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Investigation of the biologically active substances from deer products

Abstract

The Sika Deer is a valuable and traditional animal that has been used for its medicinal properties for over 2,000 years in China, making its first appearance in the Shennong's Classic of the Materia Medica during the Han Dynasty. Modern research has shown that the main by-products of Sika Deer are rich in a variety of active ingredients, including free amino acids, peptides, chondroitin sulphate, prostaglandins, phospholipids, hormones, biogenic amines, inorganic elements, etc. The effects of Sika Deer are extremely wide-ranging. Its efficacy is also extremely wide, such as the prevention and treatment of cardiovascular disease, physical fitness, delay aging, enhance immunity.

From human consumption of venison and blood treatment of disease, has been a history of thousands of years, deer products have been basically formed. Deer products have basically formed a system and scale that can be used for food or medicine. Deer products refer to the products and products of various deer species of the deer family, with antlers, blood, whips, tires, bones and meat as raw materials are widely used in food, medicine, health food and other industries. In recent years, there have been many researches on the chemical composition analysis, pharmacological effects and clinical effects of the main by-products of deer, and the main by-products of deer have shown good medicinal value and have a broad market prospect. The biological effects of antler, fetus, heart, blood and whip were reviewed to summarize their biological effects and to improve the social, economic and biological values of Sika deer. And biological value of the plum blossom deer, so as to provide theoretical references for subsequent research.

Keywords: Antler deer, nutrients, chinese medicine, growth and metabolism

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Introduction

Deer antler

As one of the raw materials for medicines of animal origin, deer antler has a variety of functions such as relieving fatigue, tissue repair, and promoting health. Deer antler is derived from sika deer and horse deer, and was recorded 2,000 years ago in China's medical classic Shennong Ben Cao Jing (Classic of the Materia Medica of the Divine Husbandman) as having the ability to nourish the yin and yang, strengthen the spleen, reinforce the bones and muscles, and promote the flow of blood. Deer antlers are used in traditional Chinese medicine and have been shown to have significant therapeutic effects on breast hyperplasia, mastitis, uterine fibroids, malignant ulcers, mumps in children and other diseases. With the development of modern analytical techniques and the research of related scholars, it has been found that deer antlers are rich in a variety of biologically active components, mainly including amino acids, inorganic elements, proteins, lipids, polysaccharides, peptides and growth factors. In recent decades, a large number of scientists and scholars have analyzed and explored the chemical composition, bioactive substances and pharmacological efficacy of antler velvet, proving that antler velvet is a kind of important health care tonic with high nutritional and medicinal value.

A large number of experiments have shown that antler and its extracts have a variety of pharmacological effects, including regulating autoimmunity, promoting blood flow, improving bone metabolism and glucose metabolism, anti-cancer, relieving fatigue, treating inflammation, antiviral bacteria and anti-oxidation.[1] The following statement summarizes the current state of biological efficacy assessment in modern times.

It was found that antler polysaccharides had a certain protective effect on oxidative stress damage in aging mice. The activity of SOD (Superoxide dismutase), CAT (catalase) and GSH-Px(glutathione peroxidase) increased significantly in D-galactose induced mouse aging model, suggesting that the antioxidant capacity of the body was enhanced. The decrease of MDA(Malonaldehyde) suggests that the accumulation of free radicals and the damage of lipid peroxidation in the body are improved, which proves that the mechanism may be related to the removal of free radicals in the body. Limmatvapirat C et al.[2] compared the antioxidant capacity of three different kinds of antler extracts by FRAP and DPPH experiments. The results showed that antler alcohol extract showed the strongest antioxidant activity in DPPH analysis, and the effect of inhibiting DPPH radical formation and reducing Fe3+ ions was more significant than that of antler water extract and antler alkane extract. Therefore, antler extract can act as a natural antioxidant. The above experimental studies show that antler has significant antioxidant activity, which can not only delay aging but also reduce oxidative stress damage in the body, and its extract can be used as a natural source of antioxidant and anti-aging drugs.

Anti-cardiovascular effects

Antler alcohol extract can significantly improve the left ventricular morphology and cardiac function of rats, reduce myocardial cell apoptosis and myocardial collagen type III precipitation, and reduce the expression of AQP2mRNA in renal medulla by inhibiting left ventricular remodeling. Its mechanism may be related to the production of essence and nourishing marrow, invigorating kidney and strengthening Yang, diuresis and removing dampness. It indicates that antler has certain clinical application value in the treatment of chronic heart failure. Based on the theory of traditional Chinese medicine, the effects of antler powder on heart function and brain natriuretic peptide

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content in rats with heart failure were studied. The results showed that antler could significantly improve the content of LVFS/LVEF, and reduce the content of BNP and MDA, so as to protect myocardial function. Studies have shown that antler can increase the content of VEGF after myocardial ischemia in rats, promote angiogenesis, and repair the damage. These effects are related to the activation of Notch signaling pathway.[3] The above experiments can confirm that antler has a certain effect on the treatment of heart failure function, and can also improve the ventricular morphology and heart function.

Anti-cancer, liver protection

Studies have shown that T-RVA (antler tip) can significantly inhibit the expression of prostate-specific antigen (PSA) and transfer-related genes in human prostate cancer LNCaP.[4] It was proved that the water-soluble polypeptide of antler can inhibit the growth of 4T1 breast tumor through immune regulation. Chunhua M et al. found that antler peptide can significantly inhibit the overproduction of inflammatory cytokines in serum and liver induced by CCl4, and TNF-α, IL-1β and IL-6 are the main factors. Antler peptide inhibits the activation of TLR/NF-κB pathway through its negative effects on TLR2, TLR4MyD88, p-NF-κBp65, and P-I-κBα (p-I-κB).

Biological efficacy of deer fetus

Deer fetus is rich in protein, amino acid, nucleic acid, prolactin, gonadotropin, polysaccharide, lysozyme, urokinase, various minerals and vitamins, and has a variety of functions to promote growth, improve immunity, regulate physiological functions and promote lactation, tonifying deficiency, beauty and beautifying.

It has been confirmed that deer fetal powder has certain positive effects on thymus index, SOD, CAT and glutathione peroxidase activities in liver of mice, and can reduce the content of malondialdehyde. Zhu Senhua et al.[5] used deer embryo ointment to treat 62 cases of infertility patients with thin endometrial membrane and observed the efficacy and serum E2 and P values. It has been confirmed that deer embryo ointment has obvious therapeutic effect on infertility patients with thin endometrium, has positive influence on follicle development, can also help endometrium growth, and has low influence on E2, P value changes and adverse reactions. The experimental results showed that the deer fetal extract had a significant regulatory effect on uterine contraction in isolated rats, and had negative effects on uterine contraction frequency, contraction amplitude and motor capacity within a certain dose range. In addition, deer fetal ointment can significantly increase the thickness of uterine wall during ovulation, and can restore plasma E2 and P values to normal levels. Therefore, deer embryo and its extract can significantly improve the endometrial thickness of infertility patients, increase the level of luteal phase hormones, increase the probability of pregnancy, and can be used as a safe drug for the treatment of gynecological diseases.

Biological efficacy of deer heart

Deer heart refers to the dried blood heart of sika deer and red deer, containing a variety of chemical components and bioactive substances, such as amino acids, fatty acids, phosphoric acid, vitamins, trace elements, peptides, etc. These biological substances can promote the body's metabolism, improve the cardiovascular and cerebrovascular and nervous system.

Experimental studies have shown that small molecule active peptides of deer heart can significantly reduce the release of myocardial enzymes after heart injury, such as CK, AST, Ldh-l; Moreover, it can reduce the content of MDA, the metabolite of lipid peroxide, increase the activity of SOD, reduce the expression of inflammatory factors TNF-α, IL-6 and IL-1β, and has certain protective effect on cultured cardiomyocytes in vitro.[6] Deer heart bushing tablets has positive effect on the heart function of rats and has obvious improvement effect. Under atmospheric anoxia, hypobaric anoxia and drug stimulation, the anti-anoxia ability of rats can be enhanced. The results indicated that deer heart bushing tablets had significant cardiac protective effect. At present, there are few reports about deer heart and its extracts, only a few studies can prove that deer heart and its small molecule active substances can prevent cardiovascular diseases, protect heart damage and heart function, and other pharmacological effects need further research and discussion by researchers.

Biological efficacy of deer blood

Deer blood, refers to the deer family Sika deer or red deer blood, is a precious Chinese medicine. Proteins and peptides are considered to be the most important biological active components in deer blood, which have many physiological functions such as anti-aging, anti-fatigue, enhancing immunity, replenishing blood, calming nerves and so on.

Experiments have shown that deer blood crystalline can enhance the absorption of E. coli by macrophages, improve the phagocytic function of white blood cells, enhance the body's resistance, and affect the NF-κB signaling pathway without affecting the activity of cells. In addition, by inhibiting the expression and release of inflammatory factors iNOS, IL-1β, IL-6, etc., immunity to bacteria is realized. Deer blood can significantly promote the function of peritoneal macrophages in immunocompromised mice, stimulate the formation and maturation of T4, and improve the ratio of T4/T8, indicating that the interaction of T lymphoid subsets can maintain the body's immune function and enhance the body's immunity. Studies have shown that deer blood can improve the phagocytic function of macrophages and promote the activities of NK, IL-2 and B cells. The results showed that deer blood wine oral liquid had obvious improvement on spleen hemolysis in rats. Through the above experiments, it can be seen that deer blood is an active substance with good immune regulation, which can inhibit inflammation, enhance immunity and significantly improve the hemolysis of organs. It has broad development prospects and is of great significance for the research and development of follow-up health products.[7]

Biological efficacy of deer whip

There are nine chemical components of deer whip: fatty acids, inorganic salts, amino acids, peptides and proteins, phospholipids, bioamines, sugars, vitamins and hormones. It is a precious traditional Chinese medicine. It has the effect of tonifying kidney Yang, qi and blood. Can treat strain, waist and knee pain, kidney deficiency, tinnitus, impotence, uterine cold infertility and other diseases.

The results showed that antler and deer whip did not significantly improve the quality of epididymis and testis but could increase the coefficient of epididymis and testis. Although deer whip powder has no significant effect on luteinizing hormone (LH) level in kidney-yang deficiency infertile rats, it can increase testosterone (T) level and reduce follicle-stimulating hormone (FSH) level, thus regulating reproductive function of infertile rats, accelerating and improving sperm swimming and sperm quantity, and then improving semen quality. Fang Zhiwei et al.,[8] established an animal model using Wistar rats and Kunming mice to observe the effect of deer whip tonic wine on invigorating kidney and strengthening Yang. The results showed that deer flagellate tonic wine could increase the free activity frequency of rats, promote the exercise ability of rats obviously,

prolong and improve the low temperature swimming time and weight gain of Yang deficiency mice, and resist the decrease of temperature. It can significantly improve the incubation period of penis erection in ovariectomized rats, and significantly improve the mating ability of male rats, which proves that deer flagellum tonic wine has the function of tonifying kidney and strengthening Yang.

Outlook

In recent years, the relevant experts at home and abroad have conducted in-depth research on the active components and pharmacological activities of antler, making it become an animal-derived medicinal material, and its production, processing technology and bioavailability of various chemical components have been greatly improved. However, it seems that there are few reports on deer hearts, and scientists need to further develop and utilize deer hearts. Although other deer products have made great achievements in chemical composition, pharmacology, clinical application and other aspects, there is still a large space for development in the fields of medicine, new drug research and development, food health care, clinical application and so on.

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Conflicts of interest

Authors declare that there is no conflict of interest.

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