Surbhi Rana et al., Thyroid Disorders Ther 2016, 5:1(Suppl)
http://dx.doi.org/10.4172/2167-7948.C1.002

OMICS International
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International Conference on
Thyroid Disorders and Treatment
February 29-March 01, 2016 Philadelphia, Pennsylvania, USA

Thyroid disorder in mitochondrial dysfunction

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Thyroid gland is located at the front of neck and secretes 2 types of thyroid hormones: T4 (Thyroxine) and T3 (Triiodothyronine). Thyroid hormones regulate many functions in our body, such as the way of energy and oxygen consumption. Thyroid hormones are involved in the regulation of basal metabolic state and in oxidative metabolism. They can cause many changes in the number and activity of mitochondrial respiratory chain components. This may result in the increased generation of reactive oxygen species (ROS). ROS are highly reactive, therefore can lead to oxidative damage. Thyroid disorders occur when thyroid gland releases excess or diminished hormones. An overactive or underactive thyroid can lead to a wide range of health problems. Hyperthyroidism is associated with increase in free radical production and lipid peroxide levels whereas hypothyroidism, a decrease in free radical production because of the metabolic suppression by the decrease in thyroid hormone levels. Mitochondria is also one of the major reactive oxygen species (ROS) producer. Mitochondrial dysfunction is associated with an increase in the generation of reactive oxygen species. Mitochondrial dysfunction and increased ROS contributes to number of diseases including neurodegenerative diseases and cancer. Mitochondria use metabolic intermediates generated during the tricarboxylic acid (TCA) cycle to generate adenosine triphosphate (ATP) during oxidative phosphorylation. It has been reported that mitochondria also serve to regulate cytosolic calcium and iron concentration. Mitochondrial dysfunction is associated with an increase in the generation of reactive oxygen intermediates and release of free radicals derived from oxygen and nitrogen. Both the radical species generated via interaction with free radicals, and referred as reactive oxygen or nitrogen species (RONS). Thyroid hormones are associated with oxidative stress and antioxidant status due to their capacity to change respiratory rate in mitochondria. It has been suggested that changes in thyroid hormone levels may be one of the main modulators of oxidative stress. Thyroid dysfunction is the most frequent endocrine abnormality in population. It has been reported that oxidative stress in both hypothyroidism and hyperthyroidism condition are controversial. In hypothyroidism, a low free radical generation is expected because of the metabolic suppression by decrease in thyroid level. However, in some studies an increased oxidative stress is found in hyperthyroidism as well as in hypothyroidism. However, many aspects that are crucial for the health and well-being of people with this condition remain to be elucidated and require further research.

Biography

Surbhi Rana is currently pursuing her PhD from Punjab Technical University, Jalandhar, Punjab India. She has published many papers in reputed journals.

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