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IMPACT OF NUTRITION PECULIARITES ON DEVELOPMENT OF THYROID DISEASE (ANALITYC LITERATURE REVIEW)

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SUMMARY. *Pathology of the thyroid gland takes the third place in the structure of the overall morbidity of population of Ukraine and all over the world. Eradication of diseases of such origin is one of the important tasks of the World Health Organization. Goitrogenic substances are present in many foods: turnip, rutabaga, horseradish, canola, corn, bamboo, sweet potatoes, millet, soybeans. But at the same time we need them in our nutrition for other disease prevention, as cancer. In the article we generalize information about goitrogenic food compounds and give recommendations for nutrition rationalization.*
Key words: thyroid gland, pathology, goitrogenic compounds, food products, prevention.

Pathology of a thyroid gland (TG) ranks third in overall structure of morbidity and mortality of Ukraine and other countries population after cardiovascular diseases and cancer [1, 2]. The elimination of such diseases is a priority task in many countries, because according to the World Health Organization, approximately 2 billion people in the world are in a risk zone of iodine deficiency disorders emergence [3].

The first information about goitrogenic substance were received in 1928, at feeding rabbits fresh cabbage. Subsequently, “cabbage” goiter able to induce in other species, and goitrogenic activity was found in most of plant foods and feed, including salad, almost all kinds of cabbage family (turnips, turnip, rutabaga, horseradish, rape, wild turnip, lady's purse, etc.) [4, 5, 6]. There are many goitrogenic substances contained in plant foods: maniok, corn, bamboo shoots, sweet potatoes, millet, mustard oil, some varieties of beans (soy) [4, 5, 7].

Goitrogenic substances disrupt the formation of thyroid hormones at different stages [5, 8].

Main goitrogenic food substances and their effects on the human body are analyzed below.

Objective. To analyze the impact variants in of peculiarities of human nutrition on development of thyroid gland diseases.

All goitrogenic common is that they are capable of varying degrees of intensity block the function of the thyroid gland and induce its increase, including by increasing the synthesis of thyroid stimulating hormone (TSH) by the pituitary feedback mechanism [9].

Goitrogenic substances, both natural and anthropogenic according to the degree of scrutiny divided into three groups [9]:

1) goitrogenic substances with proven effect according to population studies;

2) goitrogens effect of which proved only in experimental studies;

3) substances with potential but not proven goitrogenic effect.

Goitrogenic food substances (cabbage, Brussels sprouts, cauliflower, broccoli, kohlrabi, turnips, rutabaga, radish, African cassava, millet, soybeans) refer to chemical factors in the development of thyroid pathology of natural origin of the first group [4, 6, 7].

The most common and most studied are cyanogenic glycosides and thiocyanates isothiocyanate contained in cruciferous plants (different types of cabbage, turnip, horseradish) [10]. Especially their goitrogenic effect is manifested on iodine deficiency areas [11]. Goitrogenic mechanism of action of these substances is inhibition of thyroid iodine capture and stimulate its release. However, it should be noted that the goitrogenic effect of these foods most fully manifested in endemic for iodine content regions [9, 10].

Thus, in 1996 Rehalbuto S. et al. [9, 13] it was shown that the ratio between iodine excretion and thiocyanates (TCN) is one of the factors that influences the development of endemic goiter in areas with iodine deficiency. The risk of goiter developing is inversely proportional to the ratio of

iodine/TCN, that is smaller iodine excretion and more thiocyanates excretion, the more common is goiter. Risk factors for goiter is the iodine/TCN ratio value <3.5 [9, 13]. Increase of iodine in the human body, even while maintaining high levels of thiocyanates intake, significantly reduces the risk of goiter [9, 14].

Phenolic organic compounds. The daily diet of an adult contains about 2.0 grams of flavonoids, in addition folk medicine often use plants that contain significant amounts of flavonoids (for example, vovkonih European, lemon balm, mint) [9]. Experiments on rats have demonstrated that oral administration of flavonoids affect the function and the pituitary TSH synthesis, reducing levels of thyroxine, triiodothyronine in blood and stimulates the synthesis of TSH in the pituitary gland by feedback mechanism [15, 16]. In addition, it was found a direct effect on the pituitary gland with TSH synthesis decrease and on thyroid gland with reduction of colloid amount and number of colloidal cavities in the follicles [9, 16].

It has been found and experimentally proved on animals direct interaction between plant extracts with thyroid stimulating immunoglobulins that leads to inactivation of TSH-extract-complexes that circulate in the blood and disturbance of TSH binding with thyroid stimulating immunoglobulin [9, 16]. There is also evidence that extracts of certain plants inhibit thyroid iodine capture. However, there is no experimental data to confirm this [17].

The effects of flavonoids on thiroperoxidase (TPO) were the best studied in experiments in vitro with purified enzyme, on intact cells and in vivo [18 Dasgupta, P., et al. 2008. Iodine nutrition: Iodine content of iodized salt in the United States.]. It was shown that the consumption of millet, which contains flavonoids, leading to the development of goiter in areas with deficient iodine intake from food [19, 20]. Most are rich in flavonoids and their C-glycosylconjugates vitexin, glycosylvitexin and glycosylorientyl. In [9, 17] are given the results of studying of vitexin antithyroid on Wistar female rats that were divided into groups with different diet: a diet rich in iodine (12,0 micrograms/day); water that does not contain goitrogenic substances; food with thymazol (0,5 mmoll); food with vitexin (20,0 and 80,0 mmol). In rats that consumed vitexin was not found to decrease thyroid iodine capture, but noted the inhibition mechanism of its condensation and development of goiter. In another experiment [21] on the goats that consumed within 2 months of millet was found thyroid morphology changes as reducing the size of the follicules and colloid and its lymphatic infiltration. However, the exact mechanisms of described changes still unknown.

At the same time, there is evidence that flavonoids inhibit cell growth of breast and prostate cancer; apihenyn and luteolin — thyroid cancer [9, 22, 23]. In [22, 23] showed that the effect inhibition is carried out through tyrosinekinase and leads to apoptosis.

In some experiments [17] in vitro using purified thyroxin binding proteins and in vivo on rats was found a negative effect of flavonoids on binding of thyroid hormones with transport proteins of blood serum, namely transferithyn, but that is typical for animals and not for man. There are only a few data on the known inhibitors of glucose transporters in the human body flavonoids calhon and floretyn [9].

Another option for impact of flavonoids (more than 100 natural — luteolin, apigenin and synthetic substances) is, preferably reversible, inhibition of 5-deiodinase type 1 and less of type 2 [9, 17].

Nowadays discussible is question about flavonoids effect on processes of conjugation and elimination of thyroid hormones. But we know that they influence the metabolism and excretion of some drugs, and perhaps in the same way they affect the process of elimination of thyroid hormones, which increase was found after receiving a large number of walnut oil and soybeans [24].

The goitrogenicity of soy can also be offset by pairing it with products containing iodine. I tell my patients with thyroid problems that if they already eat soy products and wish to continue, they should be sure to include additional iodide in the diet, in the form of seaweed products such as kombu or nori. For people who don't already use soy regularly, I suggest that they simply continue whatever limited usage they already have and not worry about it too much, as such small amounts aren't likely to impact the thyroid too greatly — but keep in mind that if you eat processed foods containing certain soy-based additives like soybean oil or hydrolyzed soy protein, they could be a "hidden" source of soy isoflavones that many hypothyroid woman could probably do without!

So unless you have a true soy allergy, I wouldn't worry too much about every little soybean or soy shake you consume. More importantly, if you do include soy in your diet and have concerns about your thyroid function, it's worthwhile to

have your iodine levels checked by your practitioner, who can (if necessary) offer you supplemental elemental iodide in amounts that are correct for your profile. We also recommend that people with thyroid problems who consume soy regularly include good dietary sources of selenium — and be sure to continue monitoring thyroid hormone levels regularly with their practitioner.

Gluten. Its main sources are cereals such as wheat, barley and rye. There are quite a lot of information that intolerance or sensitivity to gluten goes along with a number of autoimmune diseases including autoimmune thyroiditis. In some cases, hypothyroidism was found in women with celiac disease [20].

There is also information about the presence of a small number of potential goitrogens in peanuts, pine nuts, millet, peaches, strawberries, spinach, cassava and other roots. However, the risk of goiter exists only in the use of large quantities of such products on the background of iodine deficiency and total nutrition imbalance.

Conclusion. Thus, the analysis showed that there are many environmental factors that can adversely affect the human body and induce pathological changes in the thyroid gland. But all above-mentioned changes in thyroid developing under the influence of goitrogenic factors may occur only on background of iodine deficiency. Considering that goitrogenic substance found in many foods that are generally beneficial to the body, one should not exclude them from the diet, but we must follow its balance and usefulness.

Recommendations. After analyzing the information above following methods of prevention of the negative impact of goitrogenic foods without excluding them entirely from the diet because they obviously have useful effect on the human body can be identified. First, individuals living in endemic for iodine content areas, necessary to eliminate iodine deficiency by correcting the diet or additional consumption iodized products, because in most of cases the intake of goitrogenic products leads to goiter in case of iodine lack in the body.

Second, reducing of the negative impact of legumes, especially soybeans, is possible during their cooking or a combination with seafood, extremely rich in iodine. For example, use tofu with nori or fish.

Foods rich in gluten, needs to be replaced gluten-free for persons with allergy or high sensitivity to them.

We should be attentive and check the products for possible contain of hidden soy products, soybean oil, soy protein hydrolysates.

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ВПЛИВ ОСОБЛИВОСТЕЙ ХАРЧОВОГО РАЦІОНУ НА РОЗВИТОК ПАТОЛОГІЇ ЩИТОПОДІБНОЇ ЗАЛОЗИ (АНАЛІТИЧНИЙ ОГЛЯД ЛІТЕРАТУРИ)

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***РЕЗЮМЕ**. Захворювання щитоподібної залози на третьому місці у структурі загальної захворюваності населення України та всього світу. Боротьба з цією патологією — одне з пріоритетних завдань Всесвітньої організації охорони здоров'я. Зобогенні речовини є в багатьох харчових продуктах: турнепсі, брукві, хріні, рапсі, кукурудзі, бамбуку, солодкій картоплі, просі, соєвих бобах. Але в той же час, вони необхідні складові харчового раціону для профілактики інших захворювань, зокрема таких як рак. У статті узагальнено інформацію щодо зобогенних речовин харчових продуктів та надано рекомендації щодо більш раціонального харчування.*

Ключові слова: щитоподібна залоза, патологія, зобогенні речовини, продукти харчування, профілактика.

ВЛИЯНИЕ ОСОБЕННОСТЕЙ ПИЩЕВОГО РАЦИОНА НА РАЗВИТИЕ ПАТОЛОГИИ ЩИТОВИДНОЙ ЖЕЛЕЗЫ (АНАЛИТИЧЕСКИЙ ОБЗОР ЛИТЕРАТУРЫ)

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***РЕЗЮМЕ**. Заболевания щитовидной железы занимают третье место в структуре общей заболеваемости населения Украины и всего мира. Борьба с данной патологией — одна из приоритетных задач ВООЗ. Зобогенные вещества присутствуют во многих пищевых продуктах: турнепсе, брюкве, хрене, рапсе, кукурузе, бамбуке, капусте, соевых бобах. В то же время, они необходимы в нашем пищевом рационе для профилактики других заболеваний, таких как рак. В статье обобщена информация касательно зобогенных веществ пищевых продуктов и даны рекомендации относительно рационализации питания.*

Ключевые слова: щитовидная железа, патология, зобогенные вещества, продукты питания, профилактика.

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