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Studies Of 3 Mushrooms Within:

Lion's Mane: Hericium erinaceus

Chaga: Inonotus obliquus

Cordyceps: Cordyceps militaris

Lion's Mane

Improving effects of the mushroom Yamabushitake (Hericium erinaceus) on mild cognitive impairment: a double-blind placebo-controlled clinical trial

Koichiro Mori 1, Satoshi Inatomi, Kenzi Ouchi, Yoshihito Azumi, Takashi Tuchida

- PMID: 18844328
- DOI: 10.1002/ptr.2634

Abstract

A double-blind, parallel-group, placebo-controlled trial was performed on 50- to 80-year-old Japanese men and women diagnosed with mild cognitive impairment in order to examine the efficacy of oral administration of Yamabushitake (Hericium erinaceus), an edible mushroom, for improving cognitive impairment, using a cognitive function scale based on the Revised Hasegawa Dementia Scale (HDS-R). After 2 weeks of preliminary examination, 30 subjects were randomized into two 15-person groups, one of which was given Yamabushitake and the other given a placebo. The subjects of the Yamabushitake group took four 250 mg tablets containing 96% of Yamabushitake dry powder three times a day for 16 weeks. After termination of the intake, the subjects were observed for the next 4 weeks. At weeks 8, 12 and 16 of the trial, the Yamabushitake group showed significantly increased scores on the cognitive function scale compared with the placebo group. The Yamabushitake group's scores increased with the duration of intake, but at week 4 after the termination of the 16 weeks intake, the scores decreased significantly. Laboratory tests showed no adverse effect of Yamabushitake. The results obtained in this study suggest that Yamabushitake is effective in improving mild cognitive impairment.

Lion's Mane

Neuroprotective Metabolites of Hericium erinaceus Promote Neuro-Healthy Aging

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- PMID: 34203691
- PMCID: PMC8232141
- DOI: 10.3390/ijms22126379

Abstract

Frailty is a geriatric syndrome associated with both locomotor and cognitive decline, typically linked to chronic systemic inflammation, i.e., inflammaging. In the current study, we investigated the effect of a two-month oral supplementation with standardized extracts of H. erinaceus, containing a known amount of Erinacine A, Hericenone C, Hericenone D, and L-ergothioneine, on locomotor frailty and cerebellum of aged mice. Locomotor performances were monitored comparing healthy aging and frail mice. Cerebellar volume and cytoarchitecture, together with inflammatory and oxidative stress pathways, were assessed focusing on senescent frail animals. H. erinaceus partially recovered the aged-related decline of locomotor performances. Histopathological analyses paralleled by immunocytochemical evaluation of specific molecules strengthened the neuroprotective role of H. erinaceus able to ameliorate cerebellar alterations, i.e., milder volume reduction, slighter molecular layer thickness decrease and minor percentage of shrunken Purkinje neurons, also diminishing inflammation and oxidative stress in frail mice while increasing a key longevity regulator and a neuroprotective molecule. Thus, our present findings demonstrated the efficacy of a non-pharmacological approach, based on the dietary supplementation using H. erinaceus extract, which represent a promising adjuvant therapy to be associated with conventional geriatric treatments.

Lion's Mane

Neurotrophic properties of the Lion's mane medicinal mushroom, Hericium erinaceus (Higher Basidiomycetes) from Malaysia

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- PMID: 24266378
- DOI: 10.1615/intjmedmushr.v15.i6.30

Abstract

Neurotrophic factors are important in promoting the growth and differentiation of neurons. Nerve growth factor (NGF) is essential for the maintenance of the basal forebrain cholinergic system. Hericenones and erinacines isolated from the medicinal mushroom Hericium erinaceus can induce NGF synthesis in nerve cells. In this study, we evaluated the synergistic interaction between H. erinaceus aqueous extract and exogenous NGF on the neurite outgrowth stimulation of neuroblastoma-glioma cell NG108-15. The neuroprotective effect of the mushroom extract toward oxidative stress was also studied. Aqueous extract of H. erinaceus was shown to be non-cytotoxic to human lung fibroblast MRC-5 and NG108-15 cells. The combination of 10 ng/mL NGF with 1 µg/mL mushroom extract yielded the highest percentage increase of 60.6% neurite outgrowth. The extract contained neuroactive compounds that induced the secretion of extracellular NGF in NG108-15 cells, thereby promoting neurite outgrowth activity. However, the H. erinaceus extract failed to protect NG108-15 cells subjected to oxidative stress when applied in pre-treatment and co-treatment modes. In conclusion, the aqueous extract of H. erinaceus contained neuroactive compounds which induced NGF-synthesis and promoted neurite outgrowth in NG108-15 cells. The extract also enhanced the neurite outgrowth stimulation activity of NGF when applied in combination. The aqueous preparation of H. erinaceus had neurotrophic but not neuroprotective activities.

Lion's Mane

Hericium erinaceus: an edible mushroom with medicinal values

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- PMID: 23735479
- DOI: 10.1515/jcim-2013-0001

Abstract

Mushrooms are considered as nutritionally functional foods and source of physiologically beneficial medicines. Hericium erinaceus, also known as Lion's Mane Mushroom or Hedgehog Mushroom, is an edible fungus, which has a long history of usage in traditional Chinese medicine. This mushroom is rich in some physiologically important components, especially β-glucan polysaccharides, which are responsible for anti-cancer, immuno-modulating, hypolipidemic, antioxidant and neuro-protective activities of this mushroom. H. erinaceus has also been reported to have anti-microbial, anti-hypertensive, anti-diabetic, wound healing properties among other therapeutic potentials. This review article has overviewed the recent advances in the research and study on H. erinaceus and discussed the potential health beneficial activities of this mushroom, with the recognition of bioactive compounds responsible for these medicinal properties.

Lion's Mane

Therapeutic Potential of Hericium erinaceus for Depressive Disorder

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- PMID: 31881712
- PMCID: PMC6982118
- DOI: 10.3390/ijms21010163

Abstract

Depression is a common and severe neuropsychiatric disorder that is one of the leading causes of global disease burden. Although various anti-depressants are currently available, their efficacies are barely adequate and many have side effects. Hericium erinaceus, also known as Lion's mane mushroom, has been shown to have various health benefits, including antioxidative, antidiabetic, anticancer, anti-inflammatory, antimicrobial, antihyperglycemic, and hypolipidemic effects. It has been used to treat cognitive impairment, Parkinson's disease, and Alzheimer's disease. Bioactive compounds extracted from the mycelia and fruiting bodies of H. erinaceus have been found to promote the expression of neurotrophic factors that are associated with cell proliferation such as nerve growth factors. Although antidepressant effects of H. erinaceus have not been validated and compared to the conventional antidepressants, based on the neurotrophic and neurogenic pathophysiology of depression, H. erinaceus may be a potential alternative medicine for the treatment of depression. This article critically reviews the current literature on the potential benefits of H. erinaceus as a treatment for depressive disorder as well as its mechanisms underlying the antidepressant-like activities.

Lion's Mane

Hericium erinaceus and Coriolus versicolor Modulate Molecular and Biochemical Changes after Traumatic Brain Injury

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- PMID: 34199629
- PMCID: PMC8228340
- DOI: 10.3390/antiox10060898

Abstract

Traumatic brain injury (TBI) is a major health and socioeconomic problem affecting the world. This condition results from the application of external physical force to the brain which leads to transient or permanent structural and functional impairments. TBI has been shown to be a risk factor for neurodegeneration which can lead to Parkinson's disease (PD) for example. In this study, we wanted to explore the development of PD-related pathology in the context of an experimental model of TBI and the potential ability of Coriolus versicolor and Hericium erinaceus to prevent neurodegenerative processes. Traumatic brain injury was induced in mice by controlled cortical impact. Behavioral tests were performed at various times: the animals were sacrificed 30 days after the impact and the brain was processed for Western blot and immunohistochemical analyzes. After the head injury, a significant decrease in the expression of tyrosine hydroxylase and the dopamine transporter in the substantia nigra was observed, as well as significant behavioral alterations that were instead restored following daily oral treatment with Hericium erinaceus and Coriolus versicolor. Furthermore, a strong increase in neuroinflammation and oxidative stress emerged in the vehicle groups. Treatment with Hericium erinaceus and Coriolus versicolor was able to prevent both the neuroinflammatory and oxidative processes typical of PD. This study suggests that PD-related molecular events may be triggered on TBI and that nutritional fungi such as Hericium erinaceus and Coriolus versicolor may be important in redox stress response mechanisms and neuroprotection, preventing the progression of neurodegenerative diseases such as PD.

Lion's Mane

The use of Hericium erinaceus and Trametes versicolor extracts in supportive treatment in oncology

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- PMID: 32697746
- DOI: 10.2478/acph-2021-0007

Abstract

Substances available in nature with potential therapeutic effects are the subject of research that raises tremendous hopes for new challenges in medicine. Fungi are the most common organisms in the ecosystem and the most interesting in this respect. This review discusses two species of edible fungi, used for centuries in Eastern natural medicine, with the best-documented effect - Hericium erinaceus (He) and Trametes versicolor (Tv). The results of in vivo and in vitro studies conducted on mice and human cell lines demonstrate immunomodulatory, potentially, anticancer, anti-inflammatory and neuroregenerative effects of substances isolated from these fungi. The substances contained in the extracts of He and Tv seem to have immunomodulatory effects that may support chemotherapy. The use of these extracts is justified stronger than the other supportive treat ments based on supplements.

Lion's Mane

Value added immunoregulatory polysaccharides of Hericium erinaceus and their effect on the gut microbiota

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- PMID: 33838836
- DOI: 10.1016/j.carbpol.2021.117668

Abstract

Hericium erinaceus polysaccharides (HEPs) were isolated from the fruiting bodies of H. erinaceus with 53.36 % total carbohydrates and 32.56 % uronic acid. To examine whether HEPs can alter the diversity and the abundance of gut microbiota, adult mice and middle-aged and old mice were fed with HEPs for 28 days. Based on the result of 16S sequencing of gut microbiota it was found that the relative abundances of Lachnospiraceae and Akkermansiaceae significantly increased, while the relative abundance of Rikenellaceae and Bacteroidaceae appeared to decrease. Bacterial solutions from different murine intestinal segments and feces were collected to ferment HEPs in vitro. It was found that HEPs remarkably promoted the production of NO, IL-6, IL-10, INF-γ and TNF-α. Moreover, HEPs significantly increased phosphorylation of signaling molecules, indicating that the immunomodulatory activity was completed via NF-κB, MAPK and PI3K/Akt pathways. Collectively, HEPs have potential to be developed as functional ingredients or foods to promote health.

Lion's Mane

Influence of Short-Term Consumption of Hericium erinaceus on Serum Biochemical Markers and the Changes of the Gut Microbiota: A Pilot Study

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Affiliations expand

- PMID: 33800983
- PMCID: PMC8004025
- DOI: 10.3390/nu13031008

Abstract

Hericium erinaceus (H. erinaceus) is widely studied as a medicinal and edible fungus. Recent studies have shown that H. erinaceus has protective effects for diseases, such as inflammatory bowel disease and cancer, which are related to gut microbiota. To investigate the benefits of H. erinaceus intake on gut microbiota and blood indices in adulthood, we recruited 13 healthy adults to consume H. erinaceus powder as a dietary supplement. Blood changes due to H. erinaceus consumption were determined by routine hematological examination and characterized by serum biochemical markers. Microbiota composition was profiled by 16S ribosomal RNA gene sequencing. Results showed that daily H. erinaceus supplementation increased the alpha diversity within the gut microbiota community, upregulated the relative abundance of some short-chain fatty acid (SCFA) producing bacteria (Kineothrix alysoides, Gemmiger formicilis, Fusicatenibacter saccharivorans, Eubacterium rectale, Faecalibacterium prausnitzii), and downregulated some pathobionts (Streptococcus thermophilus, Bacteroides caccae, Romboutsia timonensis). Changes within the gut microbiota were correlated with blood chemical indices including alkaline phosphatase (ALP), low-density lipoprotein (LDL), uric acid (UA), and creatinine (CREA). Thus, we found that the gut microbiota alterations may be part of physiological adaptations to a seven-day H. erinaceus supplementation, potentially influencing beneficial health effects.

Lion's Mane

Improvement of cognitive functions by oral intake of Hericium erinaceus

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- PMID: 31413233
- DOI: 10.2220/biomedres.40.125

Abstract

Hericium erinaceus has been recognized as medical mushroom since ancient time, but its scientific evidence for human health has been still uncertain. In this study, we tested a randomized, double-blind, placebo-controlled parallel-group comparative study to evaluate the improvement of the cognitive functions by taking supplements containing fruiting body of H. erinaceus for 12 weeks. We performed three kinds of tests: Mini Mental State Examination (MMSE), Benton visual retention test, and Standard verbal paired-associate learning test (S-PA). MMSE alone showed that oral intake of H. erinaceus significantly improved cognitive functions and prevented from the deterioration. We speculate that various chemical compounds, including hericenones, in the mushroom have multiple effects to the brain neural networks and improve cognitive functions. Oral intake of H.erinaceus is safe and convenient method for dementia prevention so far.

Lion's Mane

Reduction of depression and anxiety by 4 weeks Hericium erinaceus intake

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Affiliations expand

- PMID: 20834180
- DOI: 10.2220/biomedres.31.231

Abstract

Hericium erinaceus, a well known edible mushroom, has numerous biological activities. Especially hericenones and erinacines isolated from its fruiting body stimulate nerve growth factor (NGF) synthesis, which expects H. erinaceus to have some effects on brain functions and autonomic nervous system. Herein, we investigated the clinical effects of H. erinaceus on menopause, depression, sleep quality and indefinite complaints, using the Kupperman Menopausal Index (KMI), the Center for Epidemiologic Studies Depression Scale (CES-D), the Pittsburgh Sleep Quality Index (PSQI), and the Indefinite Complaints Index (ICI). Thirty females were randomly assigned to either the H. erinaceus (HE) group or the placebo group and took HE cookies or placebo cookies for 4 weeks. Each of the CES-D and the ICI score after the HE intake was significantly lower than that before. In two terms of the ICI, "insentive" and "palpitatio", each of the mean score of the HE group was significantly lower than the placebo group. "Concentration", "irritating" and "anxious" tended to be lower than the placebo group. Our results show that HE intake has the possibility to reduce depression and anxiety and these results suggest a different mechanism from NGF-enhancing action of H. erinaceus.

Lion's Mane

Hericium erinaceus mycelium ameliorate anxiety induced by continuous sleep disturbance in vivo

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- PMID: 34865649
- PMCID: PMC8643634
- DOI: 10.1186/s12906-021-03463-3

Abstract

Background: Sleep disruption is a major public health issue and may increase the risk of mortality by ten-folds if an individual is sleeping less than 6 h per night. Sleep has changed dramatically during to the COVID-19 pandemic because COVID symptoms can lead to psychological distress including anxiety. Hericium erinaceus mycelium has been widely investigated in both the in vivo studies and clinical trials for its neuroprotective functions because the mycelium contains hericenones and erinacines, which synthesize the nerve growth factor and brain-derived neurotrophic factor (BDNF). Recent in vivo reports have shown showed that erinacine A-enriched Hericium erinaceus mycelium can modulate BDNF/TrkB/PI3K/Akt/GSK-3β pathways to induce an antidepressant-like effect. A large body of evidence indicates that erinacine can pass the blood-brain barrier and suggests its neuroprotective function in both peripheral and central nervous systems. Thus, Hericium erinaceus mycelium may be a dual-function supplement for sleep disruption improvement while sustaining anxiolytic effects.

Method: To simulate the condition of sleep disruption, the mice were subjected to the tail suspension test (TST) for 15 min every day during the same period for nine consecutive days. Two different doses (75 and 150 mg/kg) of Hericium erinaceus mycelium were administered orally 20 min prior to the TSTs before entering the light period of 12:12 h L:D cycle. All sleep-wake recording was recorded for 24 h using electroencephalogram and electromyogram. The elevated-plus-maze and open-field tests were conducted to record the behavior activities.

Results: Consecutive TSTs prior to the light period could cause significant sleep disturbance and anxiety behavior in the elevated-plus-maze experiments. Results showed that administration with Hericium erinaceus mycelium at 150 mg/kg ameliorated the rodent anxiety ($p < 0.05$) and reversed the TST-induced NREM sleep disturbance in the dark period.

Conclusion: This is the first in vivo study suggesting that Hericium erinaceus mycelium has a dual potential role for anxiety relief through improving sleep disruptions.

Lion's Mane

Key Mechanisms and Potential Implications of Hericium erinaceus in NLRP3 Inflammasome Activation by Reactive Oxygen Species during Alzheimer's Disease

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- PMID: 34829535
- PMCID: PMC8615045
- DOI: 10.3390/antiox10111664

Abstract

Alzheimer's disease (AD) is the principal cause of dementia, and its incidence increases with age. Altered antioxidant systems and inflammation have an important role in the etiology of neurodegenerative disorders. In this study, we evaluated the effects of Hericium erinaceus, a nutritional mushroom with important antioxidant effects, in a rat model of AD. Animals were injected with 70 mg/Kg of AlCl3 daily for 6 weeks, and Hericium erinaceus was administered daily by gavage. Before the experiment's end date, behavioral test training was performed. At the end of the study, behavioral changes were assessed, and the animals were euthanized. Brain tissues were harvested for further analysis. AlCl3 mainly accumulates in the hippocampus, the principal region of the brain involved in memory functions and learning. Hericium erinaceus administration reduced behavioral changes and hippocampal neuronal degeneration. Additionally, it reduced phosphorylated Tau levels, aberrant APP overexpression, and β-amyloid accumulation. Moreover, Hericium erinaceus decreased the pro-oxidative and pro-inflammatory hippocampal alterations induced by AD. In particular, it reduced the activation of the NLRP3 inflammasome components, usually activated by increased oxidative stress during AD. Collectively, our results showed that Hericium erinaceus has protective effects on behavioral alteration and histological modification associated with AD due to the modulation of the oxidative and inflammatory pathways, as well as regulating cellular brain stress.

Lion's Mane

Hericium erinaceus (Bull.) Pers. Ethanolic Extract with Antioxidant Properties on Scopolamine-Induced Memory Deficits in a Zebrafish Model of Cognitive Impairment

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- PMID: 34204787
- PMCID: PMC8231562
- DOI: 10.3390/jof7060477

Abstract

Hericium erinaceus (H. erinaceus) is a rare and appreciated fungal species belonging to the division Basidiomycota used for centuries in traditional Chinese medicine for its medicinal value. This species of mushrooms brings the most diverse benefits for the human body, and can have beneficial effects for treating Alzheimer's disease (AD). This study investigated whether ethanolic extract from the fungal biomass of H. erinaceus enhances cognitive function via the action on cholinergic neurons using the scopolamine (SCOP)-induced zebrafish (Danio rerio) model of memory impairment. The ethanolic extract from the fungal biomass of H. erinaceus was previously obtained using an ultrasonic extraction method (UE). The administration of H. erinaceus extract to zebrafish, with a pattern of AD induced by scopolamine, showed an improvement in memory evaluated by behavioral and biochemical tests on brain tissue. These results suggest that H. erinaceus has preventive and therapeutic potentials in managing memory deficits and brain oxidative stress in zebrafish with AD.

Lion's Mane

Mycochemical Profiling and Antioxidant Activity of Two Different Tea Preparations from Lion's Mane Medicinal Mushroom, Hericium erinaceus (Agaricomycetes)

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- PMID: 34936309
- DOI: 10.1615/IntJMedMushrooms.2021040368

Abstract

Mushrooms have become the new superfood with their many bioactive metabolites and are potential candidates in the field of herbal medicine. Since not all mushrooms can be consumed whole, their active constituents and therapeutic benefits can be had in the form of beverages specially teas or coffees. In the present study, two forms of teas, infusion and decoction, were prepared from Hericium erinaceus (Bull.) Pers., a very popular mushroom in Chinese medicine. Both forms of tea were studied mycochemically and medicinally and a comparative view was presented on the basis of the findings. The tea preparations were rich in bioactive mycochemicals; interestingly, the infusion contained a higher amount of phenol (1.72 mg gallic acid equivalent/g of dry weight of mushrooms) than decoction (0.28 mg gallic acid equivalent/g of dry weight of mushrooms). Lycopene and β-carotene were found in very minute amounts. Both infusion and decoction exhibited good free radical scavenging potential, reducing power, and total antioxidant properties. However, the infusion fraction produced overall better results than the decoction fraction. Finally, the results suggest that H. erinaceus is a potent source of natural antioxidant and also can be consumed as a beverage.

Lion's Mane

Optimization of Ultrasonic Extraction to Obtain Erinacine A and Polyphenols with Antioxidant Activity from the Fungal Biomass of Hericium erinaceus

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- PMID: 33352839
- PMCID: PMC7766035
- DOI: 10.3390/foods9121889

Abstract

Hericium erinaceus is a medicinal fungal species that produces the active biological metabolite erinacine A with strong antioxidant activity. The classical extraction techniques used to date to obtain metabolites from this fungal species require high consumption of resources and energy and, in the end, prove to be expensive and inefficient, especially on a biomedical scale. The aim of this research is based on the development of an ultrasonic extraction (UE) method for the identification and extraction of biological compounds with high antioxidant activity from the mycelia of H. erinaceus biomass developed through a solid cultivation process. The extraction process was optimized by varying parameters to determine the best extraction yield of metabolites involved in such antioxidant activity, using the response surface methodology (RSM). The physicochemical analyses were oriented towards the investigation of polyphenols, flavonoids, and the diterpenoid erinacine A. It is highlighted that there is a very good mutual connection between the concentration of polyphenols and flavonoids in the extracts studied and the diterpenoid erinacine A. Also, this study describes an efficient and qualitative extraction method for extracting natural antioxidants from the H. erinaceus mushroom, since toxic solvents were not used in the developed extraction procedure. This biomass can be used both as a food source and as a possible phytotherapeutic tool in the prevention or treatment of various neurodegenerative disorders that require drugs with strong antioxidant activity.

Lion's Mane

Erinacine A-enriched Hericium erinaceus mycelia promotes longevity in Drosophila melanogaster and aged mice

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- PMID: 31100095
- PMCID: PMC6524823
- DOI: 10.1371/journal.pone.0217226

Abstract

Erinacine A-enriched Hericium erinaceus mycelia is a well-established potential therapeutic agent for neurodegenerative disorders. However, the effect of erinacine A-enriched H. erinaceus mycelia on promoting longevity remains unclear. This is the first study to investigate the effect of erinacine A-enriched H. erinaceus mycelia on lifespan-prolonging activity in Drosophila melanogaster and senescence-accelerated P8 (SAMP8) mice. Two hundred D. melanogaster and 80 SAMP8 mice of both sexes were randomly divided into four groups and were administered with either the standard, low-dose, mid-dose, or high-dose erinacine A-enriched H. erinaceus mycelia. After treatment, the lifespan was measured in D. melanogaster, and the lifespan, food intake and oxidative damage were evaluated in SAMP8 mice. Results showed that supplementation with erinacine A-enriched H. erinaceus mycelia extended the lifespan in both D. melanogaster and SAMP8 by a maximum of 32% and 23%, respectively, compared to the untreated controls. Moreover, erinacine A-enriched H. erinaceus mycelia decreased TBARS levels and induced the anti-oxidative enzyme activities of superoxide dismutase, catalase, and glutathione peroxidase. Together, these findings suggest that erinacine A-enriched H. erinaceus mycelia supplement could promote longevity, mediated partly through the induction of endogenous antioxidants enzymes.

Lion's Mane

Erinacine A-Enriched Hericium erinaceus Mycelium Delays Progression of Age-Related Cognitive Decline in Senescence Accelerated Mouse Prone 8 (SAMP8) Mice

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- PMID: 34684662
- PMCID: PMC8537498
- DOI: 10.3390/nu13103659

Abstract

There have been many reports on the neuroprotective effects of Hericium erinaceus mycelium, in which the most well-known active compounds found are diterpenoids, such as erinacine A. Previously, erinacine A-enriched Hericeum erinaceus mycelium (EAHEM) was shown to decrease amyloid plaque aggregation and improve cognitive disability in Alzheimer's disease model APP/PS1 mice. However, its effects on brain aging have not yet been touched upon. Here, we used senescence accelerated mouse prone 8 (SAMP8) mice as a model to elucidate the mechanism by which EAHEM delays the aging of the brain. Three-month-old SAMP8 mice were divided into three EAHEM dosage groups, administered at 108, 215 and 431 mg/kg/BW/day, respectively. During the 12th week of EAHEM feeding, learning and memory of the mice were evaluated by single-trial passive avoidance and active avoidance test. After sacrifice, the amyloid plaques, induced nitric oxidase synthase (iNOS) activity, thiobarbituric acid-reactive substances (TBARS) and 8-OHdG levels were analyzed. We found that the lowest dose of 108 mg/kg/BW EAHEM was sufficient to significantly improve learning and memory in the passive and active avoidance tests. In all three EAHEM dose groups, iNOS, TBARS and 8-OHdG levels all decreased significantly and showed a dose-dependent response. The results indicate that EAHEM improved learning and memory and delayed degenerative aging in mice brains.

Lion's Mane

Antitumor, Anti-Inflammatory and Antiallergic Effects of Agaricus blazei Mushroom Extract and the Related Medicinal Basidiomycetes Mushrooms, Hericium erinaceus and Grifola frondosa: A Review of Preclinical and Clinical Studies

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- PMID: 32397163
- PMCID: PMC7285126
- DOI: 10.3390/nu12051339

Abstract

Since the 1980s, medicinal effects have been documented in scientific studies with the related Basidiomycota mushrooms Agaricus blazei Murill (AbM), Hericium erinaceus (HE) and Grifola frondosa (GF) from Brazilian and Eastern traditional medicine. Special focus has been on their antitumor effects, but the mushrooms' anti-inflammatory and antiallergic properties have also been investigated. The antitumor mechanisms were either direct tumor attack, e.g., apoptosis and metastatic suppression, or indirect defense, e.g., inhibited tumor neovascularization and T helper cell (Th) 1 immune response. The anti-inflammatory mechanisms were a reduction in proinflammatory cytokines, oxidative stress and changed gut microbiota, and the antiallergic mechanism was amelioration of a skewed Th1/Th2 balance. Since a predominant Th2 milieu is also found in cancer, which quite often is caused by a local chronic inflammation, the three conditions-tumor, inflammation and allergy-seem to be linked. Further mechanisms for HE were increased nerve and beneficial gut microbiota growth, and oxidative stress regulation. The medicinal mushrooms AbM, HE and GF appear to be safe, and can, in fact, increase longevity in animal models, possibly due to reduced tumorigenesis and oxidation. This article reviews preclinical and clinical findings with these mushrooms and the mechanisms behind them.

Lion's Mane

Hericium erinaceus Improves Recognition Memory and Induces Hippocampal and Cerebellar Neurogenesis in Frail Mice during Aging

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Affiliations expand

- PMID: 30934760
- PMCID: PMC6521003
- DOI: 10.3390/nu11040715

Abstract

Frailty is a geriatric syndrome associated with both locomotor and cognitive decline, implicated in both poor quality of life and negative health outcomes. One central question surrounding frailty is whether phenotypic frailty is associated with the cognitive impairment during aging. Using spontaneous behavioral tests and by studying the dynamic change during aging, we demonstrated that the two form of vulnerability, locomotor and recognition memory decline, develop in parallel and therefore, integration of the motoric and cognitive evaluations are imperative. We developed an integrated frailty index based on both phenotypic and recognition memory performances. Hericium erinaceus (H. erinaceus) is a medicinal mushroom that improves recognition memory in mice. By using HPLC-UV-ESI/MS analyses we obtained standardized amounts of erinacine A and hericenones C and D in H. erinaceus extracts, that were tested in our animal model of physiological aging. Two-month oral supplementation with H. erinaceus reversed the age-decline of recognition memory. Proliferating cell nuclear antigen (PCNA) and doublecortin (DCX) immunohistochemistry in the hippocampus and cerebellum in treated mice supported a positive effect of an H. erinaceus on neurogenesis in frail mice.

Chaga

I**nonotus obliquus - from folk medicine to clinical use**

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- PMID: 34195023
- PMCID: PMC8240111
- DOI: 10.1016/j.jtcme.2020.08.003

Abstract

The Inonotus obliquus (I. obliquus) mushroom was traditionally used to treat various gastrointestinal diseases. For many years, mounting evidence has indicated the potential of I. obliquus extracts for treatment of viral and parasitic infections. Furthermore, substances from I. obiquus have been shown to stimulate the immune system. The most promising finding was the demonstration that I. obliquus has hypoglycemic and insulin sensitivity potential. This review summarizes the therapeutic potential of I. obliquus extracts in counteracting the progression of cancers and diabetes mellitus as well as their antiviral and antiparasitic activities and antioxidant role. As shown by literature data, various authors have tried to determine the molecular mechanism of action of I. obliquus extracts. Two mechanisms of action of I. obliquus extracts are currently emerging. The first is associated with the broad-sense impact on antioxidant enzymes and the level of reactive oxygen species (ROS). The other is related to peroxisome proliferator-activated receptor gamma (PPARγ) effects. This receptor may be a key factor in the anti-inflammatory, antioxidant, and anti-cancer activity of I. obliquus extracts. It can be concluded that I. obliquus fits the definition of functional food and has a potentially positive effect on health beyond basic nutrition; however, studies that meet the evidence-based medicine (EBM) criteria are needed.

Chaga

Inonotus obliquus extract alleviates myocardial ischemia/reperfusion injury by suppressing endoplasmic reticulum stress

Yi Wu 1, Heming Cui 1, Yuying Zhang 1, Ping Yu 1, Yuangeng Li 1, Dan Wu 1, Yan Xue 1, Wenwen Fu 1

- PMID: 33236154
- PMCID: PMC7716405
- DOI: 10.3892/mmr.2020.11716

Abstract

Inonotus obliquus (IO) is an edible fungus that exerts various biological functions, including anti-inflammatory, antitumor and immunomodulatory effects. The present study was designed to investigate the role of IO extract (IOE) in myocardial ischemia/reperfusion (MI/R) and determine the exact molecular mechanisms. The left anterior descending coronary artery was ligated to establish the MI/R injury model in rats. IOE exhibited a novel cardioprotective effect, as shown by improvement in cardiac function and decrease in infarct size. Pretreatment with IOE activated antioxidant enzymes in cardiomyocytes, including glutathione peroxidase, superoxide dismutase and catalase. IOE pretreatment also induced the upregulation of NAD-dependent protein deacetylase sirtuin-1 (SIRT1) and downregulation of glucose-regulated protein 78, phosphorylated (p-) protein kinase R-like endoplasmic reticulum kinase, p-eukaryotic translation initiation factor 2 subunit α, C/EBP homologous protein and caspase-12. Furthermore, IOE alleviated endoplasmic reticulum (ER) stress-induced apoptosis in cardiomyocytes by decreasing the mRNA levels of caspase-12. IOE inhibited apoptosis induced by overexpression of pro-caspase-9 and pro-caspase-3. In summary, IOE pretreatment protects the heart against MI/R injury through attenuating oxidative damage and suppressing ER stress-induced apoptosis, which may be primarily due to SIRT1 activation.

Chaga

Deciphering the antitumoral potential of the bioactive metabolites from medicinal mushroom Inonotus obliquus

Yanxia Zhao 1, Weifa Zheng 2

- PMID: 32877719
- DOI: 10.1016/j.jep.2020.113321

Abstract

Ethnopharmacological relevance: The crude extracts of the medicinal mushroom Inonotus obliquus have been used as an effective traditional medicine to treat malicious tumors, gastritis, gastric ulcers, and other inflammatory conditions in Russia and most Baltic countries.
Aim of this review: Deciphering the antitumoral potential of the bioactive metabolites from I. obliquus and addressing its possibility to be used as effective agents for tumor treatment, restoration of compromised immunity and protection of gastrointestinal damage caused by chemotherapy.
Materials and methods: We analysed the current achievements and dilemma in tumor chemo- or immunotherapy. In this context, we searched the published literatures on I. obliquus covering from 1990 to 2020, and summarized the activities of antitumor, antioxidation, and immunomodulation by the polysaccharides, triterpenoids, small phenolic compounds, and hispidin polyphenols. By comparing the merits and shortcomings of current and traditional methodology for tumor treatment, we further addressed feasibility for the use of I. obliquus as an effective natural drug for tumor treatment and prevention.
Results: The diverse bioactive metabolites confer I. obliquus great potential to inhibit tumor growth and metastasis. Its antitumor activities are achieved either through suppressing multiple oncogenic signals including but not limited to the activation of NF-κB and FAK, and the expression of RhoA/MMP-9 via ERK1/2 and PI3K/Akt signaling pathway. The antitumor activities can also be achieved by inhibiting tyrosinase activity via PAK1-dependent signaling pathway or altering lysosomal membrane permeabilization through blocking tubulin polymerization and/or disturbing energy metabolism through LKB1/AMPK pathway. In addition, the metabolites from I. obliquus also harbour the potentials to reverse MDR either through selective inhibition on P-gp/ABCB1 or MRP1/ABCC1 proteins or the induction of G2/M checkpoint arrest in tumor cells of chemoresistant phenotypes mediated by Nox/ROS/NF-kB/STAT3 signaling pathway. In addition to the eminent effects in tumor inhibition, the metabolites in I. obliquus also exhibit immunomodulatory potential to restore the compromised immunity and protect against ulcerative damage of GI tract caused by chemotherapy.
Conclusions: I. obliquus possesses the potential to reduce incidence of tumorigenesis in healthy people. For those whose complete remission has been achieved by chemotherapy, administration of the fungus will inhibit the activation of upstream oncogenic signals and thereby prevent metastasis; for those who are in the process of chemotherapy administration of the fungus will not only chemosensitize the tumor cells and thereby increasing the chemotherapeutic effects, but also help to restore the compromised immunity and protect against ulcerative GI tract damage and other side-effects induced by chemotherapy.

Chaga

Inonotus obliquus polysaccharide ameliorates dextran sulphate sodium induced colitis involving modulation of Th1/Th2 and Th17/Treg balance

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- PMID: 30856346
- DOI: 10.1080/21691401.2019.1577877

Abstract

Inflammatory bowel disease (IBD) is an intestinal chronic inflammatory disease, and is related to imbalance of CD4+T subsets. However, the current treatments of chronic colitis are not ideal and have potential side effects. Therefore, more effective and safer biologically active substances which are extracted from natural plants have been widely concerned. In this study, it was found that Inonotus obliquus polysaccharides (IOP), the main bioactive constituent of Inonotus obliquus, can alleviate dextran sodium sulfate-induced chronic murine intestinal inflammation. Oral administration of IOP (100, 200, 300 mg/kg) can significantly reduce the disease active index and alleviate the pathological changes in colitis mice, where the tight junction proteins Occludin and ZO-1 losses in colon tissues were reduced. It can also regulate imbalanced Th1/Th2 and Th17/Treg in colon tissues, mesenteric lymph nodes and spleen using Reverse Transcription-Polymerase Chain Reaction detection and flow cytometry. Immunohistochemistry and western blot assays further revealed the modulatory effect of IOP on the p-STAT1, p-STAT6, p-STAT3 expression, which promoted the balance of Th1/Th2, Th17/Treg in the colon of chronic colitis mice. In short, these results indicated that IOP was potentially effective therapeutic agent for IBD.

Chaga

Inonotus obliquus attenuates histamine-induced microvascular inflammation

Sumreen Javed 1, Kevin Mitchell 2, Danielle Sidsworth 2, Stephanie L Sellers 3, Jennifer Reutens-Hernandez 1, Hugues B Massicotte 4, Keith N Egger 4, Chow H Lee 1, Geoffrey W Payne 2

- PMID: 31437163
- PMCID: PMC6706056
- DOI: 10.1371/journal.pone.0220776

Abstract

Cell-to-cell communication is a key element of microvascular blood flow control, including rapidly carrying signals through the vascular endothelium in response to local stimuli. This cell-to-cell communication is negatively impacted during inflammation through the disruption of junctional integrity. Such disruption is associated with promoting the onset of cardiovascular diseases as a result of altered microvascular blood flow regulation. Therefore, understanding the mechanisms how inflammation drives microvascular dysfunction and compounds that mitigate such inflammation and dysfunction are of great interest for development. As such we aimed to investigate extracts of mushrooms as potential novel compounds. Using intravital microscopy, the medicinal mushroom, Inonotus obliquus was observed, to attenuate histamine-induced inflammation conducted vasodilation in second-order arterioles in the gluteus maximus muscle of C57BL/6 mice. Mast cell activation by C48/80 similarly disrupted endothelial junctions and conducted vasodilation but only histamine was blocked by the histamine antagonist, pyrilamine not C48/80 suggesting the importance of mast cell activation. Data presented here supports that histamine induced inflammation is a major disruptor of junctional integrity, and highlights the important anti-inflammatory properties of Inonotus obliquus focusing future assessment of mast cells as putative target for Inonotus obliquus.

Chaga

Progress on understanding the anticancer mechanisms of medicinal mushroom: inonotus obliquus

Fu-Qiang Song 1, Ying Liu, Xiang-Shi Kong, Wei Chang, Ge Song

- PMID: 23679238
- DOI: 10.7314/apjcp.2013.14.3.1571

Abstract

Cancer is a leading cause of death worldwide. Recently, the demand for more effective and safer therapeutic agents for the chemoprevention of human cancer has increased. As a white rot fungus, Inonotus obliquus is valued as an edible and medicinal resource. Chemical investigations have shown that I. obliquus produces a diverse range of secondary metabolites, including phenolic compounds, melanins, and lanostane-type triterpenoids. Among these are active components for antioxidant, antitumoral, and antiviral activities and for improving human immunity against infection of pathogenic microbes. Importantly, their anticancer activities have become a hot recently, but with relatively little knowledge of their modes of action. Some compounds extracted from I. obliquus arrest cancer cells in the G0/G1 phase and then induce cell apoptosis or differentiation, whereas some examples directly participate in the cell apoptosis pathway. In other cases, polysaccharides from I. obliquus can indirectly be involved in anticancer processes mainly via stimulating the immune system. Furthermore, the antioxidative ability of I. obliquus extracts can prevent generation of cancer cells. In this review, we highlight recent findings regarding mechanisms underlying the anticancer influence of I. obliquus, to provide a comprehensive landscape view of the actions of this mushroom in preventing cancer.

Chaga

Chemical characterization and biological activity of Chaga (Inonotus obliquus), a medicinal "mushroom"

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- PMID: 25576897
- DOI: 10.1016/j.jep.2014.12.069

Abstract

Ethnopharmacological relevance: In Russian traditional medicine, an extract from the mushroom Inonotus obliquus (Fr.) Pil´at is used as an anti-tumor medicine and diuretic. It has been reported that Inonotus obliquus has therapeutic effects, such as anti-inflammatory, immuno-modulatory and hepatoprotective effects. This study was designed to investigate the chemical composition and biological properties of aqueous and ethanolic extracts of Inonotus obliquus from Finland, Russia, and Thailand. Their antioxidative, antimicrobial, and antiquorum properties were tested as well as the cytotoxicity on various tumor cell lines.

Materials and methods: The tested extract was subjected to conventional chemical study to identified organic acids and phenolic compounds. Antioxidative activity was measured by several different assays. Antimicrobial potential of extracts was tested by microdilution method, and antiquorum sensing activity and antibiofilm formation of Inonotus obliquus extracts was tested on Pseudomonas aeruginosa. Cytotoxicity of the extracts was tested on tumor cells (MCF-7, NCI-H460, HeLa and HepG2) and non-tumor liver cells primary cultures.

Results: Oxalic acid was found as the main organic acid, with the highest amount in the aqueous extract from Russia. Gallic, protocatechuic and p-hydroxybenzoic acids were detected in all samples. Inonotus obliquus extracts showed high antioxidant and antimicrobial activity. Extracts were tested at subMIC for anti-quorum sensing (AQS) activity in Pseudomonas aeruginosa and all extracts showed definite AQS activity. The assays were done using twitching and swarming of bacterial cultures, and the amount of produced pyocyanin as QS parameters. All the extracts demonstrated cytotoxic effect on four tumor cell lines and not on primary porcine liver cells PLP2.

Conclusions: As the Inonotus obliquus presence in Chaga conks is limited, further purification is necessary to draw quantitative conclusions. The presence of AQS activity in medicinal mushrooms suggests a broader anti-infectious disease protection than only immunomodulatory effects.

Chaga

Chemical diversity of biologically active metabolites in the sclerotia of Inonotus obliquus and submerged culture strategies for up-regulating their production

Weifa Zheng 1, Kangjie Miao, Yubing Liu, Yanxia Zhao, Meimei Zhang, Shenyuan Pan, Yucheng Dai

- PMID: 20532760
- DOI: 10.1007/s00253-010-2682-4

Abstract

Inonotus obliquus (Fr.) Pilat is a white rot fungus belonging to the family Hymenochaetaceae in the Basidiomycota. In nature, this fungus rarely forms a fruiting body but usually an irregular shape of sclerotial conk called 'Chaga'. Characteristically, I. obliquus produces massive melanins released to the surface of Chaga. As early as in the sixteenth century, Chaga was used as an effective folk medicine in Russia and Northern Europe to treat several human malicious tumors and other diseases in the absence of any unacceptable toxic side effects. Chemical investigations show that I. obliquus produces a diverse range of secondary metabolites including phenolic compounds, melanins, and lanostane-type triterpenoids. Among these are the active components for antioxidant, antitumoral, and antiviral activities and for improving human immunity against infection of pathogenic microbes. Geographically, however, this fungus is restricted to very cold habitats and grows very slowly, suggesting that Chaga is not a reliable source of these bioactive compounds. Attempts for culturing this fungus axenically all resulted in a reduced production of bioactive metabolites. This review examines the current progress in the discovery of chemical diversity of Chaga and their biological activities and the strategies to modulate the expression of desired pathways to diversify and up-regulate the production of bioactive metabolites by the fungus grown in submerged cultures for possible drug discovery.

Chaga

The pharmacological potential and possible molecular mechanisms of action of Inonotus obliquus from preclinical studies

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- PMID: 31209936
- DOI: 10.1002/ptr.6384

Abstract

The use of mushrooms as functional foods and in the treatment of diseases has a long history. Inonotus obliquus is a mushroom belonging to the Hymenochaetaceae family and has possible anticancer, antiviral, and hypoglycemic properties. Chemical analysis of this mushroom has allowed the identification of various constituents such as melanins, phenolic compounds, and lanostane-type triterpenoids. A plethora of findings have highlighted the potential molecular mechanisms of actions of this mushroom such as its ability to scavenge reactive oxygen species, inhibit the growth of tumors, decrease inflammation and insulin resistance in type 2 diabetes, and stimulate the immune system. This review summarizes the relevant findings with reference to the therapeutic potential of this mushroom in countering the progression of cancers, diabetes mellitus, and antiviral activities, while highlighting its possible molecular mechanisms of action. The possible role of this mushroom as a therapeutic agent in addressing the pathogenesis of diabetes and cancer has also been suggested.

Chaga

Inonotus obliquus polysaccharides induces apoptosis of lung cancer cells and alters energy metabolism via the LKB1/AMPK axis

Shuping Jiang 1, Fuli Shi 1, Hui Lin 1, Ying Ying 1, Lingyu Luo 2, Deqiang Huang 2, Zhijun Luo 3

- PMID: 31751687
- DOI: 10.1016/j.ijbiomac.2019.10.174

Abstract

The present study explores the mechanisms underlying the anti-cancer action of Inonotus obliquus polysaccharides (IOP). Thus, we characterized the IOP components extracted from Chaga sclerotium and, found that the extracts contained 70% polysaccharides with an average molecular weight of 4.5 × 104 Da consisting of 75% glucose. We then showed that IOP extract activated AMPK in lung cancer cells expressing LKB1, suppressed cell viability, colony-formation, and triggered cell apoptosis. In conjunction, IOP downregulated Bcl-2, upregulated Bax, and enhanced cleavage of Caspase-3 and PARP. All of these effects were prevented by treatment with Compound C, a chemical inhibitor of AMPK. IOP diminished mitochondrial membrane potential (MMP), concurrent with decreases in oxidative phosphorylation and glycolysis, which was dependent on LKB1/AMPK. Finally, IOP at a dosage of 50 mg/kg significantly inhibited allograft tumor growth of the LLC1 cells in association with increased apoptosis. Collectively, our results demonstrate that IOP acts on cancer cells through a mechanism by which AMPK triggers the apoptotic pathway via the opening of mitochondrial permeability transition pore, and reducing MMP, leading to an inhibition of ATP production. Therefore, our study provides a solid foundation for the use of IOP as a promising alternative or supplementary medicine for cancer therapy.

Cordyceps

The genus Cordyceps: An extensive review of its traditional uses, phytochemistry and pharmacology

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- PMID: 29775778
- DOI: 10.1016/j.fitote.2018.05.010

Abstract

The genus Cordyceps has about 750 identified species which are distributed in many regions of the World, but mainly found in South Asia, Europe and North America. The species of the genus are highly priced and are widely used as food and medicine for the treatment of various ailments. This present review compiles literature information on the ethno-medicinal, phytochemistry and pharmacological properties of species in the genus Cordyceps. In addition, the review also suggest recommendations for the future researches. Thirty five Cordyceps species have been reported in the literature to have medicinal properties or has a report on the isolation of bioactive compounds. In vitro and in vivo research studies reporting the validation of the medicinal properties of some species were also reviewed. The phytochemical diversity of this genus was demonstrated with over 200 metabolites including nucleosides, sterols, cyclic peptides, flavonoids, dihydrobenzofurans, bioxanthracenes, polyketide, terpenes, alkaloids and phenolics isolated from various Cordyceps species. Cordyceps sinensis was identified as the most frequently used and most explored member of the Cordyceps genus. Cyclodepsipeptides, nucleosides and polysaccharides were identified as the most studied class of compounds from the genus and they show immunomodulatory, antioxidant, antitumor, cytotoxic, anti-inflammatory, anti-allergic, antidiabetic, analgesic, anti-HIV, antibacterial, antimalarial and antifungal activities. Thus, species belonging to the genus Cordyceps showcases an important source of treating various disorders due to the presence of bioactive constituents that displays potent bioactivities and could serve as possible leads in drug discovery.

Cordyceps

Functional study of Cordyceps sinensis and cordycepin in male reproduction: A review

Yung-Chia Chen 1, Ying-Hui Chen 2, Bo-Syong Pan 3, Ming-Min Chang 4, Bu-Miin Huang 5

PMID: 28911537
DOI: 10.1016/j.jfda.2016.10.020

Abstract

Cordyceps sinensis has various biological and pharmacological functions, and it has been claimed as a tonic supplement for sexual and reproductive dysfunctions for a long time in oriental society. In this article, the in vitro and in vivo effects of C. sinensis and cordycepin on mouse Leydig cell steroidogenesis are briefly described, the stimulatory mechanisms are summarized, and the recent findings related to the alternative substances regulating male reproductive functions are also discussed.

Cordyceps

In vivo stimulatory effect of Cordyceps sinensis mycelium and its fractions on reproductive functions in male mouse

Yuan-Li Huang 1, Sew-Fen Leu, Bi-Ching Liu, Chia-Chin Sheu, Bu-Miin Huang

- PMID: 15207653
- DOI: 10.1016/j.lfs.2004.01.029

Abstract

Cordyceps sinensis (CS), an Ascomycetes fungus parasitic to Lepidoptera larvae, has been traditionally used as nutritious food for the enhancement on sexual performance and the restitution of impairment in sexual function in Chinese society. We have previously demonstrated the stimulatory effect of CS and its fractions on steroidogenesis both on primary mouse Leydig cells and MA-10 mouse Leydig tumor cells. In the present studies, we determined the in vivo effects of CS and its fractions on steroidogenesis in mouse. Different concentrations of CS and CS fractions (0.02 and 0.2 mg/g body weight) were fed to immature or mature mice from 1 to 7 days. The plasma levels of testosterone were evaluated by radioimmunoassay. The weights of reproductive organs were also determined. Results illustrated that CS significantly induced plasma testosterone levels both in immature and mature mice in 3 and/or 7 days treatment ($p < 0.05$). F2 and F3 at 0.02 and/or 0.2 mg/g body weight for different feeding duration could also significantly stimulated plasma testosterone levels both in immature and mature mice ($p < 0.05$). In general, CS, F2 and F3 didn't have considerable effect on the weights of reproductive organs. Taken together, these studies illustrate that CS and its fractions significantly stimulated in vivo mouse testosterone production.

Cordyceps

The in vivo effect of Cordyceps sinensis mycelium on plasma corticosterone level in male mouse

Sew-Fen Leu 1, Chi-Hsien Chien, Chi-Yu Tseng, Yu-Ming Kuo, Bu-Miin Huang

- PMID: 16141547
- DOI: 10.1248/bpb.28.1722

Abstract

Cordyceps sinensis (CS), an Ascomycetes fungus parasitic to Lepidoptera larvae, has been traditionally used as nutritious food for the enhancement in immuno-modulation in Chinese society for a long time. Previous report has demonstrated the CS water extract stimulates in vitro corticosterone production in rat primary adrenal cells. In the present studies, we determined the in vivo effects of CS and its fractions on plasma corticosterone production in mouse. Different concentrations of CS and CS fractions dissolved in water (0.02 and 0.2 mg/g body weight) were fed to immature and mature mice from 1, 3 or 7 d. The plasma levels of corticosterone were determined by radioimmunoassay (RIA), and the weight of adrenal gland and body weight were also evaluated. Results illustrated that plasma corticosterone levels were significantly induced by F2 at 0.02 mg/g body weight with 7 d feeding in immature mice, and by CS at 0.02 mg/g body weight with 3 d feeding and F3 at 0.02 mg/g body weight for 7 d feeding in mature mice, respectively ($p < 0.05$). There were no differences of adrenal gland weight except there was significant stimulation by CS at 0.2 mg/g body weight with 3 d feeding in mature mice ($p < 0.05$) and there were significant inhibitions by both dosages of F3 for 3 d feeding in immature mice and F2 for 7 d feeding in mature mice ($p < 0.05$), respectively. Concerning body weight, the stimulatory effects were observed with CS feeding at 0.2 mg/g body weight for 7 d and F3 feeding at 0.02 mg/g body weight for 3 and 7 d in mature mice. Whereas, the inhibitory effect were observed in F2 feeding at 0.2 mg/g body weight for 7 d in immature mice and at both dosages for 7 d in mature mice, respectively. Taken together, these studies illustrate that CS and its fractions stimulated mouse in vivo corticosterone production. However, CS and its fractions didn't have constant stimulatory or inhibitory effects on the weights of body and adrenal glands.

Cordyceps

Antifatigue and antistress effect of the hot-water fraction from mycelia of Cordyceps sinensis

- PMID: 12736514
- DOI: 10.1248/bpb.26.691

Abstract

This study was conducted to investigate the chemical component of the hot water (HW) fraction of mycelia of Cordyceps sinensis and its antifatigue and antistress effect against a stimulus in vivo using rats and mice. The growth of mycelia reached a maximum level of 31.6 g/l after 120 h of incubation. The main chemical composition of the HW fraction of mycelia of C. sinensis was found to be carbohydrate (78.9%) with 5% moisture. The swimming endurance capacity of mice orally administered with the HW fraction (150 and 300 mg/kg/d, respectively) was significantly prolonged from 75 to 90 min with a lessening of fatigue. When the HW fraction (150 mg/kg/d) was given to rats for 8 d including a 48 h stress period, the weight changes of the adrenal gland, spleen, thymus, and thyroid, which is an index of stress, were suppressed. The HW fraction also significantly inhibited the increase in total cholesterol and the decrease in alkaline phosphatase levels as biochemical parameters of immobilization stress in rats.

Cordyceps

Cordyceps fungi: natural products, pharmacological functions and developmental products

Xuanwei Zhou 1, Zhenghua Gong, Ying Su, Juan Lin, Kexuan Tang

- PMID: 19222900
- DOI: 10.1211/jpp/61.03.0002

Objectives: Parasitic Cordyceps fungi, such as Cordyceps sinensis, is a parasitic complex of fungus and caterpillar, which has been used for medicinal purposes for centuries particularly in China, Japan and other Asian countries. This article gives a general idea of the latest developments in C. sinensis research, with regard to the active chemical components, the pharmacological effects and the research and development of products in recent years.

Key findings: The common names for preparations include DongChongXiaCao in Chinese, winter worm summer grass in English. It has many bioactive components, such as 3'-deoxyadenosine, cordycepic acid and Cordyceps polysaccharides. It is commonly used to replenish the kidney and soothe the lung, and for the treatment of fatigue. It also can be used to treat conditions such as night sweating, hyposexuality, hyperglycaemia, hyperlipidaemia, asthenia after severe illness, respiratory disease, renal dysfunction, renal failure, arrhythmias and other heart disease and liver disease. Because of its rarity and outstanding curative effects, several mycelia strains have been isolated from natural Cordyceps and manufactured by fermentation technology, and are commonly sold as health food products. In addition, some substitutes such as C. militaris and adulterants also have been used; therefore, quality control of C. sinensis and its products is very important to ensure their safety and efficacy.

Summary: Recent research advances in the study of Cordyceps, including Cordyceps mushrooms, chemical components, pharmacological functions and developmental products, has been reviewed and discussed. Developing trends in the field have also been appraised.

Cordyceps

Pharmacological actions of Cordyceps, a prized folk medicine

T B Ng 1, H X Wang

- PMID: 16354395
- DOI: 10.1211/jpp.57.12.0001

Abstract

Cordyceps species, including C. sinensis, C. militaris, C. pruinosa and C. ophioglossoides, are prized traditional medicinal materials. The aim of this article is to review the chemical constituents and pharmacological actions of Cordyceps species. The chemical constituents include cordycepin (3'-de-oxyadenosine) and its derivatives, ergosterol, polysaccharides, a glycoprotein and peptides containing alpha-aminoisobutyric acid. They include anti-tumour, anti-metastatic, immunomodulatory, antioxidant, anti-inflammatory, insecticidal, antimicrobial, hypolipidaemic, hypoglycaemic, anti-ageing, neuroprotective and renoprotective effects. Polysaccharide accounts for the anti-inflammatory, antioxidant, anti-tumour, anti-metastatic, immunomodulatory, hypoglycaemic, steroidogenic and hypolipidaemic effects. Cordycepin contributes to the anti-tumour, insecticidal and antibacterial activity. Ergosterol exhibits anti-tumour and immunomodulatory activity. A DNase has been characterized.

Cordyceps

Medicinal uses of the mushroom Cordyceps militaris: current state and prospects

Shonkor Kumar Das 1, Mina Masuda, Akihiko Sakurai, Mikio Sakakibara

- PMID: 20650308
- DOI: 10.1016/j.fitote.2010.07.010

Abstract

Cordyceps militaris is a potential harbour of bio-metabolites for herbal drugs and evidences are available about its applications for revitalization of various systems of the body from ancient times. Amongst all the species, C. militaris is considered as the oldest source of some useful chemical constituents. Besides their popular applications for tonic medicine by the all stairs of the community, the constituents of C. militaris are now used extensively in modern systems of medicine. The current survey records the mysterious potentials of C. militaris are boosting up the present herbal treatments, as well as gearing up the green pharmacy revolution, in order to create a friendly environment with reasonable safety. Evidence showed that the active principles of C. militaris are beneficial to act as pro-sexual, anti-inflammatory, anti-oxidant/anti-aging, anti-tumour/anti-cancer/anti-leukemic, anti-proliferative, anti-metastatic, immunomodulatory, anti-microbial, anti-bacterial, anti-viral, anti-fungal, anti-protozoal, insecticidal, larvicidal, anti-fibrotic, steroidogenic, hypoglacaemic, hypolipidaemic, anti-angiogenetic, anti-diabetic, anti-HIV, anti-malarial, anti-fatigue, neuroprotective, liver-protective, reno-protective as well as pneumo-protective, let alone their other synergistic activities, which let it be marketable in the western countries as over-the-counter medicine. A number of culture techniques for this mushroom have been noticed, for example, storage/stock culture, pre-culture, popular/indigenous culture (spawn culture, husked rice culture and saw dust culture) and, special/laboratory culture (shaking culture, submerged culture, surface liquid culture and continuous/repeated batch culture). The prospects for herbal biotechnology regarding drug discovery using C. militaris delivering what it has promised are high, as the technology is now extremely more powerful than before. This study chiefly highlights the medicinal uses of the mushroom C. militaris including its culture techniques, also aiming to draw sufficient attention of the researchers to the frontier research needs in this context.

Cordyceps

Effects of Cordyceps militaris extract on angiogenesis and tumor growth

Hwa-seung Yoo 1, Jang-woo Shin, Jung-hyo Cho, Chang-gue Son, Yeon-weol Lee, Sang-yong Park, Chong-kwan Cho

- PMID: 15132834

Abstract

Aim: To evaluate the effects of Cordyceps militaris extract (CME) on angiogenesis and tumor growth.

Methods: Human umbilical vein endothelial cells (HUVEC), HT1080, and B16-F10 cells were used. DNA fragment, angiogenic related gene expressions (MMPs, bFGF, VEGF, etc), capillary tube formation, wound healing in vitro, tumor growth in vivo were measured.

Results: CME inhibited growth of HUVECs and HT1080 ($P<0.01$). CME 100 and 200 mg/L reduced MMP-2 gene expression in HT1080 cells by 6.0 % and 22.9 % after 3-h and 14.9 % and 32.8 % after 6-h treatment. CME did not affect MMP-9 gene expression in B16-F10 melanoma cells. CME 100 and 200 mg/L also reduced bFGF gene expression in HUVECs by 22.2 % and 41.3 %. CME inhibited tube formation of endothelial cells in vitro and in vivo. CME repressed the growth of B16-F10 melanoma cells in mice compared with control group ($P<0.05$).

Cordyceps

Comparison of protective effects between cultured Cordyceps militaris and natural Cordyceps sinensis against oxidative damage

Hui Mei Yu 1, Bor-Sen Wang, Shiow Chyn Huang, Pin-Der Duh

- PMID: 16608242
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Abstract

The Chinese herb DongChong-XiaCao originating from Cordyceps sinensis is widely used as a traditional medicine in China for treatment of a wide variety of diseases. The extracts of Cordyceps sinensis (CSE) and Cordyceps militaris (CME) are well-known for their biological effects. In the present study, the antioxidant efficiency of CME and CSE in protecting lipid, protein, and low-density lipoprotein (LDL) against oxidative damage was investigated. CME and CSE showed weakly inhibitory effect on liposome oxidation, that of CME being superior to that of CSE. As for the protein oxidation model system, the inhibitory effect of CME on protein oxidation was inferior to that of CSE. CME and CSE at 1.0 mg/mL showed 50.5 and 67.1% inhibition of LDL oxidation, respectively. The contents of bioactive ingredients cordycepin and adenosine in CME are higher than those of CSE; however, both cordycepin and adenosine showed no significant antioxidant activity as determined by the Trolox equivalent antioxidant capacity method. Polyphenolic and flavonoid contents are 60.2 and 0.598 microg/mL in CME and 31.8 and 0.616 microg/mL in CSE, respectively, which may in part be responsible for their antioxidant activities. In addition, a polysaccharide present in CME and CSE displayed antioxidant activity, which suggested that the activity might be derived partly from polysaccharides of CME and CSE. The tendency to scavenge the ABTS(*)(+) free radical and the reducing ability of CME and CSE display concentration-dependent manners, suggesting that CME and CSE may be potent hydrogen donators. On the basis of the results obtained, the protective effects of CME and CSE against oxidative damage of biomolecules are a result of their free radical scavenging abilities.