

Editorial

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Cadmium toxicity could be a cause for thyroid problem

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Every year World Thyroid Day is observed on May 25 to spread awareness on the disorders of thyroid gland and their prevention. Yet the increase in thyroid problems is unabated. In fact, thyroid is one of the most important endocrine glands that regulates all most all body functions of human beings. It synthesizes and secretes 2 main hormones, thyroxine(T_4) and tri-iodothyronine(T_3), both being regulated by thyroid-stimulating hormone (TSH). While the whole amount of circulating T_4 is produced by the thyroid gland itself, T_3 is mostly generated in liver and kidney by peripheral mono-deiodination of T_4 with the help of an enzyme, 5'-deiodinase (5' D). Thyroid hormones are vital for the well-being of a person and their abnormal levels lead to health problems. People with thyroid abnormalities suffer either from hypo-functioning (hypothyroidism) or from hyper-functioning (hyperthyroidism) of the gland. However, most common thyroid problem is hypothyroidism and females suffer more from this as compared to males. According to Chiovato *et al.* (2019), hypothyroidism affects about 5% of the general population and 5% more are believed to be sufferers, but undiagnosed. Primary hypothyroidism is normally diagnosed with low serum thyroid hormones and high TSH concentrations than the normal reference ranges. Symptoms of hypothyroidism include intolerance to cold, mild to moderate weight gain, dry skin, puffiness of the body, peri-orbital swelling, chronic fatigue, constipation, depression, hoarse voice and menstrual irregularities. The consequences of untreated or under-treated hypothyroidism include cretinism, myxoedema and goitre, even coronary artery disease.

According to the 1999 World Health Assembly report, about 1.5 billion persons in more than 110 countries are threatened with thyroid disorders. A World Health Organization (WHO) estimation also indicates that about 200 million people have goitre, although most of the goitres are small and subclinical. Now the question arises, why this thyroid problem is increasing day by day and what are the different factors that are responsible for this?. Usually, environmental iodine deficiency is considered as the most common cause of hypothyroidism. But it is also seen in urban areas with iodine sufficiency. Moreover, most people are now consuming iodized salt. Other than Hashimoto's disease (autoimmune thyroiditis), chronic stress, lesser known causes include heavy metal pollution that is also increasing parallelly. In fact, ever growing anthropogenic activities, especially industrial expansions have led to the increase in heavy metal concentrations in soil and water and the consumption of the contaminated water and intoxicated vegetables and fruits has led to the increase in their toxicity in humans causing various health disorders.

Cadmium is one such heavy metal, that is known to affect most organs including kidney, liver, bones, and gonads. Scientific evidence also suggests that cadmium (Cd) not only boosts oxidative stress, but also results in endocrine and reproductive toxicity in humans (Rana, 2014; Kumar and Sharma, 2019). A clinical trial indicates that cadmium burden alters glycaemic control in adolescents and induces insulin resistance, thus increasing the risk of developing metabolic disorders (Pizzino *et al.*, 2017). Unfortunately, nothing much has been investigated in relation to alterations in cadmium-induced thyroid dysfunctions, despite the fact that liver is a major site of T_3 generation which is often affected by cadmium. In fact, a recent review suggests the role of metal toxicity in developing hypothyroidism (Błażewicz, 2021). An earlier review had emphasized that chronic cadmium toxicity is associated with colloid cystic goitre, adenomatoid follicular hyperplasia with nodular hyperplasia and hypertrophy. Our investigations also indicated that cadmium chloride affects the thyroid functions in different animal models (Chaurasia *et al.*, 1996; Gupta *et al.*, 1997; Gupta and Kar, 1999).

Keeping all these in mind it may be emphasized that cadmium toxicity is one of the causes of present day's increasing thyroid dysfunction and we need to develop a suitable strategy to get rid of it, not simply by preventing cadmium release at its sources of generation (more the job of the administration) and to ameliorate its toxicity by different methods. In the latter type of action, scientists/researchers have a major role to play.

Lots of research work has been done in different aspects of cadmium toxicity in relation to its accumulation in environment, in different organs of body and on its prevention at its source level. Although some investigations have been made on the reduction of its toxicity, primarily through the use of antioxidants, anti-inflammatory agents, and essential ion supplement (Gupta and Kar, 1997, 1998, Zwolak and Zaporowska, 2012; Hormozi *et al.*, 2019; Xiong *et al.*, 2021), further research is the need of the hour. In recent years use of microbes have been suggested to mitigate the adverse effects of cadmium toxicity. Particularly, probiotic microorganisms like *Lactobacillus* and *Bifidobacterium* have been found to encounter this heavy metal in the gastrointestinal tract. They have the ability to reduce the concentration of heavy metals using various mechanisms like complex formation, reduction to non-toxic valencies and use of efflux pumps (Huet and Puchooa, 2017) and thus alleviating their harmful effects. Our recent review also indicates the use of microbes (Goyal *et al.*, 2019). As it is a lesser explored area of research on metal toxicity, more investigations on the role of microorganisms will prove to be much useful. It will also be interesting to work more on the mode of actions of cadmium in altering the thyroid functions and the possible strategies to mitigate the cadmium-induced thyroid problems.

Now, let me express my view on the *Journal of Environment Biology* (JEB), to which I've been associated as a consulting editor and reviewer. This journal is a reputed international journal that publishes quality research papers on different aspects of Environmental Biology. I feel, this open access journal is among the very few which doesn't charge very high towards registration and page charges, allowing the good researchers to publish their original work at affordable price.

I must appreciate the efforts made by the Editor-in-Chief, Prof. R.C. Dalela for maintaining the standard of the journal. Of course, the contributions of other associated members including Executive Editor, Editor, Advisors, Consulting Editors and Reviewers are equally important for successful and timely publication of this journal. Although the content of this journal is well balanced, I suggest in every issue 2-3 articles should be published on "Environment and Health" that would be of interest even to the people of other fields.

In this editorial I've emphasized on the role of Cadmium in increasing thyroid problem. I believe publications on the impact of other toxicants in different health issues and their possible remediation would be equally interesting.

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