

Endocrine disruptors

The endocrine system consists of hormone-producing glands as well as receptors that enable organs and tissues throughout the body to respond to these hormones. The endocrine system helps regulate important bodily functions, including growth and development, metabolism, and reproduction.

Endocrine disruptors are chemicals that interfere with the body's endocrine system by disrupting hormone balance in the body and mimicking the effects of certain hormones. Normally, hormones bind to receptors in the body in order to elicit an appropriate response. When harmful endocrine-disrupting chemicals bind to hormone receptors instead, it can be harmful to organ systems and allow disease processes to ensue.

Where are endocrine disruptors found?

[Endocrine disruptors](#) can be found in everyday products such as plastic containers and bottles, metal food cans linings, cleaning products, personal care products, flame retardants, toys, food, and pesticides. Some endocrine-disrupting chemicals break down gradually and remain hazardous to health over time as a result. Endocrine disrupting chemicals can enter the body through the skin (e.g., after applying certain deodorants), orally by consuming contaminated foods or drinking contaminated water, and through inhalation (e.g., perfumes, tobacco smoke).



Adverse health effects of endocrine disruptors

Endocrine disruptors can have negative health implications on many body functions, including development, reproduction, immune function, and brain function. The following health effects or conditions may be associated with exposure to endocrine disruptors based on animal, in vitro, and in vivo studies:

- [Attention-deficit/hyperactivity disorder \(ADHD\)](#)
- [Infertility](#)
- Certain types of cancer
- Metabolic disorders (e.g., diabetes)
- Impaired growth and development

Common endocrine disrupting chemicals

Endocrine disruptor	Description	Possible sources
Bisphenol A (BPA)	A chemical used to produce hard plastic such as polycarbonate	Canned beverages Canned food liners Dental sealants Kids toys Medical equipment Microwaveable food products Plastic food storage containers Plastic tableware Reusable water bottles Thermal paper receipts
Dioxins	Chemicals that have chlorine atoms as part of their structure, are commonly emitted during fuel-burning processes, and can be found in food, water, soil, and air	Air during iron and steel production Air during the combustion of coal, oil, or wood Contaminated drinking water Dairy products Electrical power generation Fish and shellfish Meat Tobacco
Fragrances	Chemicals that emit volatile organic compounds (VOCs), such as limonene	Air fresheners Cleaning products Hand sanitizers Laundry supplies Personal care products Soaps

Parabens	Chemicals that are used as preservatives	<ul style="list-style-type: none"> Cosmetics Food products Personal care products Pharmaceuticals products
Perfluorinated chemicals (PFCs)	A class of chemicals that contribute to greenhouse gas emissions	<ul style="list-style-type: none"> Groundwater Firefighting foams Industrial products Microwave popcorn Non-stick cookware Paper Soil Textile coatings Waterproof clothing
Phthalates	A group of chemicals used to make plastics flexible	<ul style="list-style-type: none"> Detergents Diapers Food packaging Kids toys Personal care products (e.g., cosmetics nail polish, shampoo) Sanitary napkins Vinyl flooring
Polybrominated diphenyl ethers (PBDE)	A chemical that's used as a flame retardant	<ul style="list-style-type: none"> Adhesives and sealants Appliances Automobile materials Carpet underlay Building materials Electrical equipment Furniture foam Mattresses Rubber products
Polychlorinated biphenyls (PCB)	Chemicals that break down slowly, are traditionally found in industrial materials, and are used to manufacture coolants or lubricants for electrical equipment such as capacitors and transformers	<ul style="list-style-type: none"> Adhesives and tapes Caulking Electrical equipment Fiberglass Fluorescent light ballasts Foam Oil-based paint Inks Plastics Sealants

Triclosan

A chemical with antimicrobial and antifungal activity

- Liquid body washes
- Hand sanitizer
- Household products
- Mouthwash
- Surgical soaps
- Toothpaste

Xenoestrogens

Chemicals that may mimic estrogen in the body and interfere with the hormone's intended actions

- Coolants
- Food preservatives
- Personal care products
- Pesticides
- Pharmaceuticals
- Plasticidants
- UV filters



Tips to reduce exposure

Reducing exposure to endocrine disruptors



Avoid scented products such as candles, perfumes, and air fresheners.



Avoid using pesticides in the garden.



Buy organic food when possible, and peel your fruits and vegetables.



Choose personal care and cleaning products that don't contain toxic chemicals.



Invest in a reusable glass or metal water bottle.



Never reheat food in plastic containers.



Opt for fresh foods instead of canned or microwavable meals.



Replace your nonstick pots and pans if they become damaged.



Store food and beverages in glass containers instead of plastic.



Wash your vegetables and fruit before eating them.



Use an app to help you evaluate ingredients for safety.



Helpful apps

- [Detox Me](#)
- [Think Dirty](#)
- [EWG's Healthy Living App](#)
- [Yuka](#)

References

1. Bay, K., Asklund, C., Skakkebaek, N. E., & Andersson, A. M. (2006). Testicular dysgenesis syndrome: Possible role of endocrine disrupters. *Best Practice & Research Clinical Endocrinology & Metabolism*, 20(1), 77–90.
2. Bridges, B. (2002). Fragrance: Emerging health and environmental concerns. *Flavour and Fragrance Journal*, 17(5), 361–371.
3. Castelain, F., & Castelain, M. (2012). Parabens: A real hazard or a scare story? *European Journal of Dermatology*, 22(6), 723–727.
4. Centers for Disease Control and Prevention. (2021). Phthalates factsheet. https://www.cdc.gov/biomonitoring/Phthalates_FactSheet.html
5. Darbre, P. (2006). Environmental oestrogens, cosmetics and breast cancer. *Best Practice & Research Clinical Endocrinology & Metabolism*, 20(1), 121–143.
6. Diamanti-Kandarakis, E., Bourguignon, J. P., Giudice, L. C., Hauser, R., Prins, G. S., Soto, A. M., Zoeller, R. T., & Gore, A. C. (2009). Endocrine-Disrupting chemicals: An endocrine society scientific statement. *Endocrine Reviews*, 30(4), 293–342.
7. DiVall, S. A. (2013). The influence of endocrine disruptors on growth and development of children. *Current Opinion in Endocrinology & Diabetes and Obesity*, 20(1), 50–55.
8. Environmental Working Group. (n.d.-a). EWG's healthy living app. <https://www.ewg.org/apps/>
9. Environmental Working Group. (n.d.-b). What are PFAS chemicals, and where are they found? <https://www.ewg.org/pfaschemicals/what-are-forever-chemicals.html>
10. Environmental Working Group. (2013, October 28). Dirty dozen endocrine disruptors. <https://www.ewg.org/consumer-guides/dirty-dozen-endocrine-disruptors>
11. Fenton, S. E. (2006). Endocrine-Disrupting compounds and mammary gland development: Early exposure and later life consequences. *Endocrinology*, 147(6), s18–s24.
12. Ferguson, K. K., Colacino, J. A., Lewis, R. C., & Meeker, J. D. (2017). Personal care product use among adults in NHANES: Associations between urinary phthalate metabolites and phenols and use of mouthwash and sunscreen. *Journal of Exposure Science & Environmental Epidemiology*, 27(3), 326–332.
13. Health Canada. (2006a). Dioxins and furans. <https://www.canada.ca/en/health-canada/services/healthy-living/your-health/environment/dioxins-furans.html>
14. Health Canada. (2006b). PCBs. <https://www.canada.ca/en/health-canada/services/healthy-living/your-health/environment/pcbs.html>
15. Health Canada. (2020a). Bisphenol A (BPA). <https://www.canada.ca/en/health-canada/services/home-garden-safety/bisphenol-bpa.html>
16. Health Canada. (2020b). Polybrominated diphenyl ethers (PBDEs). <https://www.canada.ca/en/health-canada/services/chemical-substances/fact-sheets/chemicals-glance/polybrominated-diphenyl-ethers-public-summary.html#2>
17. Hiller-Sturmhöfel, S., & Bartke, A. (1998). The endocrine system. *Alcohol Health and Research World*, 22(3), 153–164.
18. Kirchhof, M. G., & de Gannes, G. C. (2013). The health controversies of parabens. *Skin Therapy Letter*, 18(2), 5–7.
19. Lorber, M., Schechter, A., Paepke, O., Shropshire, W., Christensen, K., & Birnbaum, L. (2015). Exposure assessment of adult intake of bisphenol a (BPA) with emphasis on canned food dietary exposures. *Environment International*, 77, 55–62.
20. McLachlan, J. A., Simpson, E., & Martin, M. (2006). Endocrine disrupters and female reproductive health. *Best Practice & Research Clinical Endocrinology & Metabolism*, 20(1), 63–75.
21. Monge Brenes, A. L., Curtzwiler, G., Dixon, P., Harrata, K., Talbert, J., & Vorst, K. (2019). PFOA and PFOS levels in microwave paper packaging between 2005 and 2018. *Food Additives & Contaminants: Part B*, 12(3), 191–198.

22. Mueller, S. O. (2004). Xenoestrogens: Mechanisms of action and detection methods. *Analytical and Bioanalytical Chemistry*, 378(3), 582–587.
23. National Center for Biotechnology Information. (2021). PubChem Compound Summary for CID 5564, Triclosan. <https://pubchem.ncbi.nlm.nih.gov/compound/Triclosan>
24. National Institute of Environmental Health Sciences. (2021). Endocrine disruptors. <https://www.niehs.nih.gov/health/topics/agents/endocrine/index.cfm>
25. Park, C. J., Barakat, R., & Ulanov, A., et al. (2019). Sanitary pads and diapers contain higher phthalate contents than those in common commercial plastic products. *Reproductive Toxicology* (Elmsford, N.Y.), 84, 114–121. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6504186/>
26. Paterni, I., Granchi, C., & Minutolo, F. (2017). Risks and benefits related to alimentary exposure to xenoestrogens. *Critical Reviews in Food Science and Nutrition*, 57(16), 3384–3404.
27. Silent Spring Institute. (n.d.). Detox Me app: Tips for healthier living. <https://silentspring.org/detox-me-app-tips-healthier-living>
28. Steinemann, A. (2016). Fragranced consumer products: Exposures and effects from emissions. *Air Quality, Atmosphere & Health*, 9(8), 861–866.
29. Think Dirty®. (2021). Think Dirty® shop clean - clean beauty app. <https://thinkdirtyyapp.com/>
30. Torday, J. (2015). Homeostasis as the mechanism of evolution. *Biology*, 4(3), 573–590.
31. US EPA. (2014). Technical fact sheet – perchlorate. https://www.epa.gov/sites/production/files/2014-03/documents/ffrofactsheet_contaminant_perchlorate_january2014_final.pdf
32. US EPA. (2021a). Learn about polychlorinated biphenyls (PCBs). <https://www.epa.gov/pcbs/learn-about-polychlorinated-biphenyls-pcbs>
33. US EPA. (2021b, April 8). Basic information on PFAS. <https://www.epa.gov/pfas/basic-information-pfas#>
34. Weatherly, L. M., & Gosse, J. A. (2017). Triclosan exposure, transformation, and human health effects. *Journal of Toxicology and Environmental Health, Part B*, 20(8), 447–469.
35. Yuka. (2020). Home (en). <https://yuka.io/en/>



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