Biochemical bases of kumis therapy

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Biochemical basis of treatment with kumyss

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SUMMARY

Purpose of the study. Justification of the biochemical basis for the use of the mare's product milk-kumis in medicine.

Material and methods. Analyzed the results of numerous studies to studycomposition of mare's milk and koumiss. The results of biochemical, enzyme immunoassay, laboratory, clinical, microbiological, analytical, statistical, questionnaire research methods were used.

Results. It is shown that the composition of kumis depends on the composition of mare's milk. Kumis isa rich source of amino acids, vitamins, hormones, polyunsaturated fatty acids, enzymes, which determine its medicinal properties. Kumis has an immunomodulatory, antibacterial, anti-inflammatory effect, and can be used as a non-medicinal prophylactic and therapeutic agent.

Key words: mare's milk, koumiss, kumis therapy, amino acids, polyunsaturatedfatty acids, vitamins, enzymes, hormones.

RESUME

The aim of the study. Rationale biochemical basis of product mare's milk-kumyss in medicine.Materials and methods. Analyzed the results of numerous studies on the composition of mare's milk and kumys. Used the results of biochemical, immunoassay, laboratory, clinical, microbiological, analytical, statistical, biographical research methods.

Results. Shown that the composition depends on the composition of kumyss mare's milk. Kumyss is a rich source of amino acids, vitamins, hormones, fatty acids, enzymes that determine the therapeutic properties. Kumyss has immunomodulating, antibacterial, anti-inflammatory effect, can be used as non-drug preventive and therapeutic tool.

Keywords: mare's milk, kumys, amino acids, fatty acids, vitamins, enzymes and hormones.

Among the natural healing factors of the Republic of Bashkortostan, the well-known and widely used in sanatoriums is the Bashkir kumis - a valuable product of lactic acid and alcoholic fermentation of mare's milk based on special kumis starter cultures. Kumis starter cultures are microorganismsLactobacterium bulgaricum and Torula yeast. The carried outWe have long-term studies to study the medicinal properties of kumis have shown that its use has a beneficial effect in the treatment of patients with diseases of the respiratory system, digestion, metabolic disorders, immunodeficiency states, etc. [1, 17, 23].

The healing properties of kumis can be explained, first of all, by the composition of mare's milk. Kumis, which contains a complex of physiologically active substances (amino acids, polyunsaturated fatty acids, antibiotic substances, vitamins, enzymes, hormones, etc.), has a high biological value and digestibility. In terms of the content of milk sugar (lactose), protein, mineral salts, as well as the qualitative characteristics of protein and fat, mare's milk is similar to women's milk and significantly differs from cow's milk (Table 1) [17].

Table 1

Chemical composition of human, mare and cow milk (in%)

Молоко	Молочный сахар	Общий белок	Жир	Минеральные соли	Сухое вещество	В % к общему белку	
						казеин	альбумин, глобулин
Женское	6,29	2,2	3,76	0,31	12,6	24,5	75,5
Кобылье	6,7	2,0	2,0	0,3	11,0	50,7	49,3
Коровье	4,7	3,0	3,7	0,7	12,5	85,0	15,0

Kumis proteins are a rich source of amino acids, especially essential ones, which are not synthesized in the body from other substances. The human body does not have enzyme systems capable of synthesizing the radical of these amino acids; therefore, essential amino acids must be supplied together with plant or animal food. Essential amino acids play the role of buffers, are involved in maintaining a constant reaction of the environment in plasma, cerebrospinal fluid, intestinal secretions, etc. The lack of even one of the essential amino acids slows down the growth and normal development of children, negatively affects the health and reproductive functions of adults [10, 14, 15]. By the content of such amino acids as: lysine, methionine, tryptophan, koumiss surpasses mare's milk. Methionine serves in the body as a donor of methyl groups (- CH_3) in the biosynthesis of choline, adrenaline and many other biologically important substances; biologically essential substances such as vitamin PP, bile acids, sex and corticosteroid hormones and sterols are synthesized from tryptophan. In addition, tryptophan stimulates the production of serotonin, which, in turn, is necessary for the development of the brain and is a precursor of melatonin synthesis, which regulates the change in circadian rhythms of sleep and wakefulness [3, 16, 20].

The lack of any amino acid manifests itself in the form of diseases with characteristic signs for each of them. A decrease in methionine levels leads to damage to the pancreas and fatty liver infiltration; a lack of tryptophan results in dysfunction of the heart and clouding of the lens (cataract); lack of lysine - to a change in the processes of inhibition in the central nervous system. Scientists' studies on rats with lysine deficiency led to fatty liver, atrophy of the pancreas, salivary gland, thymus and spleen within six days [8, 18].

An equally important property is that amino acids such as methionine, lysine, tryptophan, as well as tyrosine and glutamic acid contained in kumis, are lipotropic substances necessary for liver function. They prevent the formation of cholesterol in the blood, a high content of which is a risk factor for atherosclerosis. And in this regard, lipotropic substances should be considered the most important measure of protection against atherosclerosis [23].

The high biological properties of kumis are due to the content of polyunsaturated fatty acids (PUFA) in the kumis fat. As you know, PUFA are an important essential nutritional factor due to their participation in the formation of membranes of brain cells, visual analyzer and biological membranes of other organs and tissues. There is evidence that PUFAs play an important role in the normal development and maintenance of a balance between physiological and pathological processes in the body. The important biological role of these compounds is confirmed by their high content in the human embryo and in the body of newborns, as well as in breast milk [11, 12].

Among the PUFAs of kumis, linoleic and especially α-linolenic acids predominate - essential fatty acids that are not formed in the human body, as a result of which they are irreplaceable and must be supplied with food. Long-chain polyunsaturated fatty acids (LCPUFA) - arachidonic, eicosapentaenoic and docosahexaenoic acids are synthesized from linoleic and α-linolenic acids using desaturation and elongation reactions (an increase in the number of double bonds and chain lengthening, respectively) [9, 11, 13].

Linoleic acid derivatives belong to the ω-6 family (arachidonic, docosapentaenoic acids, etc.), while α-linolenic acid derivatives belong to the ω-3 family (eicosapentaenoic, docosahexaenoic acids, etc.) [2, 4, 5, 11, 22].

The intake of polyunsaturated fatty acids of the ω-3 and ω-6 families into the body is necessary for the normal functioning of the body, because insufficient intake of essential PUFAs in the body can lead to serious disturbances in the functioning of the immune system, internal organs, impaired visual and reproductive functions, etc. [5, 11].

Of particular importance are LCPUFA - arachidonic and docosahexaenoic acids. LCPNZhK

are part of the phospholipids of cell membranes, their concentration affects the "fluidity" of membranes, permeability and activity of enzymes associated with the membrane. Docosahexaenoic acid makes up 25-30% of the gray matter phospholipids of the brain, arachidonic acid - 15-18%. About 60% of PUFAs in the phospholipids of the retinal membranes are represented by docosahexaenoic acid, which affects the photoreceptor function of the retina through the activation of the visual pigment rhodopsin. PUFA, and primarily arachidonic acid, is a precursor of eicosanoids - prostaglandins, leukotrienes, thromboxanes, which ensure the normal course of biochemical and physiological processes by participating in metabolism [13, 16].

Research results have shown that LCPUFA play an important role in the maturation and functioning of the central nervous system in the fetus and infants. The process of myelination of nerve fibers directly depends on the level of LCPUFA. Adequate intake of LCPUFA ensures the normal development of sensory, motor, behavioral and other functions. There is a proven link between LCPUFA and cholesterol metabolism, which is expressed in its increased excretion from the body through transformation into readily soluble compounds [21].

Due to the presence in kumis of a significant amount of polyunsaturated fatty acids, in particular linoleic and α-linolenic acids, kumis has a certain immunomodulatory, hypocholesterolemic, anti-inflammatory effect. All this gives reason to use kumis in the prevention and complex therapy of a number of diseases associated with insufficient intake of essential polyunsaturated fatty acids into the body.

The therapeutic effect of kumis is also due to a number of other components, in particular, vitamins. Water and fat-soluble vitamins are found in kumis: A (retinol), B_1 (thiamine), B_2 (riboflavin), C (ascorbic acid), PP (nicotinic acid), B_3 (pantothenic acid), B_6 (pyridoxine), B_{nine} (folic acid), B_{12} (cyanocobalamin), H (biotin), E (tocopherols), D (calciferols). Kumis is especially rich in vitamin C, with which researchers associate the medicinal effect of the drink. So, 100 g of kumis contains vitamin C - 8.84 mg, A - 0.33 mg; PP - 0.07 mg; V_2 - 0.04 mg; V_1 - 0.002 mg, etc. It has been established that vitamin C, contained in large quantities in kumis, helps to improve metabolic processes, plays an important role in the pathogenesis and clinical picture of tuberculosis and a number of other diseases, and also increases the body's resistance to infectious diseases, accelerates wound healing [17]. Vitamins act on the body in a complex way and replenish each other. The combination of fat-soluble and water-soluble vitamins (vitamins A and C) regulates metabolic processes, the state of the nervous system and tissue trophism. Vitamin E in combination with vitamins A and C is an antioxidant defense factor. Vitamins C and PP provide normal permeability and stability of the vascular walls, increase blood coagulability, vitamin B12 with folic acid normalize and enhance hematopoiesis [16, 18, 19].

Kumis contains a number of minerals that play an important role in maintaining acid-base balance, osmotic pressure, blood coagulation system, regulation of numerous enzyme systems, etc. are crucial in creating and maintaining the constancy of the internal environment of the body [19].

Kumis (according to A. Kosobryukhov) contains the following minerals (as a percentage of ash): calcium oxide - 48, magnesium oxide - 3.40; phosphorus pentoxide - 21.3; chlorine - 7.5 [6].

The value of kumis is due to the content of macro and microelements in the composition. So, in 100 g of kumis, the content of the following elements was found, in mg: calcium - 92; potassium - 76; phosphorus - 59; sodium - 33; magnesium - 24; iron - 0.1 [17, 23]. In addition to the above elements, kumis contains such trace elements as: copper, cobalt, manganese, zinc, fluorine, bromine, iodine, arsenic, silicon, boron, vanadium, titanium, etc. These trace elements are contained in kumis in small amounts, but their role is also is great [23].

A large number of enzymes are found in kumis. The enzyme systems of koumiss by origin, on the one hand, are associated with the microorganisms of the starter culture, on the other hand, with the original mare's milk. Enzymes accelerate all life processes occurring in the body, namely: synthesis and decomposition of substances, energy and plastic metabolism in cells, tissues, in nerve conduction, in secretion, etc. [16]. Kumis contains proteolytic, lipolytic enzymes and glucosidases, which play an important role in the use of the drink in pediatrics, since they contribute to the replenishment of age-related deficiency of hydrolytic enzymes in the gastrointestinal tract in young children [1, 23].

In koumiss enzymes found fromclass oxidoreductase (lactate dehydrogenase, glutamate dehydrogenase, catalase, etc.), transferases (alanine amino and aspartate aminotransferases, etc.), hydrolases (lipase, α-amylase, acidic and alkaline proteinases, etc.), etc. the activity of enzymes that catalyze the breakdown of proteins (acidic proteinase) and the processes of transamination of amino acids (aminotransferase) is significantly increased. An increase in the activity of enzymes is associated with their enhanced formation during the reproduction of microorganisms in kumis. An increase in proteinase activity promotes the breakdown of milk proteins and peptides, and an aminotransferase activity promotes the formation of free amino acids [23].

As a result of research, the content of hormones in kumis was established, in particular, steroid (cortisol, estradiol, testosterone), thyroid (triiodothyronine, thyroxine) and protein (insulin, prolactin), which have a significant effect on the metabolism in cells and thus on the function all systems and organs [1, 17]. It was revealed that the level of some hormones in mare's milk is higher than in kumis. Thus, the level of triiodothyronine and thyroxine in mare's milk was 2.56 ± 0.21 and 103.17 ± 3.16 nmol / L, respectively, and in kumis their content decreased and amounted to 2.1 ± 0.2 and 84 , 67 ± 1.78 nmol / L. The level of hormones decreases, apparently, due to microbial-enzymatic degradation during the technological production of kumis [1].

During the maturation of kumis, a decrease in the concentration of estradiol (sex hormone) was also observed. The concentration of estradiol in mare's milk and kumis was 28.39 ± 3.19 and 25.01 ± 1.99 pG / ml, respectively. As for testosterone, its concentration, both in the initial product and in the final product, practically did not differ and amounted to 3.32 ± 0.37 and 3.31 ± 0.32 nmol / L, respectively [1]. An increase in the concentration of the hormone in kumis was observed on the example of cortisol and prolactin. The concentration of cortisol in mare's milk was 41.15 ± 3.59 nmol / l, and in kumis - 62.25 ± 7.83 nmol / l. The prolactin content in mare's milk and kumis was 41.79 ± 1.95 and 56.27 ± 3.46 mlu / ml, respectively. As for immunoreactive insulin, its concentration in mare's milk and kumis differed insignificantly and amounted to 94.54 ± 6.72 and 96.6 ± 7.18 mcU / ml, respectively [1].

Most valuable antibacterial the mechanism of action of koumiss is an his antibiotic activity, depending on the mare's milk, as well as the composition and quality of the starter cultures.

There are numerous reports in the literature on the antibiotic activity of the microflora of kumis and kumis itself against the causative agents of a number of diseases. So, yeast is kindTorula and Candida,isolated from kumis, have antibiotic properties to some strains of staphylococci, streptococci, colibacillus and hay bacillus, Bact. prodigiosus, Bact. aerogenes, mycobacteria tuberculosis [1, 17].

Antibiotic substances are antagonists of pathogenic and putrefactive microorganisms found in the human intestine. Strains of kumis yeast resistant to the action of antibacterial drugs have been isolated, which allows us to conclude that it is advisable to use kumis as one of the important factors in complex therapy that enhances the effect of chemotherapy and other methods in the treatment of various forms of tuberculosis, therapy of patients with nonspecific lung diseases, cardiovascular diseases, anemias, metabolic disorders, etc. [7].

Carbonic acid contained in kumis stimulates respiration and blood pressure. Having an anesthetic effect, carbon dioxide reduces the increased irritability of the gastric mucosa, enhances the secretion of gastric juice, accelerates the movement of the stomach and peristalsis of the small intestine, and also increases the excretion of urine [23].

The lactic acid present in kumis contributes to the better assimilation of the constituent parts of food products (proteins, fats, carbohydrates). It increases the acidity of gastric juice and, in small doses, promotes gastric digestion. At the same time, lactic acid delays the development of harmful putrefactive bacteria in the intestines, which cause chronic self-poisoning of the body. Strengthening intestinal motility, lactic acid promotes faster passage of food and, consequently, a decrease in the amount of toxic substances formed in the intestine and absorbed by it, which is observed when food stagnates in it [6].

Ethyl alcohol contained in kumis stimulates appetite, enhances the absorption and motor capacity of the stomach, the separation of gastric juice, and also improves

feeling, being a food substance, easily burns in the human digestive tract, reduces the breakdown of proteins, fats and carbohydrates in the body [23]. Scientifically grounded facts have confirmed that kumis, which contains a complex of many physiologically active substances, is an effective remedy in the treatment of various diseases. The preventive and therapeutic effect of kumis is expressed in the normalization of the most important metabolic processes, the activation of physiological and biochemical processes. The use of kumis increases nonspecific immunity, restores a depleted body, and increases vitality. Under the influence of kumis, the body is reorganized, physiological and biochemical processes are activated, and metabolism is normalized.

Kumis therapy enhances redox processes, stimulates the activity of the cardiovascular system and the respiratory center, regulates the secretory and motor activity of the gastrointestinal tract. The normalizing effect of kumis on the autonomic nervous system, endocrine glands and other body functions made it possible to classify kumis as a biostimulant [7, 23].

In connection with the problem of drug resistance of pathogenic microorganisms and side effects of various severity from the use of antibiotics, it became necessary to use kumis as a harmless non-drug agent. And in this regard, koumiss acquires special significance, because has the ability to directly influence the pathological process and general regulatory functions in the whole organism.

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