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Relationship between intestinal microbiota and thyroid homeostasis

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Summary

The human digestive tract is inhabited by hundreds of bacterial species, both aerobic and anaerobic, bacteriophages, viruses and fungi that collectively are referred to as intestinal microbiota. Microbiota has a significant impact on the production and maintenance of immunological, hormonal and metabolic homeostasis. Dysbiosis is present in inflammations, e.g. intestinal inflammation, autoimmune diseases, e.g. multiple sclerosis, type 1 diabetes, rheumatic diseases, metabolic disorders such as obesity or type 2 diabetes, and mental illness. Currently, numerous studies are underway on the effect of microbiota on thyroid autoimmune diseases. . It seems, that microbiota has a small, if any, effect on the metabolism of iodine and selenium - elements particularly responsible for thyroid homeostasis. However, the relationship between thyroid function and the gastrointestinal tract has been proven.

The human digestive tract is inhabited by hundreds of bacterial species, both aerobic and anaerobic, bacteriophages, viruses and fungi that collectively are referred to as intestinal microbiota. [1] Microbiota consists of over a thousand commensal, symbiotic and pathogenic microorganisms. [7] At the time of birth, the composition of the microbiota is relatively poor, with the growing diversity of bacteria, viruses and fungi colonizing the digestive tract. In adulthood, it is fairly stable (it undergoes changes in long-term changes in diet, use of medicines, in some diseases). [1,6] Intestines are mainly an environment for bacteria of the genus *Firmicutes* and *Bacterioidetes*. It is believed that each person has an individual set of intestinal bacteria to some extent. Microbiota has a significant impact on the production and maintenance of immunological, hormonal and metabolic homeostasis. It

takes part in the digestion, fermentation of nutrients and in energy storage processes obtained in short-chain fatty acids. In addition, it is involved in the production of neurohormones, vitamins B and K, polyamines as well as mineral homeostasis. Microbiota is also an important element in the proper functioning of the brain-gut axis and even brain development. [1,6,7] Dysbiosis is present in inflammations, e.g. intestinal inflammation, autoimmune diseases, e.g. multiple sclerosis, type 1 diabetes, rheumatic diseases, metabolic disorders such as obesity or type 2 diabetes, and mental illness [6,7]

Currently, numerous studies are underway on the effect of microbiota on thyroid autoimmune diseases. The digestive tract is responsible for the absorption of micronutrients among others iodine and selenium, which are necessary for the production of thyroid hormones. Iodine is absorbed using the Na / I symprorter. It seems, that microbiota has a small, if any, effect on the metabolism of iodine and selenium - elements particularly responsible for thyroid homeostasis. [1] However, the relationship between thyroid function and the gastrointestinal tract has been proven. Triiodiotronine influences the development and differentiation of epithelial cells of the intestinal mucosa. [2] Both hypothyroidism and hyperthyroidism give gastrointestinal symptoms. It has been proven that thyroid dysfunction can affect the intestinal bacteria population. It has been shown that people with overt hypothyroidism have a higher risk of bacterial overgrowth in the small intestine. [3,6] This hyperplasia is explained by gastrointestinal symptoms in these patients. Adequate antibiotic therapy leads to decontamination and resolution of these symptoms. However, in the hyperthyroidism, more bacteria of the genus Bifidobacterium, Lactobacillus and Clostridium and Enterococcus were observed in relation to the healthy population. [6]

The most common thyroid dysfunction is Hashimoto disease, involving about 5% of world population. It is a chronic, autoimmune thyroiditis leads to hypothyroidim. In patients with Hashimoto's disease morphological changes in the distal part of the duodenum were shown. In the electron microscope, an increased distance between adjacent microvilli and a change in microvilli thickness was observed. These patients have also been diagnosed with

intestinal leakage by a lactulose/mannitol test, resulting in increased permeability to toxins, antigens or bacterial metabolites from the intestine into the bloodstream as compared to the control group. In this mechanism the effect of microbiota on thyroid disease is quested. [4]

The relationship between microbiota and thyroid homeostasis is still not sufficiently studied. Currently, the "Investigation of Novel biomarkers and Definition of the microbiome In Graves' Orbitopathy" (INDIGO) project is being carried out. The aim of the project is to identify prognostic biomarkers to facilitate early prophylactic intervention, examine the role of the microbiome in disease progression, and assess the impact of probiotics on the reduction of Graves' disease. [5]

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