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1-12 IMMUNOMODULATORY EFFECTS of FUNGAL PROTEINS
Xue-fei Wang, Kai-qi Su, Ting-wen Bao, Wei-ran Cong, Yun-fei Chen, Qi-zhang Li and Xuan-wei Zhou

ABSTRACT: *For centuries, mushrooms have been found to be a rich source of bioactive compounds for treatment of various diseases. Ganoderma spp. has long been used in traditional Chinese medicines or functional foods in Japan and other Asian countries. Crude extracts and isolated substances such as polysaccharides, polysaccharo-peptides, polysaccharide-proteins and proteins display both in vivo and in vitro immunomodulatory activities. Therefore, mushrooms have attracted attention in research and pharmaceutical fields. In this review, an attempt has been made to summarize the information on the fungal immunomodulatory proteins including the protein coding genes and protein structures, with an emphasis put on their immunomodulation functions and future perspectives.*

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13-30 EFFECTS OF GLUCOMANNAN ISOLATED FROM *CANDIDA UTILIS* ON
ADJUVANT ARTHRITIS IN LEWIS RATS
K. Bauerová, D. Mihalová, K. Drábiková, V. Jancinová, J. Kucharská, E. Paulovicová, R. Nosál' and S. Poništ

ABSTRACT: *In first part of this paper an overview is given about glucomannans sources, characterisation and use for healing of human diseases. In the second part an experimental study is presented. The study is focused on assessing the contribution of the in vivo antioxidant properties of Candida utilis cell-wall glucomannan (GM) on its anti-arthritic effect. For this purpose not only biochemical methods were used but also chemiluminescence measurements were performed in whole blood and in selected tissues, as spleen and hind paw taken from arthritic rats treated with GM in two doses (7.5 mg/kg and of 15 mg/kg body weight) daily per os during 28 experimental days. Additionally, the functionality of neutrophils was evaluated by flow cytometry. The anti-arthritic effect of GM in adjuvant arthritis was evidenced using evaluation with clinical parameters – hind paw volume and body weight of experimental Lewis rats. GM in vivo antioxidant activity has a large impact on this effect, both in the whole system and locally. The local effect of GM was primarily exerted in the hind paw tissue and mitochondria of skeletal muscles. As to the intensity of GM effects observed for the tested doses of 7.5 and 15 mg/kg b.w., no significant difference was manifest; however the lower dose was more effective concerning the number of parameters affected. The results suggest that Candida utilis cell-wall GM is a potential immunomodulative agent in treating exaggerated neutrophilic inflammation accompanying arthritis and thus GM seems to be beneficial for rheumatoid arthritis therapy.*

31-42 MUSHROOM AND IMMUNITY

Cuixia Guo, Man-Wing Choi and Peter C-K Cheung

ABSTRACT: *Mushroom is a health food that is low in fat and calories, but high in proteins, dietary fiber (non-starch polysaccharides), vitamins and minerals. Mushroom has a long history of use in medicine in China, Japan, and Korea. Many mushrooms such as Lentinus edodes (Shiitake), Schizophyllum commune, Grifola frondosa, and Ganoderma lucidum (Lingzhi), etc. are considered as important natural resources of immunomodulatory and anticancer agents. The ability of mushrooms to modulate immune functions and inhibit tumor growth mainly contributes to their extracts or bioactive compounds, including polysaccharides, glycopeptide/protein complexes (polysaccharide-peptide/protein complexes), proteoglycans, proteins and triterpenoids. Mushroom polysaccharides in particular (1→3)-β-D-glucans and their peptide/protein derivatives are mostly extensively studied for their immunomodulatory and antitumor activities. Immune responses in the innate and adaptive immunity mediated by mushrooms and their bioactive compounds are related to their effects on immune effector cells. They include hematopoietic stem cells, lymphocytes, macrophages, dendritic cells (DCs), natural killer (NK) cells, and T cells. The underlying mechanism mainly involves the interaction of membrane receptors in the immune cells with the mushroom polysaccharides especially β-D-glucans that triggers a cascade of signaling pathways and cytokine release to activate the human immune cells.*

43-52 MUSHROOMS AND CARDIOVASCULAR DISEASE

Eunmi Choi, Onju Ham, Se-Yeon Lee, Byeong-Wook Song, Min-Ji Cha, Chang Hee Park, Jiyun Lee, Heesang Song and Ki-Chul Hwang Youn Lee, Jun-Hee Park

ABSTRACT: *Many edible mushrooms have been used by ancient cultures to increase human longevity, as well as for good foods, while being devoid of undesirable side effects. Presently, mushrooms are appreciated and consumed primarily for their nutritional properties; however they are also increasingly used in medicine. Therefore, the food industry is especially interested in cultivated and wild mushrooms. The nutritional value of mushrooms is attributed to high levels of protein, fiber, carbohydrates, vitamins, and minerals and low fat levels. As cardiovascular disease is a major cause of morbidity and mortality in our society, mushrooms are currently investigated for their therapeutic properties. In in vitro and in vivo investigations, mushrooms were shown to reduce risk factors of cardiovascular disease such as high total cholesterol and low-density lipoprotein (LDL) cholesterol, low high-density lipoprotein (HDL) cholesterol, high blood pressure, atherosclerosis, and oxidative and inflammatory damage. In this review, we summarize the current understanding of mushroom effects on cardiovascular disease, and discuss the therapeutic applications of mushrooms for heart disease.*

53-60 MEDICINAL PROPERTIES OF ANTRODIA CAMPHORATA - A REVIEW

Robert M. Levin, Yung-Shun Juan, Catherine Schuler, Robert E. Leggett and Alpha D. Lin

ABSTRACT: *Antrodia camphorata (AC) is a unique mushroom of Taiwan that has been used for centuries as a traditional medical treatment for a variety of ailments from alcoholic dysfunction, hepatitis, and liver cirrhosis. Recently, a variety of compounds have been isolated from AC which appears to have many medicinal properties. Recent studies have shown extracts and other preparations from AC have anti-cancer, hepatoprotective and anti-inflammatory properties, anti-*

hepatitis B virus actions, and vaso-relaxant, antioxidant and antihypertensive activities. This review presents the scientific basis for the above medicinal claims for AC.

Current Topics in Nutraceutical Research 10 (1): 61-74

61-74 ANTRODIA CINNAMOMEA (A. CAMPHORATA, NEU CHANG CHIH): AN EXCEPTIONAL POLYPORE MUSHROOM WITH POTENTIAL ANTITUMOR AND IMMUNO-MODULATORY EFFECTS

Chia-Hsin Huang, Yun-Ju, Chen and Chi-Chen Lin

ABSTRACT: *About 80% of the world population currently relies on indigenous or traditional medicines to treat many types of ailments. Antrodia cinnamomea (niu-chang-chih, previously named A. camphorata; hereafter referred to as AC) is a well-known traditional Chinese medicinal mushroom that is found only in the endemic, aromatic tree Cinnamomum kanehirai Hayata (Lauraceae) in Taiwan. The aromatic fruiting body of AC looks like a brownish-red leaf attached to the C. kanehirai tree of sessile. A great deal of work has been carried out on the therapeutic potential of AC. Over 225 compounds extracted from AC have been described, including macromolecules (nucleic acids, proteins, and polysaccharides), small molecules (benzenoids, lignans, benzoquinones and maleic/succinic acid derivatives), terpenoids (lanostane triterpenes, ergostane triterpenes, diterpenes, monoterpenes and steroids), nucleotides (nucleobase and nucleoside), fatty acids and fatty acid esters. Many of them exhibit pharmacological activity, with anticancer, antihyperlipidemic, antihypertensive, anti-inflammatory, cardiovascular, hepatoprotective, vasodilatory, neuroprotective, immunological, antimicrobial and anti-oxidative properties. They can also attenuate the progression of nephritis and the activation of the aryl hydrocarbon receptor by cigarette smoke. Because AC has attracted a lot of attention for its antitumour and immunological properties, this review will focus on these in particular, and we will also discuss their underlying mechanisms of action.*

Current Topics in Nutraceutical Research 10 (1): 75-82

75-82 MUSHROOMS: AN UNTAPPED RESERVOIR FOR NUTRACEUTICAL ANTIBACTERIAL APPLICATIONS AND ANTIBACTERIAL COMPOUNDS
William R. Schwan

ABSTRACT: Mushrooms are found on every continent on planet Earth. Most of the million plus species have yet to be identified. These diverse populations of fungi synthesize secondary metabolites to thwart invaders, such as nematodes, other fungi, and even bacterial species. Presently, antibiotic resistance among bacteria continues to grow. Some bacterial strains are resistant to all of the drugs commercially available, rendering treatment options as being futile. New nutraceuticals with antibacterial activities and antibacterial drugs are sorely needed to combat infections caused by multidrug-resistant strains of bacteria, like Burkholderia cepacia and Acinetobacter baumannii. Mushrooms could be used in a nutraceutical capacity to treat patients with bacterial infections and could also help to bolster the drug pipeline. This review will examine how mushrooms may be used in a nutraceutical capacity for the treatment of bacterial infection and provide examples of a representative selection of mushroom fruiting bodies that are being mined for small molecules, carbohydrates, and proteins that have antibacterial activities.