

Phosphate Ester Flame Retardants - ToxFAQs™

**CAS # 126-71-6; 126-73-8; 78-51-3; 115-86-6;
13674-84-5; 13674-87-8; 115-96-8; 1330-78-5**

This fact sheet answers the most frequently asked health questions (FAQs) about phosphate ester flame retardants. For more information, call the CDC Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because these substances may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: The general population is primarily exposed to phosphate ester flame retardants by eating contaminated food. Limited data are available regarding health effects in humans. In animal studies, long term exposure to some flame retardants has caused damage to various organs and tumors. These chemicals have been found in at least 8 of the 1,699 National Priorities List (NPL) sites identified by the Environmental Protection Agency (EPA).

What are phosphate ester flame retardants?

Phosphate ester flame retardants are human-made chemicals that are typically liquids at room temperature, although some are solids. They are made up of groups of chemicals with similar properties but different structures.

Phosphate esters are added to consumer and industrial products in order to reduce flammability. They are used in plasticizers, hydraulic fluids, solvents, extraction agents, antifoam agents, and coatings for electronics.

What happens to phosphate ester flame retardants when they enter the environment?

- They can change chemical composition in the environment.
- Some phosphate esters will deposit on wet and dry surfaces and others will be broken down by water.
- They are poorly soluble in water and adsorb strongly to soil.
- They are considered emerging pollutants.
- They biodegrade in aquatic and terrestrial environments.

How might I be exposed to phosphate ester flame retardants?

- Most foods contain small amounts of phosphate esters and you may be exposed by eating contaminated food.

- Drinking water may contain phosphate esters due to leakage from plastics or industrial waste water discharge.
- Breathing contaminated indoor air from plastics, adhesives, foams, or electronics.
- Breathing contaminated outdoor air, mainly from hydraulic fluid.
- Skin contact with soil contaminated by hydraulic spills or industrial waste water used on crops.

How can phosphate ester flame retardants affect my health?

Limited data are available regarding health effects in humans. Long-term occupational exposure to two flame retardants (tris(1,3-dichloro-2-propyl) phosphate, TDCP, and triphenyl phosphate, TPP) did not produce adverse health effects. Allergic reactions have been associated with consumer products containing TPP.

A number of health effects have been observed in laboratory animals ingesting phosphate ester flame retardants: brain and kidney lesions and decreased fertility caused by tris(2-chloroethyl) phosphate (TCEP); urinary bladder lesions caused by tributyl phosphate (TnBP); liver lesions caused by tributoxyethyl phosphate (TBEP); kidney and liver lesions caused by TDCP; and adrenal and ovarian lesions caused by tricresyl phosphate (TCP).

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How likely are phosphate ester flame retardants to cause cancer?

There is not enough information available to determine with certainty whether or not phosphate ester flame retardants produce cancer in humans.

Increases in cancer have been observed in laboratory animals exposed to TCEP (kidney tumors), TnBP (urinary bladder and liver), and TDCP (liver, kidneys, testes, and adrenal gland tumors).

The Department of Health and Human Services (DHHS) and the EPA have not classified the carcinogenic potential of the phosphate esters. The International Agency for Research on Cancer (IARC) determined that TCEP is not classifiable as to its carcinogenicity to humans.

How can phosphate ester flame retardants affect children?

No studies have been conducted to examine the toxicity of phosphate ester flame retardants in children.

In animal studies, continuous exposure to some flame retardants caused reductions in live births and reduced pup body weight.

How can families reduce the risk of exposure to phosphate ester flame retardants?

- Avoid food that is high in phosphate ester content.
- Avoid installation or use of materials that are known to contain phosphate esters-based flame retardants in indoor environments to minimize exposure via air.

Is there a medical test to determine whether I've been exposed to phosphate ester flame retardants?

Phosphate ester flame retardants can be measured in blood and urine.

No studies have been conducted to measure these chemicals in blood samples from groups of people representative of the U.S. general population.

Has the federal government made recommendations to protect human health?

The Occupational Safety and Health Administration (OSHA) has set a legal limit of 3 milligrams per cubic meter of workplace air (3 mg/m³) for TPP and 5 mg/m³ for TnBP over an 8-hour workday and 40-hour work week.

The EPA has permitted TnBP, TBEP, and TPP for use in nonfood pesticide products.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2012. Toxicological Profile for Phosphate Ester Flame Retardants. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information?

For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Human Health Sciences, 1600 Clifton Road NE, Mailstop F-57, Atlanta, GA 30329-4027.

Phone: 1-800-232-4636.

ToxFAQs™ Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaqs/index.asp>.

ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.