Short Communication
Volume 09: 01, 2025

Reports in Thyroid Research

ISSN: 2684-4273 Open Access

The Endocrine Disruption of Thyroid Function: A Review of Current Evidence

Gloria Miquel*

Department of Endocrinology, University of Zulia, Maracaibo, Zulia State, Venezuela

Introduction

The thyroid gland plays a crucial role in regulating metabolism, growth and development through the secretion of thyroid hormones, primarily Thyroxine (T4) and Triiodothyronine (T3). These hormones influence nearly every organ system in the body, making thyroid function essential for maintaining overall health. However, the delicate balance of thyroid hormone production and regulation can be easily disrupted by environmental factors, particularly endocrine-disrupting chemicals (EDCs). These are synthetic or naturally occurring substances that interfere with the body's hormonal systems, including thyroid function. The impact of endocrine disruption on thyroid health is of growing concern, as exposure to EDCs has been linked to a variety of thyroid-related disorders, including hypothyroidism, hyperthyroidism, goiter and even thyroid cancer. Common EDCs such as pesticides, plastics, industrial chemicals and heavy metals can interfere with thyroid hormone production, disrupt receptor activity, or affect the synthesis and metabolism of thyroid hormones. As research continues to uncover the extent of these disruptions, it has become increasingly clear that environmental exposures are a significant factor in thyroid dysfunction, with potentially wide-reaching public health implications. This review will explore the current evidence on the endocrine disruption of thyroid function, examining the mechanisms through which EDCs impact thyroid health, the associated risks and the potential long-term effects on human health. By understanding how environmental chemicals influence thyroid function, we can better assess the risks of exposure and develop strategies to mitigate these effects, ultimately protecting thyroid health and improving public health outcomes [1].

Description

Endocrine-Disrupting Chemicals (EDCs) have emerged as a significant environmental concern due to their ability to interfere with the endocrine system, particularly thyroid function. The thyroid gland is essential for regulating numerous physiological processes through the secretion of thyroid hormones, which control metabolism, growth and development. However, various EDCs, including pesticides, industrial chemicals, plastics and heavy metals, can disrupt thyroid function at multiple levels. These chemicals may interfere with thyroid hormone synthesis, disrupt hormone transport, affect receptor activity, or alter the metabolism of thyroid hormones, leading to imbalances in thyroid hormone levels. Exposure to EDCs has been linked to a range of thyroid-related disorders. For instance, some studies suggest that certain chemicals may contribute to hypothyroidism (low thyroid hormone levels) by inhibiting thyroid hormone production or disrupting iodine uptake. Conversely, other chemicals have been associated with hyperthyroidism (excessive thyroid hormone levels), potentially through mechanisms that increase thyroid hormone release. Additionally, EDCs are believed to play a role in the development of goiter (enlarged thyroid) and even thyroid cancer, especially with prolonged exposure to certain industrial chemicals like Polychlorinated Biphenyls (PCBs) and pesticides [2].

Endocrine disruption of thyroid function is a growing area of concern, as various environmental chemicals and pollutants have been shown to interfere with the synthesis, release and action of thyroid hormones. These chemicals, known as endocrine-disrupting chemicals (EDCs), can mimic or block the effects of thyroid hormones, leading to disruptions in thyroid function. Common EDCs include pesticides, phthalates, bisphenol A (BPA) and per- and polyfluoroalkyl substances (PFAS), which are widespread in the environment due to their use in industrial processes and consumer products. These substances can affect thyroid function at various levels, from altering hormone production in the thyroid gland to disrupting thyroid hormone receptors and transport proteins. The ability of EDCs to interfere with thyroid function is particularly concerning during critical periods of development, such as pregnancy and infancy, when proper thyroid function is essential for neurological and physical development [3].

Recent studies have provided compelling evidence that exposure to EDCs can lead to both hypothyroidism and hyperthyroidism, depending on the nature of the chemical and the timing of exposure. For example, BPA, a common chemical in plastics, has been linked to alterations in thyroid hormone levels and has been shown to disrupt the binding of thyroid hormones to their receptors. Similarly, PFAS, a class of chemicals often found in water and food packaging, has been associated with reduced thyroid hormone levels, potentially leading to hypothyroidism. Other studies have suggested that exposure to these chemicals can impair the conversion of the inactive thyroid hormone T4 to the active form T3, further complicating thyroid regulation. These disruptions are concerning, given that thyroid hormones play a crucial role in metabolic regulation, growth and brain development, making individuals more susceptible to a range of health issues, including developmental disorders, cognitive impairments and metabolic diseases. The long-term health consequences of endocrine disruption on thyroid function remain an area of ongoing research. While the evidence linking EDC exposure to thyroid dysfunction is substantial, many questions remain about the dose-response relationship, the effects of combined chemical exposures and the potential for these disruptions to lead to chronic diseases later in life. Epidemiological studies have provided some insights into the association between EDCs and thyroid dysfunction, but more research is needed to establish causality and understand the full scope of impact [4].

Additionally, there is a growing call for stricter regulation and monitoring of environmental chemicals, particularly those that interfere with endocrine systems, to minimize the risk of thyroid disruption. As awareness of the thyroid-EDC link increases, public health initiatives and policy changes are essential to reduce exposure and protect vulnerable populations from the harmful effects of endocrine-disrupting chemicals. The mechanisms by which EDCs affect thyroid health are complex and not fully understood. However, it is believed that these chemicals may mimic or block the action of natural thyroid hormones, alter thyroid receptor function, or disrupt the feedback regulation of the thyroid axis, which involves the hypothalamus, pituitary gland and thyroid gland itself. This disruption can lead to hormonal imbalances and abnormal thyroid gland function, contributing to a variety of health problems. Furthermore, the impact of EDCs on thyroid health may be more pronounced in vulnerable populations, such as pregnant women, infants and young children, as thyroid hormones are critical for brain development during early life. As the understanding of endocrine disruption and its effects on thyroid health evolves, it has become increasingly evident that limiting exposure to these chemicals is essential

***Address for Correspondence:** Gloria Miquel, Department of Endocrinology, University of Zulia, Maracaibo, Zulia State, Venezuela, E-mail: miquel.gloria@unizulia.vz*

Received: 03 March, 2025, Manuscript No. rtr-25-164107; **Editor assigned:** 05 March, 2025, PreQC No. P-164107; **Reviewed:** 17 March, 2025, QC No. Q-164107; **Revised:** 24 March, 2025, Manuscript No. R-164107; **Published:** 31 March, 2025, DOI: 10.37421/2684-4273.2025.9.108

to protect thyroid function and overall health. Current research is focused on identifying specific EDCs that affect thyroid health, understanding the mechanisms of disruption and evaluating the long-term effects of exposure. This knowledge can inform regulatory policies and public health initiatives aimed at reducing the risks associated with endocrine-disrupting chemicals, ultimately leading to better prevention strategies and improved public health outcomes [5].

Conclusion

In conclusion, Endocrine-Disrupting Chemicals (EDCs) pose a significant threat to thyroid health by interfering with the complex processes that regulate thyroid hormone production, metabolism and function. These disruptions can lead to a range of thyroid-related disorders, including hypothyroidism, hyperthyroidism, goiter and even thyroid cancer. The mechanisms by which EDCs affect thyroid function are multifaceted, involving alterations to hormone synthesis, receptor activity and feedback regulation. Vulnerable populations, particularly pregnant women, infants and young children, may face heightened risks due to the critical role of thyroid hormones in development. As research continues to uncover the full extent of EDCs' impact on thyroid health, it is clear that reducing exposure to these harmful chemicals is crucial for protecting thyroid function and overall well-being. Greater awareness, better regulation of environmental chemicals and more stringent safety standards are essential to mitigate the risks of endocrine disruption. By addressing these concerns, we can improve public health outcomes and safeguard the future of thyroid health for generations to come.

Acknowledgement

None.

Conflict of Interest

None.

References

1. Wingren, Gun B. and Olav Axelson. "Occupational and environmental determinants for benign thyroid disease and follicular thyroid cancer." *Int. J. Occup. Med. Environ. Health* 3 (1997): 89-94.
2. Huen, Karen, Paul Yousefi, Asa Bradman and Liying Yan, et al. "Effects of age, sex and persistent organic pollutants on DNA methylation in children." *Environ Mol Mutagen* 55, no. 3 (2014): 209-222.
3. Graceli, Jones B., Raquel S. Dettogni, Eduardo Merlo and Oscar Nino, et al. "The impact of endocrine-disrupting chemical exposure in the mammalian hypothalamic-pituitary axis." *Mol Cell Endocrinol* 518 (2020): 110997.
4. Hossein-Nezhad, Arash, Avrum Spira and Michael F. Holick. "Influence of vitamin D status and vitamin D3 supplementation on genome wide expression of white blood cells: A randomized double-blind clinical trial." *Plos One* 8 (2013): e58725.
5. Yilmaz, Bayram, Hakan Terekeci, Suleyman Sandal and Fahrettin Kelestimur. "Endocrine disrupting chemicals: Exposure, effects on human health, mechanism of action, models for testing and strategies for prevention." *Rev Endocr Metab Disord* 21 (2020): 127-147.

How to cite this article: Miquel, Gloria. "The Endocrine Disruption of Thyroid Function: A Review of Current Evidence." *Rep Thyroid Res* 09 (2025): 108.