

# Endocrine Disruption Fact Sheet

## What are endocrine disrupting chemicals?

The endocrine system is involved in every stage of life, including conception, development in the womb and from birth throughout early life, puberty, adulthood and senescence. It does this through control of the other vital systems that orchestrate metabolism, immune function, reproduction, intelligence and behavior, etc.<sup>1,2</sup>

*Endocrine disrupting chemicals (EDCs) interfere with hormone signaling in a variety of ways depending on the chemical and the hormone system.<sup>1,2</sup>*

The endocrine system acts through signaling molecules, including hormones such as estrogens, androgens, thyroid hormones, and insulin, as well as brain neurotransmitters and immune cytokines (which are also hormones) and other signaling molecules in the body.<sup>1,2</sup>

## How are humans exposed to endocrine disrupting chemicals?

We breathe, eat, drink, and touch EDCs every day. Some can be persistent and remain in the environment for centuries and can build up in the body. Other non-persistent EDCs can be so ubiquitous they are found in nearly every human tested.<sup>1</sup>

*Biomonitoring of chemicals in human blood and urine has shown that nearly 100% of the people tested have EDCs in their bodies.<sup>1</sup>*

EDCs include components of plastics, pesticides, flame retardants, fragrances and more. They are found in our homes, schools and work places, toys, clothing, cosmetics, sunscreens, electronics, furniture, cleaning products, lawn care products, automobiles, building materials, food, and food packaging.<sup>1,3</sup>

## How do endocrine disrupting chemicals affect our health?

A vast body of scientific literature exists on the health impacts of some EDCs, while for others there is very little research. Laboratory studies and human epidemiological studies confirm that EDCs have a wide array of effects on the body.<sup>1</sup>

*EDCs have been implicated in neurological diseases, reproductive disorders, thyroid dysfunction, immune and metabolic disorders and more.<sup>1</sup>*

*Effects of EDCs have been found in animals at tissue concentrations below those measured in humans.<sup>1,4</sup>*

In the US, the cost of treating health conditions for which EDC exposure is implicated is over \$1 trillion a year.

## What distinguishes EDCs from other chemicals of concern?

**Dose:** a central feature of endocrine disruption is that effects are found using very low chemical concentrations. Effects of EDCs at very low concentrations can be different from effects of the same chemical at higher concentrations.<sup>4</sup>

**Timing:** there are many periods of vulnerability during which exposure to EDCs can be particularly harmful.

The most well studied critical periods are prenatal and early postnatal development. Effects of early life exposure may not manifest until much later in life. Effects in one generation may be transmitted to future generations through mechanisms involved in programming gene activity, referred to as epigenetic changes.<sup>9</sup>

*Traditional approaches to determining safe exposure levels (for example, chemical risk assessments) do not work with EDCs.<sup>1,5-8</sup>*

## References

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- <sup>2</sup>Norris, DO, Carr JA. 2013. Vertebrate Endocrinology, Fifth Edition. London, Waltham MA, San Diego CA: Academic Press.
- <sup>3</sup>CDC (Centers for Disease Control and Prevention). Fourth National Report on Human Exposure to Environmental Chemicals, Updated Tables: US Department of Health and Human Services; 2012 Sep.
- <sup>4</sup>Vandenberg, L. N.; Colborn, T.; Hayes, T. B.; Heindel, J. J.; Jacobs, D. R., Jr.; Lee, D. H.; Shioda, T.; Soto, A. M.; Vom Saal, F. S.; Welshons, W. V.; Zoeller, R. T., and Myers, J. P. Hormones and endocrine-disrupting chemicals: Low-dose effects and nonmonotonic dose responses. *Endocr Rev.* 2012; 33(3):378-455.
- <sup>5</sup>American Society of Human Genetics, American Society for Reproductive Medicine, Endocrine Society, Genetics Society of America, Society for Developmental Biology, Society for Pediatric Urology, Society for the Study of Reproduction, Society for Gynecologic Investigation. 2011. Assessing chemical risk: societies offer expertise. *Science* 331(6021):1136.
- <sup>6</sup>Kortenkamp A et al. 2013 May 17. [The 2013 Berlaymont Declaration on Endocrine Disrupters.](#)
- <sup>7</sup>Bergman A, Heindel JJ, Kasten T, Kidd KA, Jobling S, Neira M, Zoeller RT, Becher G, Bjerregaard P, Bornman R, Brandt I, Kortenkamp A, Muir D, Drisse MN, Ochieng R, Skakkebaek NE, Bylehn AS, Iguchi T, Toppari J, Woodruff TJ. 2013 Apr. The impact of endocrine disruption: a consensus statement on the state of the science. *Environ Health Perspect* 121(4):a104-6.
- <sup>8</sup>Collegium Ramazzini. 2013 Jun 13. [Endocrine Disrupting Chemicals In The European Union.](#)
- <sup>9</sup>Manikkam M, Guerrero-Bosagna C, Tracey R, Haque MM, Skinner MK: Transgenerational Actions of Environmental Compounds on Reproductive Disease and Epigenetic Biomarkers of Ancestral Exposures. *PLoS ONE* 2012, 7:e31901.