UDC 615.35:577

THE RISK OF AVITAMINOSIS DUE TO ADMINISTRATION OF ANTIVITAMIN DRUGS

Student Popova M. BHFsk-16
Language and scientific supervisor Renska I. I.
Kyiv National University of Technologies and Design

Vitamin is an essential element of food for the humans and for most living organisms, because they mostly can`t be synthesized, or some of vitamins are synthesized in insufficient quantities by organisms. Vitamins are substances that provide the relevant course of biochemical and physiological processes in the body. They can be assigned to a group of biologically active compounds, which produces its effect on metabolism in very low concentrations.

Currently, there are about 20 different vitamins and their chemical structure has been examined.

The **main aim** of the study is to specify the role and impact of antivitamins on the human body. According to the aim the following tasks have been set: to analyse the characteristic features of antivitaims; to describe the main known types of antivitamins and their effect on the human organism.

"Antivitamin" was discovered in the 1974 as a result of experiment that seemed like a failure. Chemists decided to synthesize vitamin B_9 (folic acid) and at the same time increase it biological properties. This vitamin activates the process of hematopoiesis and takes part in protein biosynthesis. Therefore, this vitamin plays a major role across the life cycle. Chemical analogue of vitamin has completely lost its vitamin activity. However, it turned out that the new compound inhibits cell growth, first of all, cancer cells. This substance was registered as an effective anticancer agent for the treatment of patients with certain malignancies.

Trying to understand the mechanism of the therapeutic effect of the drug, biochemists came to the conclusion that this substance is an antagonist of vitamin B_9. Due to the fact that substance was invading a complex chain of chemical reactions it can cause therapeutic effect. Also substance interferes with the conversion of folic acid into a coenzyme.

This has set up the research of the substance, that is known as antivitamin now.

Chemical structure of antivitamin is very close to the vitamin chemical structure, but antivitamin can cause the opposite biological effect. The antivitamin disrupts metabolic reaction of vitamins and inhibit their normal flow. This gives many potential sites for genetic disruption of vitamin metabolism and function, which results in vitamin deficiency even in cases where the vitamin comes from food in sufficient amounts or is synthesized by organisms.

For the first time the mechanism of antivitamin action was defined in 1940 by D. Woods, who showed that the sulfanilamide (streptocid) is a metabolic competitive with vitamin para-aminobenzoic acid (B_{10}). Para-aminobenzoic acid is involved in the synthesis of dihydropteric acid – predecessor of the other vitamin folic acid (B_9).

Upon further investigation, antivitamins were allocated into two groups:

1. Nonspecific - antivitamin, inactivating the function of vitamin. Generally they are shattering or tying them, transferring into an inactive form. They include enzymes that destruct thiamine (thiaminase, ascorbinase), a substance forming a complex with vitamins, preventing their absorption (egg protein binds vitamin H).

2. Specific antivitamin that replaces derived vitamins (cofactors) in the active site of the enzyme, obstructed implementation of metabolic functions. This group is of great importance in medicine, coupled with vitamin, impeding their absorption.

REPRESENTATIVES

Let us consider some specific examples of compounds which cause antivitamin activity.

Antivitamins of para-aminobenzoic acid (B_9). Sulfonamides (streptocid, norsulfazol, ftalazol) – structural analogues of PABA. They inhibit the enzyme by displacing PABA complex with the enzyme that synthesizes folic acid, which leads to inhibition of bacterial growth.

Antivitamin of thiamine (B_1). The change in the biological properties of thiamine due to the conversion of regions of the molecule thiamine - hydroxyethyl radical, pyrimidine connections. As a result of changes hydroxyethyl radical is formed an effective antimetabolite - amprolium contributing to the dysfunction of the central nervous system.

Antivitamin of folic acid (B_9). Includes amino - and ameto-pterin, the sulfonamides, which block reactions associated with the transfer and use of single carbon radical in the synthesis of nucleic and other compounds, which subsequently leads to physiological disorders in the human body.

Aminopterin can contribute to the development of dogs anemia due to deficiency of folic acid.

Antivitamin of cobalamin (B_{12}). The most active analogues, Coferment B_{12} derivatives include 2-amino-methylpropanol. The change in the biological properties of vitamin B_{12} leads to severe disorders of hematopoiesis, the expression of the nervous system and digestive organs.

Antivitamin ascorbic acid (C). The ascorbate and some other oxidative enzymes show antivitamin activity relative to the vitamin C.

The ascorbate catalyzes the oxidation of ascorbic acid to dehydroascorbic acid. The contents of ascorbic acid and its activity in different products varies: it is most active in cucumbers, squashes. At the same time, ascorbic acid practically absent or found in small amounts in carrots, onions, tomatoes, beets, and some fruits and berries.

The degree of manifestation of the activity of ascorbic acid depends on the degree of disruption of the structure of plant tissues. By ascorbic acid a mixture of crude ismel received vegetables for 6 hours of storage is losing more than 50% contained ascorbine-the howling acid, and the loss is greater, the greater the degree of grinding. In the juices the result is a large contact between the ascorbate and ascorbic acid, this process is even more accelerated: 15 min is sufficient for oxidation of 50% contained in the pumpkin juice of ascorbic acid, 35 min - the cabbage juice.

The ascorbate thermolabile: warming plant-based foods for 3 min at 100 °C is sufficient for the complete suppression of its activity.

Antivitamin K. This antivitamin already included in the arsenal of drugs. There is interesting story of its creation. Experts tried to find out the cause of the so-called sweet clover disease in farm animals, one symptom of which is poor blood clotting. It turned out that the clover hay contains antivitamin K — dicoumarin. Vitamin K promotes blood clotting, and dicoumarin disrupts that process. So the idea then was embodied into life to use dicoumarin for the treatment of various diseases caused by high blood clotting.

Antivitamin of Niacin, or nicotinic acid (PP). Active antagonist Niacin are isoniazid and leucine, existing in the form of analog coenzymes NADP and NAD. Prolonged intake of these can cause deficiency of nicotinic acid. In turn, this may be the cause of the disease called the syndrome of "burning feet", commemorating pellagra. This disease develops mainly in spring and is characterized by gradually increasing weakness and burning sensation, extending from the spine to the extremities. Then on the hands and feet, mostly on the back side, there is redness and swelling of the skin, accompanied by a feeling of tension and burning, and extends to the forearm, neck, rarely on the face. After 2-6 weeks, the redness gives way to pityriasis peeling, sometimes blistering, after which the skin remains rough, dry and darker. This process is repeated every spring with a greater force, a patient is in a fever, he complains of thirst, difficulty in swallowing, vomiting, diarrhea, catarrh of the bronchi, eyes, severe pain along the spine. Next to this are developing nervous disorders, dullness of vision, convulsions and a kind of mental illness, violent or, on the contrary, the oppressive nature.

Conclusion. It is extremely important for doctors and other professionals who work with chemical substances and drugs to be aware of the influence of antivitamins on the human body.

This topic requires further thorough research and development.