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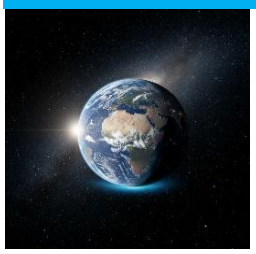

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The impact of a vegetarian diet on thyroid health – a review of current literature

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ABSTRACT

Background: Thyroid dysfunction is one of the most common endocrine disorders and represents an important public health issue. Its etiology is multifactorial and includes genetic, immunological, environmental, and dietary factors. A vegetarian diet, rich in plant-based foods, provides bioactive compounds with antioxidant and anti-inflammatory properties that may influence immune regulation. However, poorly balanced vegetarian diets may result in deficiencies of nutrients essential for thyroid function, including iodine, selenium, and vitamin B12.

Aim: This study aims to review current scientific evidence on the effects of a vegetarian diet on thyroid function, focusing on potential benefits, risks, and the role of supplementation.

Materials and methods: A narrative literature review was conducted using publications from PubMed, Scopus, and Web of Science databases published between 2010 and 2025. Articles addressing vegetarian diets, thyroid function, autoimmune thyroid diseases, and micronutrient supplementation were analyzed.

Results: Evidence suggests that a vegetarian diet may have both beneficial and adverse effects on thyroid health. Benefits include higher intake of antioxidants, lower body weight, and a potentially reduced risk of hyperthyroidism. Conversely, vegetarians show a higher risk of deficiencies in iodine, selenium, vitamin B12, and omega-3 fatty acids, which may contribute to hypothyroidism and exacerbate autoimmune thyroid diseases. Regular monitoring and targeted supplementation are therefore recommended.

Conclusions: A well-planned vegetarian diet can support thyroid health when appropriate supplementation is ensured. Increased awareness of potential nutrient deficiencies, particularly in individuals with thyroid disorders and in pregnant women, is essential. Further research is needed to establish optimal dietary strategies for thyroid health in vegetarian populations.

Keywords: Vegetarian diet, Thyroid dysfunction, Iodine nutrition, Hypothyroidism, Autoimmune disease

1. Introduction

Thyroid disorders are among the most common endocrine diseases and constitute a significant public health problem. Their etiology is multifactorial and includes genetic predisposition, immune disorders, environmental factors, and diet. Chronic inflammation and abnormal regulation of the immune response play a particularly important role in the pathogenesis of thyroid disorders, especially those of autoimmune origin.

In recent years, there has been growing interest in the impact of diet on thyroid function. A vegetarian diet, based mainly on plant products, is characterized by a high content of bioactive compounds with anti-inflammatory and antioxidant properties, which may have a beneficial effect on the regulation of immune processes. At the same time, an improperly balanced vegetarian diet can lead to deficiencies in nutrients essential for proper thyroid function, such as iodine, selenium, and vitamin B12, as well as excessive consumption of gas-forming compounds. (1–3)

The aim of this study is to review the available scientific literature on the impact of a vegetarian diet on thyroid dysfunction, with particular emphasis on the potential benefits and possible risks associated with its use.

2. Characteristics of a vegetarian diet

A vegetarian diet includes various nutritional models based on the elimination of meat and meat products, while allowing the consumption of selected animal products or excluding them entirely. There are several basic types of vegetarian diets, including lactoovo vegetarianism, which allows the consumption of milk and dairy products as well as eggs, lacto vegetarianism and ovo vegetarianism, as well as veganism, which is based exclusively on plant products. There are also intermediate forms, such as the pescetarian or semi-vegetarian diet, which limit but do not completely eliminate animal products. A properly balanced vegetarian diet is based on the consumption of vegetables, fruits, whole grains, legumes, nuts, and seeds, providing significant amounts of dietary fiber, vitamins, minerals, and bioactive compounds with antioxidant and anti-inflammatory properties. At the same time, it requires proper planning to ensure an adequate supply of potentially deficient nutrients such as vitamin B12, iron, iodine, selenium, zinc, and long-chain omega-3 fatty acids. (1,2)

Type of diet	Allowed foods	Excluded foods	References
Lactoovo vegetarian	Vegetables, fruits, dairy products, eggs	Meat, fish	(4,5)
Lactovegetarian	Vegetables, fruits, dairy products	Meat, fish, eggs	(4)
Ovovegetarian	Vegetables, fruits, eggs	Meat, fish, dairy products	(4)
Vegan	Vegetables, fruits, legumes, nuts, seeds	All animal-derived products	(4,6,7)
Pescatarian	Vegetables, fruits, fish, dairy products, eggs	Meat	(4,5)
Semi-vegetarian	Vegetables, fruits, occasional meat consumption	–	(5)

Table 1. Types of vegetarian diets and their characteristics

3. Dietary components essential for thyroid function

Thyroid hormones play a key role in the proper development of the brain and body in infants, and in adults they are essential for maintaining proper metabolism. Their synthesis and proper functioning require an adequate supply of iodine, which can only be obtained from foods that naturally contain it or from fortified products. Both iodine deficiency and excessive iodine intake can lead to thyroid dysfunction. (6)

Vegetarian and vegan diets may be associated with reduced iodine intake and status. Studies show that vegans had the lowest median urinary iodine concentrations, and vegetarians also often failed to achieve optimal iodine status. These groups were more likely to be iodine deficient compared to omnivores in most of the studies analyzed. Iodine is essential for the synthesis of thyroid hormones (T3 and T4), which regulate metabolism, nervous system development, and many physiological processes. Insufficient supply of this element can lead to

conditions such as goiter, hypothyroidism, and developmental disorders in fetuses and children. (6) A study conducted in Norway showed insufficient iodine intake among vegetarians and vegans. In people who used iodine supplements or macroalgae, iodine concentrations were higher, indicating the effectiveness of supplementation in improving iodine status. (8)

The effects of iodine deficiency can be exacerbated by insufficient supply of other nutrients. The thyroid gland contains the highest concentration of selenium of all organs, and this element participates in the biosynthesis of thyroid hormones. Selenium deficiency may contribute to the development of autoimmune thyroid diseases. (8) In addition, vegans and some vegetarians may be at risk of deficiencies in vitamins and minerals such as vitamin B12, riboflavin, iron, zinc, calcium, omega-3 fatty acids, and vitamin D. (1,7,9–13) The table below summarizes nutrients, their functions, and dietary sources.

Nutrient	Role in thyroid function	Plant-based dietary sources	References
Iodine	Synthesis of thyroid hormones T3 and T4	Iodized salt, seaweed	(4,6)
Selenium	Thyroid hormone biosynthesis, antioxidant activity	Brazil nuts, sunflower seeds	(4,9,13–15)
Vitamin B12	Proper neurological and hematological function	Fortified plant-based foods, supplements	(7,11–13)
Omega-3 fatty acids (EPA/DHA)	Regulation of inflammatory processes	Flaxseeds, algae	(11,12)
Iron	Oxygen transport, function of thyroid-related enzymes	Legumes, nuts, seeds	(11,12)
Zinc	Thyroid hormone synthesis	Nuts, seeds, legumes	(11,12)

Table 2. Nutrients essential for thyroid function – sources in a plant-based diet

4. Vegetarian diet and other chronic diseases

Scientific studies clearly indicate that a vegetarian diet may be associated with a reduced risk of many chronic diseases. A prospective meta-analysis conducted by Dybvik et al. (2023) showed that people following vegetarian and vegan diets have a significantly lower risk of ischemic heart disease compared to omnivores. More favorable health indicators were also observed, including lower total and LDL cholesterol levels, lower body weight, and a more favorable metabolic profile.

A systematic review by Eveleigh et al. (2020) confirms that plant-based diets, including

vegetarian and vegan diets, are associated with an overall beneficial effect on health indicators, including body weight, blood pressure, and lipid profile. The beneficial effects of a vegetarian diet are particularly evident when following eating patterns based on unprocessed plant foods such as vegetables, fruits, whole grains, legumes, and nuts. Such diets are associated with a reduced risk of cardiovascular disease, type 2 diabetes, certain cancers, and a beneficial effect on metabolic indicators, including glycemia and lipid profile.

In summary, vegetarian diets can be an important part of chronic disease prevention, with the greatest benefits achieved with eating patterns based on natural, unprocessed plant foods. (1,6,8)

5. The impact of a vegetarian diet on thyroid function

There is growing scientific evidence to suggest that vegetarian diets can have a positive effect on thyroid function. This is primarily due to the high content of bioactive compounds with antioxidant and anti-inflammatory properties in plant-based foods. Antioxidants such as vitamins C and E, as well as polyphenols and flavonoids, can help reduce oxidative stress and inflammatory processes in the thyroid gland. In addition, a plant-based diet promotes the maintenance of a healthy body weight. Obesity is a significant risk factor for hypothyroidism, while people who follow vegetarian diets typically have a lower body mass index (BMI) and a lower risk of being overweight or obese, which may indirectly support proper hormone regulation, thus highlighting the potential health benefits of this type of diet. (3,8)

5.1 Vegetarian diet and hypothyroidism

Scientific studies indicate that a vegetarian diet, especially a vegan diet, may be associated with reduced iodine status, which is a significant risk factor for thyroid dysfunction in the form of hypothyroidism. (14) Populations following plant-based diets have been found to have lower urinary iodine concentrations and increased thyroglobulin concentrations, suggesting greater thyroid stimulation with low iodine intake, even though standard thyroid function markers (TSH, fT3, fT4) often remain within normal limits. (4,16) Large prospective studies suggest a moderately higher risk of developing hypothyroidism in vegetarians compared to meat eaters. (17) These results highlight the importance of monitoring iodine status in people on plant-based diets and, if necessary, using supplementation, especially in predisposed groups. On the other hand, the lower body mass index (BMI) often observed in people on plant-based diets may further reduce the risk of hypothyroidism. (18)

5.2 Vegetarian diet and autoimmune thyroid diseases

Chronic inflammation plays a key role in the pathogenesis of autoimmune diseases. A plant-based diet, rich in bioactive compounds with anti-inflammatory properties, such as polyphenols, flavonoids, and carotenoids, may have a modulating effect on the course of these diseases. In addition, vegetarian diets are high in dietary fiber, which supports the maintenance of normal structure and activity of the gut microbiota, which is important for regulating the immune response. (19,20)

It should be emphasized that some components of a plant-based diet may adversely affect thyroid function, especially in people with diagnosed autoimmune diseases. Goitrogens have an adverse effect on thyroid function because they disrupt iodine metabolism and inhibit the synthesis of thyroid hormones. These compounds, classified as antinutrients, can limit both iodine uptake by the thyroid and its storage in the gland. People with existing iodine deficiency are particularly vulnerable to their effects. The most important goitrogens include thiocyanates, isothiocyanates, nitrates, thioxazolidone compounds, and cyanogenic glycosides, which are mainly found in vegetables of the Brassica family. (21) In addition, an improperly planned vegetarian diet may contribute to the development of deficiencies in nutrients essential for the proper functioning of the thyroid gland, such as vitamin B12 and long-chain omega-3 fatty acids. (20) Insufficient intake of vitamin B12, selenium, and iodine-relatively common among people on plant-based diets-can exacerbate the course of autoimmune thyroid diseases, which highlights the need for careful diet planning and, if necessary, appropriate supplementation to prevent disorders resulting from nutritional deficiencies. (15,21)

5.3 Vegetarian diet and hyperthyroidism

There are studies in the scientific literature analyzing the relationship between a vegetarian diet and the occurrence of autoimmune diseases, but there are still few studies focusing specifically on the impact of this type of diet on the incidence of hyperthyroidism. Hyperthyroidism has a variety of etiologies, most commonly associated with Graves' disease. Analyses comparing the incidence of hyperthyroidism among people following different dietary patterns-vegan, lactoovovegetarian, pescovegetarian, semi-vegetarian, and omnivorous diets - have shown that the lowest rates of this disease were found in vegans, lactoovovegetarians, and pescovegetarians, with the greatest reduction in risk observed in the vegan group. (5) Although excessive iodine intake may promote the development of hyperthyroidism, data indicate that a vegetarian diet

may have a protective effect by lowering insulin-like growth factor (IGF) levels and thanks to the presence of flavonoids, which have anti-autoimmune properties. (3)

6. Supplementing a vegetarian diet

Although a vegetarian diet, including plant products, milk, and eggs, provides most of the necessary nutrients, in some cases there may be a risk of deficiencies in micronutrients that are essential for the proper functioning of the body. These groups primarily include vitamin B12, iodine, calcium, vitamin D3, and long-chain omega-3 fatty acids (EPA/DHA). Vitamin B12, despite being present in eggs and dairy products, may be insufficiently consumed by people who limit these products, which justifies preventive supplementation to maintain proper neurological and hematological function. Iodine deficiency, which in a vegetarian diet depends on the consumption of iodized salt and foods rich in this element, can affect the synthesis of thyroid hormones, especially in pregnant women and other vulnerable groups. Calcium and vitamin D3, although partially covered by dairy products, also require monitoring and possible supplementation, especially when dairy products are restricted. In addition, omega-3 fatty acids, which come mainly from eggs and milk, may be consumed in insufficient amounts. Conscious diet planning and, if necessary, supplementation of the above components can minimize the risk of deficiencies, supporting the proper function of the thyroid, skeletal system, and nervous system. (11,22,23)

7. Summary

A vegetarian diet can have both beneficial and potentially adverse effects on thyroid function. On the one hand, plant products are rich in bioactive compounds such as polyphenols, flavonoids, and carotenoids, which have anti-inflammatory and antioxidant effects, supporting the regulation of immune processes, weight control, and protection against autoimmune thyroid diseases.

On the other hand, an improperly balanced vegetarian diet is associated with the risk of deficiencies in iodine, selenium, vitamin B12, iron, zinc, and omega-3 fatty acids, which may increase the risk of thyroid dysfunction and exacerbate the course of autoimmune diseases. Excessive consumption of goitrogenic foods may also interfere with thyroid hormone synthesis in predisposed individuals.

In summary, a vegetarian diet can be beneficial for thyroid health, provided that it is carefully planned and supplemented with the nutrients necessary for proper gland function. With the

growing popularity of plant-based diets, further research is needed to determine optimal nutritional strategies that maximize benefits while minimizing the risk of deficiencies and thyroid dysfunction.

Disclosure

Author's contribution

Conceptualization – Katarzyna Trela, Bartosz Palacz, Julia Anna Wrona

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Writing – review and editing –Anna Gluzicka, Anhelina Korolchuk, Anna Matyas

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