



## Endocrine Disruptors and Their Effects on Thyroid Function: A Clinical Perspective

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### Description

Endocrine disruptors are chemicals that interfere with the normal functioning of the body's hormonal system, particularly the thyroid gland. Disruption of thyroid function by external chemicals can have serious implications for human health, particularly in vulnerable populations such as pregnant women, infants and individuals with pre-existing thyroid conditions. Exposure to endocrine disruptors occurs through various means, including ingestion, inhalation and skin contact, with these chemicals found in everyday products such as plastics, pesticides, cosmetics and industrial pollutants. Several well-known chemicals are recognized as endocrine disruptors that affect thyroid function. Bisphenol A (BPA), commonly used in plastic production, has been shown to interfere with thyroid hormone receptors, disrupting normal hormone signaling. BPA can mimic or block the action of thyroid hormones, leading to altered metabolic rates and developmental issues, especially during pregnancy when proper thyroid hormone levels are critical for fetal brain development. Research has demonstrated that exposure to BPA is associated with altered thyroid hormone levels in both animals and humans, raising concerns about its long-term effects on thyroid health.

Another group of endocrine disruptors that has drawn attention is Polychlorinated Biphenyls (PCBs), which are industrial chemicals used in electrical equipment and other applications. Although their use has been banned in many countries, PCBs persist in the environment and continue to be a health concern. PCBs can accumulate in body fat and disrupt thyroid hormone synthesis and metabolism. Studies have linked PCB exposure to reduced levels of circulating T4 and T3, which may result in hypothyroidism, a condition where the thyroid produces insufficient hormones. Hypothyroidism can lead to symptoms such as fatigue, weight gain and cognitive impairments, highlighting the far-reaching impact of PCB exposure on thyroid function.

Pesticides, including organochlorines like DDT and its derivatives, are also recognized as endocrine disruptors affecting thyroid function. These chemicals can interfere with thyroid hormone production by affecting the enzymes involved in hormone synthesis or metabolism. Prolonged exposure to pesticides has been associated with alterations

in thyroid hormone levels, potentially contributing to conditions such as hypothyroidism or hyperthyroidism (overactive thyroid). Given the widespread use of pesticides in agriculture, the potential for chronic exposure through contaminated food and water supplies raises concerns about long-term thyroid health in exposed populations.

Phthalates, another class of endocrine disruptors commonly found in plastics, personal care products and household items, have also been implicated in thyroid disruption. These chemicals can influence thyroid hormone levels by interfering with hormone synthesis or binding to thyroid hormone receptors. Studies have linked phthalate exposure to decreased thyroid hormone levels, particularly in pregnant women and children, where proper thyroid function is essential for normal development. The potential for phthalates to impact neuro development and cognitive function due to disrupted thyroid activity is an area of ongoing research, with concerns about the cumulative effects of low-level exposure over time. Perfluorinated chemicals (PFCs), used in nonstick cookware, water-repellent fabrics and fire-fighting foams, have been found to alter thyroid hormone levels as well. PFCs can persist in the environment for extended periods, leading to bioaccumulation in humans and animals. Research has demonstrated that PFC exposure is linked to changes in Thyroid-Stimulating Hormone (TSH) levels, suggesting potential thyroid dysfunction. While the full extent of PFCs' impact on thyroid health is still being investigated, their widespread presence in consumer products and the environment raises concerns about long-term exposure.

Despite the growing evidence of the harmful effects of endocrine disruptors on thyroid function, regulation and public awareness remain limited. Many of these chemicals are still widely used in industrial applications and consumer products, leading to ongoing exposure for much of the population. Regulatory agencies have taken steps to limit the use of some endocrine disruptors, such as banning PCBs and reducing BPA in certain products. However, the challenge remains in addressing the cumulative effects of exposure to multiple endocrine disruptors, often from various sources and understanding the long-term impact on thyroid health. Efforts to reduce exposure to endocrine disruptors require a combination of regulatory action, public awareness and further research. Individuals can minimize their risk of exposure by reducing the use of plastic products containing BPA or phthalates, choosing organic foods to limit pesticide intake and avoiding products with known endocrine-disrupting chemicals. On a broader level, policymakers and health professionals must work together to strengthen regulations on endocrine disruptors and promote safer alternatives in consumer products and industrial processes.

In conclusion, endocrine disruptors represent a significant concern for thyroid health, affecting hormone synthesis, metabolism and receptor activity. Chemicals such as BPA, PCBs, pesticides, phthalateS and PFCs have been shown to interfere with normal thyroid function, with potential consequences for metabolic health, development and cognitive function. Reducing exposure to these chemicals through personal choices and regulatory measures is essential for protecting thyroid health and ensuring long-term well-being for individuals and future generations. Continued research and policy development are needed to address the pervasive presence of endocrine disruptors in the environment and mitigate their impact on thyroid function.

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