



## SYMPTOMS AND PREVENTION OF THE IODINE DEFICIENCY

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### ABSTRACT

In recent times the iodine deficiency is increasing worldwide and Iodine deficiency disorders research (IDD research) shows that at the end of the 20th century this trend was found in 131 countries from 191 watched countries. Regarding to this fact the children with higher physical activities are one of the more attacked group. But this negative influence can be reduced by the correct nutrition intake.

**Key words:** iodine deficiency, nutrition correction, physical activity

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### **Iodine is irreplaceable trace element for human body**

Iodine is an important trace element for organism. Its function is irreplaceable role for thyroid system and for correct function metabolism in human body. In the thyroid gland the iodine is used for thyroid hormones like a thyroxine (T4) and triiodothyronine (T3) which has a leading role in regulation of intensity of metabolism and bioenergetic reactions of cell, adaptive and trophical reactions of organism. Because iodine is excreted from the body is necessary to ensure its continuous intake. Despite the fact that nutrition is used iodized salt, it is assumed that the world suffers from different levels of iodine deficiency disorder (IDD) affects 800 to 1.5 million people in the world, because the most of them live in zones with

iodine deficit and moreover to the heat treatment, the iodine content is reduced to 20% on grilling and up to 60% during the cooking (**Turianica, 2007**). All world is focused on conditions and diseases with iodine insufficiency, previously united by term „endemic goitre“ because the 28.9% of earth population live in critical zones. Approximately 200 millions of them are diagnosed with goitre, 3 millions have endemic cretinism, and a lot of millions people light psycho-motor disturbances are observed (**Manz et al., 2002; Герасимов, 2003**). We must remember also that with regard to the prevention of high blood pressure is salt curing, and overall consumption is limited to the lowest level is lowered and thus the intake of iodine is reduced as well.

Iodine deficiency in the biosphere is by hundred times increasing the risk of congenital thyroide deficiency development in children and in different parts of world including Western Europe was found the iodine insufficiency. This is serious economical, psychological and social burden for families who have ill child and is problem for society as well. Liquidation of iodine deficiency is so huge that the developed countries were made the International Council of Iodine Deficiency Disorders and by the beginning of third millennium this is one of the priority of United Nations Organisation (UNO) as well (**Акопян и др., 2004; Осип и др., 2001; Phillips, 2001**).

The normal iodine intake is 100 – 200 µg daily. Last years the diagnostics of iodine deficiency was improved by the sensitive methods of iodine amount egested with urine (**Дедов и др., 2000; Haddow et al., 1999; Макаp и др., 1999**). Thus we cannot talk about iodine insufficiency when the daily iodine amount egested with urine is more than 100 µg/L, because it was found the direct correlation between egestion of iodine with urine and the iodine deficiency diseases. The daily iodine egestion between 50 – 99 µg/L shows the light form of iodine deficiency, 20 – 49 µg/L shows iodine deficiency of middle severity and less than 20 µg/L is showing the severe degree of iodine deficiency (**Балаболкин, 1997**).

One of the subjects with developed iodine insufficiency are children of early age and in the puberty age, pregnant and lactations women and people with heavy physical activity. Because the degradation and release of iodine intakes is directly connected with the activity of the organism, especially children with physical activity belong to this group (**Weber, 2002**).

### **Symtoms of iodne deficiency**

Iodine is incorporated into thyroid hormones, necessary for regulating of metabolic rate, growth, and development of the brain and nervous system. As we mentioned the thyroid

hormones, thyroxine (T4) and triiodothyronine (T3), are tyrosine-based hormones produced by the thyroid gland primarily responsible for regulation of metabolism. Iodine is important for the production of T3 and T4. The major form of thyroid hormone in the blood is thyroxine, which has a longer half-life than T3 and the ratio of T4 to T3 released into the blood is roughly 20 to 1 (three to four times more potent than T4). These hormones act in several ways as indicated and act on nearly every cell in the body, they can directly regulate the activity of genes. A deficiency of iodine leads to decreased production of T3 and T4, enlarges the thyroid tissue and will cause the disease known as goitre in adults, usually not a serious problem, or in cretinism in children, which is marked by severe mental and physical retardation, with irreversible hearing and speech defects and either deaf-mutism, squint and paralysis, or stunting and edema. Well known the thyroid hormones take part in a lot of metabolic links in adjusting of intensity and efficiency of bio-energetical reactions of cells, their action spreads on the row of sub-cellular structures (nuclei, mitochondria, ribosome, membranes and other **(Соколова, 1994; Стрижков, 1993; Верещагина, 1990)**. They act to increase the basal metabolic rate, affect protein synthesis, help regulate long bone growth (synergy with growth hormone) and neuronal maturation, and increase the body's sensitivity to catecholamines (such as adrenaline) by permissiveness **(Walker et al., 1989)**. The thyroid hormones are essential to proper development and differentiation of all cells of the human body. These hormones also regulate protein, fat, and carbohydrate metabolism, affecting how human cells use energetic compounds and also stimulate vitamin metabolism. The important catalysts of the immune system represent the hormones of thyroid gland and numerous physiological and pathological stimuli influence thyroid hormone synthesis. Most authors agree on the assumption that thyroid hormones are metabolic simulators of the immune system **(Ростока и др., 2002; 2007; Turjanitsa et al., 1997; 2003; Шідловський, 1998; Кеворков, Бахметьев, 1989)**.

Secretion of T3 and T4 multiplying by capture and organization of iodides passes under the action of thyrotropic hormone of hypophysis. The goitre develops prevail in the area where foods contain small amounts of iodine, this depend on the soil where they are grown, hence mountainous and some inland regions have high goitre and IDD incidence and there are also goitrogenic foods. This situation also can occur when hypertyroism is due to gigantic amount of iodine daily intake for a long time and up to 10 mg, what is 50 – 100 time more than recommended daily iodine intake **(Langer, 1995)**.

### **Circle of iodine insufficiency disaster**

The lack of micro-elements is hazardous because the clinically shows up very late, especially for growing organism has the most heavy effect deficit of iodine. The most subject to developed lack of micro-elements specially deficit of iodine are the fetus, children of early age and in the puberty age, women during the pregnancy and lactation woman (**Зелинская, 1999**). This problem of deficit of iodine does not have sexual distinction and here start the circle of iodine insufficiency disaster, because the iodine insufficiency will pass to progeny with more deterioration. We can protect next generation from broken physical, mental and cognitive development in an inheritance by the particularly supervision of doctors – endocrinologist especially the above mentioned vulnerable groups. The results of some inspections showed that the correction of iodine insufficiency before pregnancy or during pregnancy significantly reduced negative index of new-born survival and have increased the remote viability.

### **Liquidation of iodine deficiency**

The one of the most expose method of prevention of iodine insufficiency on the world was salt iodination (**Кравченко и др., 1999, 2004; Heinisch et al., 2002; Weirsinga et al., 2001**). The other prophylaxis of IDD is simple with no just iodized salt but other food like by food with high level of iodine for example seafood, seaweed and iodized flour, milk or iodinated central water supplies.

In some countries like a Germany or England is practices iodination of forages for pigs and cattle (**Олійник, 1997**). And some countries have prophylaxis of IDD build on medicinal drugs injectable or oral for example iodine-containing oil or drugs which contain an iodine, such as potassium iodide, Antistumin, Lugol's iodine solution (**Герасимов, 2002; Дедов, 2001**). Benefit of drugs is a regular intake of certain dose into organism. Lugol's iodine intake for healthy people does not influence on the levels of T3 and T4 in blood during the 10 days reception of 0.5 mg/daily. For people with thyrotoxicosis the same amount intake have result of the decrease of concentration of T3 and T4. On the same time the TSH was belong ranges of sensitiveness of method, that specifies on absence of a compensate reaction of hypophysis on the decrease of T3 and T4 in blood (**Тан, 1990**).

In area where is no available iodinated salt and any other iodinated food stuffs for some reasons, the prevention of iodine deficiency diseases is by iodinated oil orally or

intramuscular. On the mountains the iodinated oil in capsules was found better on prophylaxis treatment like and iodinated salt. The most use oil is lipoidol – poppy oil which 38% of the weight is iodine. The 48% of the entered dose is excreted with urine and other is deposited in hypodermic fatty cellulose (**Eltom et al., 1985; Sebotsa et al., 2003**). In 1981 the **ДеМейер и др.** indicate that the ability of tissue to maintain organically connected iodine is considerably higher than the inorganic iodides. The high advantage of the usage of tablets drugs of iodides guarantee regular entering of dose of micro-element into organism, but for the determination of dose of drugs is necessary to be oriented on the initial concentration of iodine in urine (**Герасимов, 2002**).

Дедов use the treatment for children who live in areas with iodine deficit and it shown that the daily reception of 100 µg potassium iodide daily normalizes of iodine exchange during of all period of introduction without any side effects but this method need a large responsibility, because irregular reception of drug is reduced the quality of treatment. For normal fetus development is important and necessary to pay attention to the prevention of pregnant woman. A number of authors (**Rezvanian et al., 2002; O'Donnel et al., 2002; Kung et al., 2000; Moscicka et al., 2001; Chan et al., 2001; Hronec et al. 2001**) indicated that intake of 200 µg iodine daily is recommended to pregnant woman who lived in areas of iodine deficit.

The hormonal function of thyroid is oppressed by a huge dosage of potassium iodide and therefore the use of potassium iodide for urgent thyroid correction does not give expected result because of the high risk of occurring the iodine induced thyrotoxicosis (**Mizukami et al., 1993; Туряница, 1997; Росток1999**).

### **Conclusion with beneficial product**

From our point of view the efforts to develop more effective methods of iodine insufficiency are actual and expedient. And therefore it's important to be focused on development of the most effective micro-elements of iodine which is organically linked form of iodine for the correction ekologically conditioned iodine deficit or deficit developed by the stress, physical over-strains and pregnancy (**Turianica et al., 2005; Rostoka et al., 2007**). Organically linked form of iodine can by exactly dosed and does not have a risk of overdose and in addition independently stimulates plugging of free amino-acid into the protein biosynthesis (**Рачев и др., 1979**).

We have developed and registered high-performance food iodine-containing additions for people based on vegetable oils, in particular sunflower and pumpkin oils, and adiposes for the correction of the iodine deficient states, effective also for treatment of pathology of thyroid gland and other diseases.

From the facts mentioned above we can make a conclusion that the health problems of inhabitants including children connected with thyroid depend almost always on biogeochemical areas with low iodine content, deficit developed with high losses of iodine at high hormonal activity of thyroid gland during the physiological activity, pregnancy, nourish, illnesses and in conditions of lower intake of iodine micro-element. Even the main natural source of iodine are an-organic iodides, especially potassium iodide, the most effective form for solution of iodide insufficiency is organically connected iodine, based on vegetables oils and fats, which is suitable for the body supply and do not block the hormonal function of thyroid even during higher intake. That is the reason why we select for sports children for hormonal stimulation of thyroid and effective hormonal regulation of protein metabolism, metabolism of fat, sugar and minerals the nutrition supplement FORTUNA VITAE as the most suitable of active organically linked iodine, based on pumpkin oil. This nutrition supplement which could not only normalise in the best way the hormonal function of thyroid gland, but can provide its correct function, its higher activity during the physical stress in training process and competitions. From our point of view the usage of synthetic hormones of thyroid gland in drugs as for example in Eutyrox, Levothyroxine or Liothyronine are not the best variation for correction iodine-thyroid regulation of metabolism because they actually are decreasing the function of thyroid gland and by hitting forms indicates overcompensation stimulation of catabolic processes after the usage in the morning, what leads to physical and psychical exhaustion in the afternoon. It is not the best variant in the present of thyroid gland because the most often problem of hypo-function is the deficit of micro-element iodine in suitable and usable form.

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