A Review on Endocrine Disruptors and their Possible Impacts on Human Health

TRASHI GUPTA
PG student, Department of Zoology
Isabella Thoburn CollegeIsabella Thoburn College, Lucknow, U. P. (India)

DR. CHITRA SINGH
Department of Zoology
Isabella Thoburn CollegeIsabella Thoburn College, Lucknow, U. P. (India)

Abstract:
Although the impacts of endocrine disruptors in animals have been researched mostly in vast from the 1940s, endocrine disruption is a named topic of research that has been particularly active for over 10 years. Endocrine disruptors have been identified in a wide number of substances, and humans can be exposed to them through their jobs or by dietary and environmental exposure (water, soil, air). Endocrine disruptive chemicals are substances that interfere with the normal functioning of the endocrine system in humans and animals. Methods must be established in order to forecast impacts on populations and communities from knowledge of effects on individuals in order to understand the vulnerability and risk factors of people due to endocrine disruptors, as well as the cures for these. There has been an increasing interest in the mechanism and effect of endocrine disruptors, as well as their relationship with the environment and human health effects, for some years. Based on a comprehensive literature review, this report examines the progress, primarily in humans, to provide information on causative agents, mode of action, ubiquity of effects, and other relevant endocrine disruptor issues. It also analyses current knowledge of the potential effects of endocrine disruptors on human health so that the consequences can be identified and solutions to the problem can be implemented as soon as possible.

Keywords: *Endocrine disruptor, Human health, Impact*

1. Introductions

1.1 Endocrine Disruptors

The United States Environmental Protection Agency (EPA) defines an endocrine-disrupting compound as "an agent that interferes with the synthesis, secretion, transport, binding, or elimination of natural hormones in the body that are responsible for maintaining homeostasis, reproduction, development, and/or behaviour". Endocrine disruptors are chemicals or chemical mixtures that interfere with regular hormone function, to put it simply.

EDCs are highly heterogeneous, and can be categorised in one of the two categories listed below.
A. According to Diamanti-Kandarakis, they can be divided into two groups:

1. Those that are found in nature: Natural compounds found in human and animal food (e.g., genistein and coumestrol: phytoestrogen).
2. Synthetic chemicals: These can be further divided into the following categories:

- Industrial solvents and lubricants, as well as their by products (e.g., polychlorinated biphenyls (PCBs), polybrominated biphenyls (PBBs), and dioxins)
- Plastics (for example, bisphenol A (BPA)
- Plasticizers
- Pesticides (such as dichlorodiphenyltrichloroethane (DDT)
- Fungicides (for example, vinclozolin) and

- Pharmaceuticals (for example, diethylstilbestrol (DES)

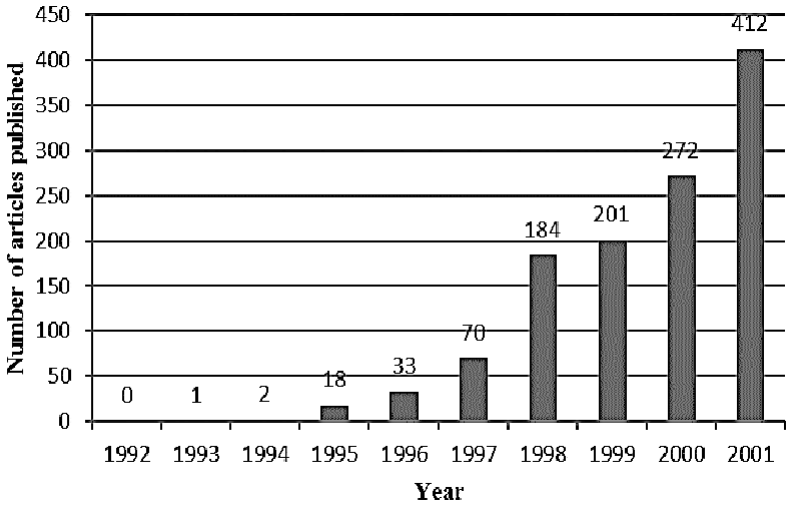
Caliman and Gavrilescu (2009) classified EDCs according to their origins:
Fitoestrogens, 3-omega fatty acids, contraceptive tablets, and thyroid treatments are examples of natural and artificial hormones.

3. Hormonal side effects of drugs (e.g., metoprolol, naproxen, and clofibrate).
4. Industrial and household chemicals (for example, phthalates, alkylphenoletoxilate detergents, fire retardants, plasticizers, solvents, 1,4-dichlorobenzene, and polychlorinated bisphenols. (PCBs).
5. Industrial and home process byproducts (e.g., polycyclic aromatic hydrocarbons (PAHs), dioxins, and pentachlorobenzene).

Common EDCs use in daily routine	Usage
DDT, chlorpyri fos, atrazine, 2,4-ichlorophenoxyaceticacid, glyphosate	Glyphosate or herbicide
Lead, phthalates, cadmium	Products for children
BPA, phthalates, phenol	Materials that come into touch with food
Brominateflameretardants, PCBs	Building materials and technology
Phthalates	Surgical tubing, personal care products
Triclosan	Antibacterials

2. History of Endocrine Disruptor

The study of endocrine disruption began in July 1991 at the Wingspread Conference Center in Racine, Wisconsin, organised by Theo Colborn and colleagues. In May 2002, a search of the science citation index (ISI Web of Science) for the phrase "endocrine disruptor" revealed that 1346 research articles had been published, with Colborn (1992) being the first (Colborn & S (1993)



In actuality, the study of endocrine disruption has been ongoing for much more than 20 years, Albeit Colborn and Clement do not cover the whole range of early work. Theo Colborn's major accomplishment in 1991 was to bring together information from very disparate fields of study (including both wildlife and humans) and develop a new paradigm of toxicant action, but research in fields that are now labelled as endocrine disruption had been published since the 1940s and 1950s.

3. EDCs on animal bodies

Prenatal BPA treatment caused rapid puberty, increased body weight, altered mammary gland, altered female genital canal, and altered structure and function of the ventral prostate in male mice.

4. Case Study

Studies on perinatal subjects exposed to BPA yielded the following findings: lower fertility and fecundity, masculization of behaviours and brain structures in female CD-1 mice, and decreased fertility in male offspring.

5. Ecological stability of EDC

Chemicals created by humans have become an integral component of modern life. There is no way for human and wildlife populations to avoid coming into touch with the chemicals used in food production (plants and meat), disease control (e.g., pesticides), and the manufacture of consumer goods. The next sections go over the characteristics of certain EDCs.

6. Intravenous insertion

It has been seen that endocrine disrupting compounds such as phthalates, which are often used in intravenous tubing, reach the human body via the intravenous access. The human body can be exposed to endocrine disrupting substances by biological transfer from the placenta and maternal milk without actually coming into touch with them. If the woman has previously had EDC in her body, biological transfer of EDC from the placenta and mother's milk of the maternal body may occur.

7. Endocrine Disruptors' Negative Effects on Human Health

An endocrine-disrupting chemical is a natural or manufactured compound that, through environmental or improper developmental exposures, affects the hormonal and homeostatic systems that allow the organ to interact with and respond to its environment. Its possible function in altering reproductive systems, prostate, breast, lung, liver, thyroid, metabolism, and obesity has been suggested by many investigations conducted on animal bodies, clinical observations, and epidemiological studies.

In the United States, some endocrine disruptors that are known to cause harm to human health have been outlawed. Even some prescription medicines have had unanticipated consequences for the endocrine system. The US Food and Drug Administration encouraged doctors to stop prescription in 1971.

8. Thyroid Function Dysfunction

Thyroid disruptors	Mechanism		Effect
Perchlorate, thiocyanate, nitrate, bromates, phthalates	Blockinguptakeof Iodide into thyroid cell		Synthesis has decreased of T3andT4
Methimazole,amitrole, soyisoflavones, benzophenone2	Blocking Of TPO follicles	Production inthyroid	Synthesis has decreased of T3andT4
PCBs, pentachlorophenols, flame retardants, phthaltes	Competitive binding to thyroid transport Protein (TTR)		T4 production in the embryonic brain may be affected.

9. Disorders related to metabolism

The alpha, beta, and gama isotypes of the peroxisome proliferator activated receptor (PPAR) play significant roles in regulating cellular differentiation processes and transcriptional control of lipid and carbohydrate metabolism. PPAR alpha is found in the liver, and when is combined with the presence of endocrine disruptors, metabolic problems are the result.

10. Hormonal Feedback Regulation and Neuroendocrine Cells Interference

Homeostatic activities such as reproduction, development, metabolism, energy balance, and stress response are all controlled by neuroendocrine systems, which act as a link between the central nervous system and the peripheral endocrine system. Endocrine disrupting substances that disrupt neuroendocrine homeostasis can cause disturbances, and there is evidence that neuroendocrine disruption of the hypothalmic pituitary thyroid system has specific metabolic and energy balance impacts. PCBs, for example, cause hypothalamic and pituitary dysregulation by lowering thyroxin and thyroid stimulating hormone (TSH) in response to thyrotropin releasing hormone.

11. Impact on nervous system

The nervous system, which is responsible for keeping all of the body components in sync and working properly, can be exposed to and influenced by endocrine disruptor substances, and this effect can be caused through a variety of processes. Because of the direct influence of endocrine disrupting substances on endocrine glands, the hormonal balance and function in the body may be disrupted. The substances, on the other hand, may have an initial effect on the central nervous system (CNS), such as neuroendocrine disruptors, which can then influence the endocrine system.

12. Impact on male and female reproduction

EDCs can produce several undesirable side effects in women, such as increased endometrial growth and a greater risk of breast cancer**.**

13. Other negative effects of EDCs on the female reproductive system include

13.1 Puberty

Early puberty may be linked to an increased risk of a variety of medical conditions, including insulin resistance, metabolic syndrome, and breast and reproductive system malignancies.

13.2 Primary ovarian failure (POF)

A condition in which the ovary Primary ovarian failure (POF) affects approximately 1 percent of the female population under the age of 40, according to studies. Several causes have been investigated, with EDC being one of them.

13.3 Public Awareness is Required

According to a report by UNEP and WHO (2013), the following are some of the results about EDC:

- Because EDCs are exogenous, they can interfere with hormone activity in any way.
- They can operate directly on hormone receptors as well as a variety of proteins that govern hormone administration to its typical target cell or tissues.
- There is no correlation between an endocrine disruptor's affinity for a hormone receptor and its potency. The chemical potency of a hormone system is determined by a variety of parameters, including the number of receptors present.

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