Australian Government
Department of the Environment and Water Resources

fact sheet

Polychlorinated biphenyls (PCBs)

Unranked at present

The National Pollutant Inventory (NPI) provides information on the types and quantities of substances being emitted into the Australian environment, and holds data on reported sources of polychlorinated biphenyls (PCBs) emissions in Australia.

This fact sheet provides information about PCBs. It describes how you might be exposed to these substances, how exposure might affect you and the environment, common uses, and physical and chemical properties.

For more information on the terms used in this fact sheet, see the glossary on the NPI web site:

www.npi.gov.au/epg/npi/contextual_info/glossary.html

What are PCBs?

PCBs are mixtures of various isomers based on biphenyl. There are 209 individual possible PCB variants (also known as congeners). Approximately 100 of these congeners are present in various technical mixtures of PCBs that were produced commercially in large quantities until the late 1970s. Australia banned the importation of PCBs in 1975.

PCBs are amongst a broader group of harmful persistent organic pollutants (POPs) that are toxic, persist in the environment and animals, bioaccumulate through the food chain and pose a risk of causing adverse effects to human health and the environment. They are listed under the Stockholm Convention on Persistent Organic Pollutants for phasing out and eventual elimination. For more information see:

www.environment.gov.au/settlements/chemicals/international/pop.html

Health effects

What effect might PCBs have on my health?

Symptoms experienced by people exposed to large amounts of PCBs are skin conditions such as acne or rashes (also known as chloracne) and irritation and burning in the eyes. Blood and urine tests indicate damage to the liver for affected people.

Other symptoms include nausea, lethargy, brown pigmentation of skin and nails, swelling of the face, distinctive hair follicles, excessive eye discharge, swelling of the eyelids, visual disturbances, gastrointestinal disturbances, jaundice and decreased lung function. These are only likely to be evident in those who work with PCBs and who do not wear appropriate protective clothing.

In the general population these effects are not considered likely.

Women exposed to relatively high levels of PCBs either in the workplace, or from consuming contaminated fish, may have babies that weigh slightly less at birth, and have an effect on the gestational period and head circumference. The babies may also have abnormal responses in tests of infant behaviour, such as motor skills and short term memory. Affected babies may also exhibit an altered immune system.

Animal studies indicate that consumption of large amounts of contaminated food for short periods of time causes mild liver damage. Animals that consumed tainted food of lower concentration over a longer period of time developed various kinds of health effects, including anaemia, acne-like skin conditions, liver, stomach and thyroid-gland injuries. The immune system was affected, behavioural alterations were noted, and reproduction was impaired.

Australian Government
Department of the Environment and Water Resources

Polychlorinated biphenyls (PCBs)

fact sheet

The Australian Safety and Compensation Council considers PCBs as probable human carcinogens, or compounds capable of causing cancer. This is based on evidence of carcinogenicity in both humans and animals.

How might PCBs enter my body?

PCBs can enter the body by ingestion, inhalation of vapours, or by absorption through the skin.

How might I be exposed to PCBs?

Exposure to PCBs may result from using old fluorescent lighting fixtures and electrical devices and appliances made over 30 years ago; eating contaminated food such as fish caught in contaminated waterways; breathing air near hazardous waste sites and drinking contaminated well water; and in the workplace during the repair and maintenance of PCB transformers, accidents, fires or spills involving transformers, fluorescent lights and other old electrical devices, and disposal of PCBs or materials containing PCBs.

What are the PCBs health guidelines?

Workplace exposure:

Currently, the eight-hour time weighted average (TWA) exposure limit is 0.5 milligrams of PCBs (containing 54% chlorine) per cubic metre of air. A 15-minute short term exposure limit (STEL) is 1 milligram of PCBs per cubic metre of air.

Australian drinking water guidelines:

No drinking water guidelines have been established for PCBs.

Environmental effects

What effect might PCBs have on the environment?

PCBs do not readily break down in the environment and may persist for long periods of time.

PCBs can accumulate in fatty tissues of animals. The longevity of PCBs and their affinity for fatty tissue can result in PCBs moving up and concentrating through the food chain, resulting in levels that may be many times higher than in the water. Research has found that some animal species, such as young fish, are particularly sensitive to PCBs. PCB contamination may cause mutations in plants, decline in some bird populations and reduced reproduction in sea mammals.

How might PCBs enter the environment?

PCBs can enter the environment as a result of their manufacture, use and disposal; from accidental leaks during storage or transport, or from leaks or fires in products that contain PCBs. PCBs may also enter the environment from hazardous waste sites, illegal or improper disposal of industrial wastes and consumer products, and from burning some wastes in incinerators.

Where in the environment do PCBs end up?

PCBs are capable of traveling long distances in air or water. Most PCBs will adhere to organic particles and sediments in the water bodies and will bind strongly to soil.

Australian Government
Department of the Environment and Water Resources

fact sheet

Polychlorinated biphenyls (PCBs)

What are the PCB environmental guidelines?

Currently there are no air quality environmental guidelines for PCBs.

In 2000, the Australian and New Zealand Environment and Conservation Council (ANZECC) and the Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) established trigger levels of 0.01-1.7 micrograms of PCBs (as Aroclor 1242 and Aroclor 1254) per litre of fresh water. No trigger levels were established for PCBs in marine water.

Common uses

PCBs have been used as coolants and lubricants in electrical equipment (such as transformers and capacitors), hydraulic fluids, additives in paint, carbonless copy paper, plasticisers and dye carriers. PCBs were used as they do not burn easily and are good insulators.

Sources

Industry sources

PCBs are generated and released into the environment as unintentional by-products of chemical manufacturing and incineration.

Previously, PCBs were imported into Australia. This practice ceased in 1975, however, PCBs may be present in many hazardous waste sites and in equipment still containing PCBs.

Diffuse sources

There are no sources of PCBs that arise from diffuse sources.

Transport sources

There are no sources of PCBs that arise from transport.

Natural sources

PCBs do not occur naturally in the environment.

Consumer products that contain PCBs

Previously, PCBs were used as dielectric fluids for capacitors and transformers, heat transfer fluids, plasticisers, additives in paint, carbonless copy paper, lubricants and many other industrial and commercial products.

Comparison to other substances

NPI rank

Currently 93 substances are required to be reported to the NPI. A panel of technical experts, the Technical Advisory Panel (TAP), was formed to recommend inclusion of substances on the NPI. The TAP assessed the hazards and risks associated with acrolein, but did not provide overall health or environmental hazard scores, or an overall rank for acrolein. For further information about the role of the TAP and inclusion of substances on the NPI list, please see our Technical Advisory Panel report: www.ephc.gov.au/pdf/npi/npi_final_tap_report_06_06.pdf

Australian Government
Department of the Environment and Water Resources

fact sheet

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Physical and chemical properties

Substance name	Polychlorinated biphenyls
CAS number	Many
Molecular formula	General Formula: $C_{12}H_{10-n}Cl_n$ (where n = 1-10)
Synonyms	PCBs, chlorinated biphenyls, Aroclor, Clophen, Fenclor, Kaneclor, Pyralene

Physical properties

PCBs range in appearance from colourless, oily liquids to more viscous and increasingly darker liquids, to yellow to black resins. The appearance depends on the chlorine content of the PCB. Some PCBs can exist as a vapour in air. They have no known smell or taste.

Chemical properties

PCBs are chemically stable, have good insulating properties and do not degrade appreciably over time or with exposure to high temperatures. They are very soluble in organic solvents.

Sources used in preparing this fact sheet

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- Australian and New Zealand Environment and Conservation Council (ANZECC) and Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) (2000), Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Volume 1, The Guidelines, accessed June 2007.
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- Environment Writer, Chemical Backgrounder: Polychlorinated Biphenyls (PCBs), accessed July 2007.
- Merck and Co. 2006, Merck Index, 14th Edition, USA.
- Office of the Australian Safety and Compensation Council, Exposure Standards: PCBs, accessed June 2007.
- Technical Advisory Panel 2006, Final Report to the National Environment Protection Council.
- United States Environmental Protection Agency, Integrated Risk Information System (IRIS): PCBs, accessed June 2007.

Other information that may be useful in understanding some of the issues surrounding the NPI can be found on our web site: www.npi.gov.au/database/substance-info/sources.html