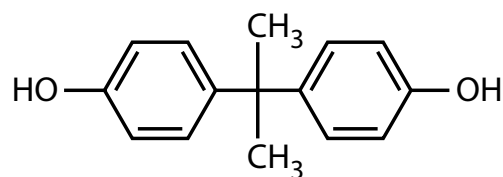




Bisphenol A

BISPHENOL A PROFILE GUIDE

BISPHENOL A PROFILE INTERPRETIVE GUIDE



Bisphenol A
(Polycarbonate plastics)
Estrogenic ++++

BISPHENOL A (BPA)

Bisphenol A (BPA) has been in use for over 50 years. It is a phenolic chemical used in the manufacture of polycarbonate plastics and epoxy resins. While air, dust, and water are possible sources of exposure, BPA in food and beverages containers accounts for the majority of daily human exposure. It is well absorbed orally. BPA leaches into food via packaging and during agricultural production. Storage temperatures are a primary influence of the degree to which BPA leaches from polycarbonate bottles. In a review of the 2005-2006 NHANES consumption data study, school lunches and meals outside the home were statistically associated with higher urinary BPA levels.¹ Research also found increased BPA in canned vegetables, while BPA concentrations did not vary by consumption of fresh fruits and vegetables, canned fruit, or store-bought fresh and frozen fish.²

BPA is rated as weakly estrogenic.⁴ Its reproductive and neurodevelopmental effects have been extensively studied.⁵⁻¹² Higher urinary BPA levels have been found to be statistically associated with avoidable morbidity,¹³ reported heart disease,¹⁴ increased diabetes and liver enzymes, increased allergy/hay-fever diagnosis, and endocrine changes in large population studies.^{15,16}

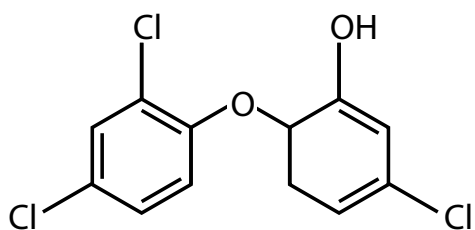
Biomonitoring studies provide clinicians with a reference value to determine whether people have been exposed to higher levels of BPA than are found in the general population. The

ability to detoxify BPA depends on concurrent exposure to other toxins and overall health status. In humans, generally little free BPA circulates after oral absorption due to the high degree of glucuronidation by the liver. Urinary measures of BPA include both conjugated and unconjugated forms. Exposure to small amounts is excreted in urine within 24 hours. While there is limited evidence of the accumulated effect of low dose chronic exposure in humans, animal studies have seen altered development of the fetal prostate and mammary gland, inhibition of postnatal testosterone production, and changes in neurodevelopment.^{8,18-20} In the Fourth National Report on Human Exposure to Environmental Chemicals (NHANES), a review of urinary BPA levels from the 2003-2004 NHANES data found BPA in 92.6% of the people sampled. Infants, children, females, and those in the lower income strata had slightly higher urinary levels.²¹

To reduce harm from BPA:

1. Identify exposure sources and remove them.
 - Avoid polycarbonate containers that contain BPA, which usually have a #7 or a #3 on the bottom.
 - Reduce your use of canned foods.
 - When possible, opt for glass, porcelain, or stainless steel containers, particularly for hot food or liquids.
 - Avoid handling store receipts, which have been found to be a source of BPA.
 - Use baby bottles that are BPA free.
 - Don't microwave polycarbonate plastic food containers as it will increase release and exposure. Polycarbonate is strong and durable, but over time it may break down from overuse at high temperatures.
2. Enhance the clearance of persistent toxins such as BPA.
 - Sauna therapy
 - BPA is cleared with glucuronidation by the liver. Provide overall liver support such as NAC, lipoic acid, and milk thistle to aid in clearing.

Type of BPA	Used in production of: ³
Polycarbonate plastics	Beverage containers, compact discs, plastic dinnerware, food containers, receipts, water bottles, baby bottles, impact-resistant safety equipment, automobile parts and toys
Epoxy resins	Protective linings of some canned food containers, wine vat linings, epoxy resin-based paints, floorings, and some dental composites and sealants



Triclosan

(Antimicrobial – releases dioxin)

Endocrine disruptor (thyroid)

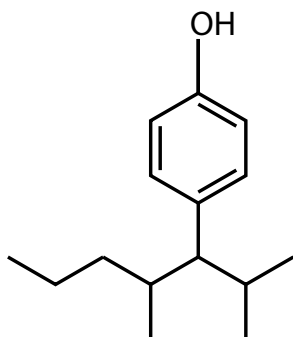
TRICLOSAN

Triclosan has broad-spectrum anti-microbial activity against most gram-negative and gram-positive bacteria. Triclosan targets bacteria mainly by inhibiting fatty acid synthesis. Triclosan is regarded as a weak androgenic compound³⁰ and its metabolite, a weak estrogenic compound.³¹ The dominant source of exposure to triclosan is considered to be personal care products containing the chemical.³² Although adverse effects of triclosan have not been established in humans, research is still needed to understand various effects of triclosan due to its high-volume usage in many personal care products.³³

In mammals, triclosan has been reported to alter serum concentration of thyroxine and to interact with P450-dependent enzymes, UDP-glucuronosyltransferases and the human pregnane X receptor. Research has found the median urinary half-life is 11 hours. Median cumulative urinary excretion was 54% of the administered dose after 4 days (ranging from 24% to 84%), with the majority of the elimination occurring in the first two days.^{33,34}



Type of Triclosan	Used in production of:
Triclosan	Personal care products, deodorants, toothpastes, shaving creams, mouth washes, cleaning supplies, medical devices, and is infused in consumer products such as kitchen utensils, toys, bedding, socks, and trash bags. ²⁹



4-Nonylphenol
(Detergents)

Endocrine disruptor (estrogen)

4-NONYLPHENOL

4-Nonylphenol (4-NP) is an alkylphenol breakdown product. Alkylphenol ethoxylates are widely used as surfactants, the majority of which are nonylphenol ethoxylate (NPE). Anaerobic environmental conditions lead to the polyethoxylate side chain being cleaved resulting in nonylphenol (NP).²² In further reactions, the nonyl group attaches to the phenol ring via the 4- and, to lesser extent, the 2-positions. 4-n-nonylphenol is the measured NP isomer, and represents a small percentage of the total NPs used in commercial mixtures.²³

The CDC detected nonylphenol in about half of 371 urine samples collected from US adults between 1988-1994.²³ Because of its hydrophobic nature, in anaerobic conditions NP absorbs and accumulates in environmental compartments. They are characterized by high organic content, typically sewage sludge and river sediments, where it persists and can further lead to agricultural contamination. Nonylphenols are used as industrial surfactants and detergents. They are added to hundreds of consumer products for carpet and dry cleaning, pesticides, paper manufacturing, paints and coatings, as well as cosmetics and household cleaners. In 2005, the EU classified nonylphenols as a reproductive hazard, and their use in cosmetics and other products was restricted.²⁴



Overall, alkylphenol ethoxylates and related compounds have been reported to be estrogenic because they have demonstrated in laboratory studies that they mimic the effects of estradiol both in vitro and in vivo. There is strong evidence that NP is an endocrine disruptor. The overall effect is weak, but since NPs are in high concentrations in the environment, the total effect is more significant. There is less evidence, but still some concern of NP's ability to disrupt reproduction and fertility and to contribute to birth defects, developmental delay, and repertory impairments.²⁴

4-Nonylphenol (NP) is used in industrial, agricultural, and domestic consumer products. 4-NP is ubiquitous in food products and is used in polyvinyl chloride (PVC) films for food packaging from which 4-NP migrated into food.^{25,26} The primary source of 4-NP contamination is unclear at this time.

Type of 4-Nonylphenol	Used in production of:
Commercial	Emulsifying, wetting, dispersing, or stabilizing agents
Individual	Food, PVC food packaging

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