Apply other supportive measures as indicated by the patient's clinical condition.

This document will be reviewed not later than 3 years or sooner if substantive evidence becomes available.

TOXBASE - <http://www.toxbase.org>

^a TOXBASE: Skin decontamination – irritants, 1996.

^b TOXBASE: Eye irritants, 2002.