

Endocrine disruptors: Ubiquitous, yet less known

Sir,

Though Endocrine disruptor chemicals (EDs) are ubiquitous in nature, and have many known ill-effects on humans, the awareness about them, unfortunately, is very limited. EDs have shown to impair hormonal balance, which can result in a variety of developmental and reproductive abnormalities. Thus EDs have played a role in increased incidence of malformations and neoplasms of the male genital tract, thereby causing decreased sperm quality; alterations in both- the male and female reproduction; changes in the normal working of the neuroendocrinology system; changes in behavior; obesity; metabolic system associated conditions like type 2 diabetes, and also diseases related to the thyroid and cardiovascular endocrinology.

Prenatal phthalate exposure is associated with greater social deficits and poorer cognition, social communication and awareness. Bisphenol A (BPA) levels show significant correlation with testosterone, androstenedione and insulin resistance; and, are significantly higher in women who are lean or overweight and suffer from polycystic ovary syndrome (PCOS). Diethylstilbestrol (DES) and BPA induce persistent epigenetic changes in the developing uterus, and while the former is associated with an increased risk of breast cancer in adult women, the latter is shown to induce neoplastic changes in the mammary tissue in animal models. Treatment of human breast adenocarcinoma cell line Michigan Cancer Foundation - 7 (MCF-7) with DES or BPA led to a three and two fold increase in Histone-lysine N-methyltransferase (*EZH2*) messenger ribonucleic acid (mRNA) expression and *EZH2* protein expression, respectively.^[1] Maternal and paternal occupational exposure to EDs was associated with an increased Time to Pregnancy (TTP).

EDs like dihydrotestosterone equivalents (in smokers, heavy drinkers, and in those exposed to disinfectants or welding/soldering fumes) and 17 β -estradiol equivalents (in those exposed to pesticides, disinfectants, and exhaust fumes) are more ubiquitous than we think.

EDs have also been found in bottled water due to leaching action, and the contents of the polyethylene terephthalate (PET) per bottle, the storage-temperature and the pH may influence the rate and magnitude of leaching (phthalates and

antimony leach into lower pH and/or warmer products). In a study on bottled water from France, Germany, and Italy, significant estrogenic response was seen in about 60% bottled water samples, which showed relative proliferative effects 2 on MCF-7 ranging from 19.8 to 50.2%.^[2] When comparing water of the same spring, estrogenic activity is three times higher in water from PET bottles than glass.

EDs like atrazine, via aromatase induction, cause an increase in the levels of estradiol and lower testosterone. Methoxychlor, apart from aromatase induction, also down-regulates hydroxysteroid (17-beta) dehydrogenase 3 (HSD17B3) and produces similar effects.^[3] In the city of Ria de Aveiro, elevated EDs' concentrations' were observed, including alkylphenol ethoxylates (A9PEO), o-phenylphenol (PhP), nonylphenoxy ethoxy acetic acids and BPA.^[4] A study showed that apart from prediction of type 2 diabetes and cardiovascular diseases, persistent organic pollutants like dichloro- 2,2-bis(p-chlorophenyl) ethylene (p,p'-DDE), consistently predicted higher body mass index (BMI) and triglyceride levels, homeostasis model assessment of insulin resistance (HOMA-IR) and lower High-density lipoprotein (HDL) cholesterol levels.^[5] Although a direct and absolute causal linkage might not be feasible owing to different types of bias in some cases, strong history of exposure to EDs, especially depending upon the duration and degree of exposure, combined with behavioral/lifestyle risk factors and similar (herd) manifestations from culprit EDs, can reinforce the causality.

Avoiding household pesticides, checking for sources of food contamination, avoiding heating/storing food in plastic containers (using glass/stainless steel instead) and proper education, can help to curb some of the disastrous effects of EDs. The need for more awareness and encouragement for in-depth research in to the sources and effects of EDs is also being felt.

EDs have a gargantuan role in causing a variety of disorders and there is an urgent need to wake up to their manifold effects.

Dilip Gude

Department of Internal Medicine, Medwin Hospital, Nampally,
Hyderabad, Andhra Pradesh, India

Corresponding Author: Dr. Dilip Gude,
AMC, 3rd Floor, Medwin Hospital, Chirag Ali lane, Nampally, Hyderabad,
Andhra Pradesh - 500 001, India.
E-mail: letsgo.dilip@gmail.com

Access this article online	
Quick Response Code:	Website: www.ijem.in
	DOI: 10.4103/2230-8210.81951

REFERENCES

1. Doherty LF, Bromer JG, Zhou Y, Aldad TS, Taylor HS. In utero exposure to diethylstilbestrol (DES) or bisphenol-A (BPA) increases EZH2 expression in the mammary gland: An epigenetic mechanism linking endocrine disruptors to breast cancer. *Horm Cancer* 2010;1:146-55.
2. Wagner M, Oehlmann J. Endocrine disruptors in bottled mineral water: Estrogenic activity in the E-Screen. *J Steroid Biochem Mol Biol* 2010. [In Press].
3. Quignot N, Desmots S, Barouki R, Lemazurier E. Effects of endocrine disruptors in adult rats: Integrative evaluation from gonadal steroidogenic gene expression profiles to hormonal balance. *Endocr Abstr* 2011;25:297.
4. Jonkers N, Sousa A, Galante-Oliveira S, Barroso CM, Kohler HP, Giger W. Occurrence and sources of selected phenolic endocrine disruptors in Ria de Aveiro, Portugal. *Environ Sci Pollut Res Int* 2010;17:834-43.
5. Lee DH, Steffes MW, Sjödin A, Jones RS, Needham LL, Jacobs DR Jr. Low dose organochlorine pesticides and polychlorinated biphenyls predict obesity, dyslipidemia, and insulin resistance among people free of diabetes. *PLoS One* 2011;6:e15977.