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THE ROLE OF ROYAL JELLY TO HUMAN HEALTH

Public Health

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ABSTRACT

Royal jelly is a bee product, unique in its composition and biological activity. Its proven biochemical properties attract the attention of researchers in recent years. Bee products including royal jelly are valuable components of the modern pharmaceutical industry. Either used as food or food supplements, they promote health and longevity, increasing the chances for adaptation.

The purpose of this review is to focus on the biological activity of royal jelly and its role in human health.

The review is made referring to publications found in Science Direct and Bio Med Central.

KEYWORDS

Royal Jelly; Biological Activity; Human Health

Royal jelly (RJ) is a thick milk substance that is secreted primarily from the hypopharyngeal and mandibular glands of worker honeybees (Apis Mellifera) between the sixth and twelfth day of their lives (12). It is used as a staple food for the development of the queen honeybee. The unique combination of proteins (10-18%), sugars (9-15%), lipids (1.5-7%), amino acids, vitamins - B1, B2, B3, B6, PP, H, C, A, D, E ; minerals (0.7-1.5%), acetylcholine, choline, enzymes(1), separates royal jelly as a functional food. Proteins are represented by albumins and globulins in the ratio 1:1. The main part of the carbohydrates in the composition of RJ are the monosaccharides glucose and fructose, in smaller quantities - sucrose, maltose, isomaltose, gentiobiose, turanose, trehalose. Fatty acids representatives are phenols, sterols, glycerides, waxes, neutral fats, phospholipids (sphingomyelin, lecithin, kefalin) and organic acids. The bee product is a valuable source of iron, sulfur, magnesium, manganese, potassium, calcium, chromium, silicon, nickel, cobalt, zinc, aluminum, silver, mercury, bismuth, phosphorus, arsenic, copper and gold (13). Enzymes within royal jelly's composition are cholinesterase, amylase ascorbic oxidase, catalase, acid phosphatase, proteolytic enzymes. As a source of essential amino acids, vitamins and minerals, RJ has a stimulating effect on the metabolism of proteins, fats and carbohydrates. The complex combination of macro- and micronutrients determines the biological effects of royal jelly. Known are its anti-inflammatory (5), antibacterial (16), antioxidant (9), antitumor (15), anti-allergic (10) and antihypertensive properties (14) which determine his growing pharmaceutical benefits and increased interest in their study.

The anti-inflammatory activity is due to inhibition of cytokine production by activated macrophages, and the antibacterial effect - the containing in royal jelly protein Royalisin. Clinical studies of "Fujiwara and associates" have shown that it is very efficient towards Gram positive bacteria, but not towards Gram negative ones. Extremely sensitive to Royalisin are Lactobacillus, Bifidobacterium, Corynebacterium, Leuconostoc, Streptococcus, Staphylococcus. Minimum inhibitory concentration has an effect comparable to that of the effective concentrations of various antibiotics. (2). This bee product stimulates cell proliferation, accelerates the migration of human fibrocytes (4), increases the level of sphingolipids and stimulates production of collagen and slows down the aging process (11). Thanks to these properties, royal jelly can be used to treat wounds and radiodermatitis.

Clinical studies have shown that RJ can favorably influence atherosclerotic processes in humans. (3). In his own study Guo and his colleagues establish a significant decrease in serum levels of total cholesterol and serum lipids in atherosclerosis patients with moderately high cholesterol. With regard to the effects on lipoproteins it has been reported a significant decrease of VLDL, precursors of LDL, and non- significant difference in the levels of HDL and serum triglycerides (3). Morita and colleagues in the Department of General Internal Medicine, Gifu University Graduate School of Medicine in Japan have studied the effects of RJ on sixty-one healthy volunteers aged 42-83 years, randomly divided into two groups: receiving RJ (n = 31) and control group (n = 30). The first group took 100 ml of a solution containing 3000 mg of RJ per a day for six months, and the control group received the same amount of liquid without any RJ in it as a placebo for the same period. Both types of liquids contained one and the same amount of fructose, citrate, vitamin B2 and some spices (8). There was a significant stimulation of erythropoiesis (the values of erythrocytes and the hemoglobin increased), improved glucose tolerance (lower plasma glucose levels on an empty stomach), an improvement of mental health (improves the functions of neurons and glia proliferation). Clinical studies of the biological activity of RJ by Morita and colleagues have shown that the product can affect hormonal balance - leads to accelerated conversion of Dehydroepiandrosterone sulfate to testosterone through the activation of 3β-HSD2 (3β-hydroxysteroid dehydrogenase type 2) and / or 17β-HSD3 (17β-hydroxysteroid dehydrogenase type 3) localized in adrenal and testicles. Estrogenic substances constituting the bee product, relieve symptoms of menopause and increased fertility in mice (7). It is known that the queen bee which eats exclusively RJ, has a longer life and better developed gonads than short-lived and infertile worker bees. Royal jelly has a positive impact on the hypothalamic-pituitary and can compensate for age-related decline of the pituitary function in rats (18).

RJ suppresses the proliferating effect of BPA (Bisphenol A) on MCF-7 cells of breast cancer in humans (6). Bisphenol A is a substance with estrogenic activity, widespread in the environment. It is used in the production of polycarbonate plastics and synthetic resins applied in beverage cans and wrapping paper for food and in dental sealants. Bisphenol A is a potential risk factor for women's health even at low doses (17).

To maintain its biological activity, royal jelly should be stored frozen (maybe refrigerated) for three weeks, mixed with honey. It keeps its valuable properties also having been freeze-dried at room temperature.

Conclusions:

1. Royal jelly is a highly potent biological product, source of useful for the human body substances.
2. Royal Jelly may be used for prevention and treatment of social - significant diseases.
3. Royal Jelly can be used in the cosmetic industry.
4. Royal jelly is a perishable product and therefore standardizing of methods for its storage and supply is highly recommended.
5. Royal jelly is a promising product for the modern pharmaceutical industry.

In conclusion, due to the high content of bioactive substances - macro and trace minerals, enzymes, vitamins, organic acids, royal jelly has a positive effect on human health. Therefore it is necessary to promote its health benefits among the population.

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