

FACT SHEET: PVC AND DIOXINS

WHAT IS DIOXINS

Dioxins is a collective name for a group chlorinated compounds: polychlorinated dibenzo-dioxins (PCDD) and polychlorinated dibenzofurans (PCDF). There are a total of 210 different dioxins of which 17 are considered particularly toxic. The most toxic is 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD), Figure 1.

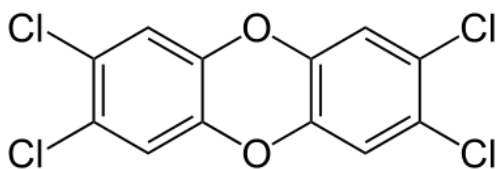


Figure 1. Structural formula for the PCDD analogue TCDD (2,3,7,8-tetrachlorodibenzo-p-dioxin)

ORIGIN

Dioxins (PCDD and PCDF) are not produced intentionally, they are formed as pollution during combustion and in some industrial processes. Earlier, the emissions came mainly from waste incineration as well as manufacturing of pulp and steel, however these have decreased in recent years. Today incineration of wood and biofuels are the largest known sources¹. Some compounds may also be naturally formed in the environment, but these amounts are considerably smaller than those from industrial processes.

The sources are not yet fully mapped out and it is believed that uncontrolled burning of waste, including garden waste, can be an important source. Emissions of dioxins have been regulated since 1970s.

DIOXINS AND PVC

When PVC is manufactured, very small amounts of dioxin can be formed in one of the process steps - the manufacturing of vinyl chloride monomers (VCM). These dioxins are absorbed by a catalyst and is thus easily taken care of. Manufacturing is well controlled and reads under strict laws and regulations for e.g. industrial emissions and waste management.

Emissions of dioxins from the production of PVC has been sharply reduced over the past 15 years. Today, PVC production accounts for less than 0.1 % of the total emissions from human activity.

If the requirement would be that no material that releases dioxins during production should be approved, a number of important building materials would not be allowed along with PVC, for example cement as well as iron and steel.

When burning waste that contains chlorine, including wood and food residues, dioxins can be formed. Most often the amount of chlorinated material in the waste is of minor importance compared to the combustion conditions, such as combustion temperature, oxygen supply and presence of catalysts.

PVC is not even the biggest source of chlorine in the municipal waste incineration plants. One study commissioned by the EU authorities showed that the biodegradable part is responsible for 35 % of the total chlorine content while plastic only account for 25 %. Several studies show that if PVC was removed from the waste it would not significantly reduce the amounts of dioxins released.

CHARACTERISTICS AND HEALTH EFFECTS

Dioxins are stable (difficult to break down) and fat soluble. They remain therefore in the environment and in the body for a long time, and the levels increase moving up in a food chain. Since the dioxins are stable they remain in food and humans despite the fact that emissions and use has been severely limited since the 1970s.

Dioxins and dibenzofurans are listed among the substances that are included in the Stockholm Convention on Persistent organic substances, so-called POPs (Persistent Organic Pollutants).

High levels of dioxins and PCBs have shown to affect the development of the brain and nervous system in animal experiments, which among other things can give behavioural disorders. The substances are also suspected to affect the immune system, hormone system and reproduction system and cause cancer. In high doses dioxin may also give chloracne, a long-lasting acne-like skin inflammation on the face².

Within the EU a so-called tolerable daily intake³ has been established (TDI); two picograms dioxin equivalents (TEQ⁴) / kg body weight and day. The TEQ system is a way of weighing the contents of the various dioxin compounds together, taking into account that they have different toxicity.

EXPOSURE

Food is the main source of dioxin in humans. Particularly high levels are found in fatty fish such as herring and wild-caught salmon from, for example, the Baltic Sea, Gulf of Bothnia, Vänern and Vättern. Breastfed infants is the group that has the largest intake per kilogram of body weight. The levels of dioxins in food has declined significantly since 1999. The National Food Administration's calculations show that the median intake of dioxins

and dioxin-like PCBs is 0.5 pg TEQ / kg body weight and day in adults (18-80 years) in Sweden⁵. This corresponds to about a quarter of the tolerable daily intake. For children and women in childbearing age it is particularly important to minimize the intake of dioxin-like substances. Among women in childbearing age (17-45 years) 1-2 % have an intake exceeding the TDI.

VINYLPUS

VinylPlus is the PVC industry's latest volunteer commitment to sustainable development and refers to the period between 2010 and 2020. The new program contains 30 measurable and concrete goals which are focusing on five challenges that are based on The Natural Step's system conditions for sustainable development.

One of the challenges concerns the release of chlorine organic compounds. It implies that the industry should ensure that persistent organic compounds, such as dioxins, do not accumulate in nature. Read more about this work on <http://www.vinylplus.eu/>

REFERENCES

1. <http://utslappisiffror.naturvardsverket.se/Amnen/Klorerade-organiska-amnen/Dioxin/>
2. <http://www.livsmedelsverket.se/livsmedel-och-innehall/oonskade-amnen/miljogifter/dioxiner-och-pcb/>
3. This corresponds to the maximum intake of dioxin-like substances for one person each day throughout the whole life without risk of some effects on the body's functions.
4. TEQ = toxic equivalents
5. "Risk and benefit assessment of herring and salmonid fish from the Baltic Sea area ", Livsmedelsverket