Medicinal Mushrooms

A Clinical Guide

Martin Powell

Mycology Press
Contents

Preface 6
Acknowledgements 7
A Note on Mushroom Names 7
Author’s Disclaimer 7
Quick Reference Mushrooms 8
Quick Reference Conditions 11

Introduction 14
Members of the Fungal Kingdom 16
Rich Sources of Pharmacologically Active Compounds 17
  Polysaccharides (beta-glucans, proteoglycans and related compounds) 17
  Proteins 19
  Triterpenes 19
  Phenols 20
  Sterols 20
  Chitin 20
  Enzymes 21
Mushroom Polysaccharides - Essential Nutrients for our Immune System? 21
Pharmacokinetics of Mushroom Polysaccharides 24
Th1-Th2, Mushroom Polysaccharides and Immune Balance 25

Understanding Mushroom Products 26
Fruiting Body/Conk/Sclerotium 26
Extracts 26
Spores 27
Mycelium 27
Mycelial Biomass 28
Combination Products 28

Prescribing Medicinal Mushrooms 29
Are there any side effects? 29
Can I use mushroom supplements for patients with candidiasis or other fungal conditions? 29
But aren’t mushrooms considered Damp in traditional Chinese medicine (TCM)? 29
Can mushrooms be taken alongside conventional treatment? 30
Can pregnant or breastfeeding women take medicinal mushrooms? 30
Medicinal Mushrooms

Agaricus brasiliensis/Agaricus blazei
Antrodia camphorata/Antrodia cinnamomea
Armillaria mellea (Honey Mushroom)
Auricularia auricula/Auricularia polytricha (Wood Ear)
Cordyceps sinensis
Flammulina velutipes (Enokitake)
Ganoderma lucidum (Reishi)
Grifola frondosa (Maitake)
Hericium erinaceus (Lion’s Mane)
Inonotus obliquus (Chaga)
Lentinus edodes (Shiitake)
Phellinus linteus
Pleurotus ostreatus (Oyster Mushroom)
Polyporus umbellatus/Grifola umbellata
Poria cocos
Trametes versicolor/Coriolus versicolor
Tremella fuciformis

Medicinal Mushrooms in Cancer Therapy

Medicinal Mushrooms and Chemotherapy
Medicinal Mushrooms and Radiotherapy
Medicinal Mushrooms and Surgery
Research on Medicinal Mushrooms in Cancer
Bladder Cancer
Brain Cancer
Breast Cancer
Cervical Cancer
Colorectal Cancer
Endometrial Cancer
Gastric Cancer
Leukaemia
Liver Cancer
Lung Cancer
Lymphoma
Ovarian Cancer
Pancreatic Cancer
Prostate Cancer
Skin Cancer
Clinical Notes
Medicinal Mushrooms for Other Conditions

Allergic Rhinitis (Hayfever) 96
Alzheimers Disease 96
Arrhythmia 96
Asthma 97
Bacterial Infections 97
Benign Prostatic Hyperplasia (BPH) 98
Candidiasis 98
Chronic Fatigue Syndrome (CFS - ME) 99
Dementia 100
Diabetes 100
Erectile Dysfunction 101
Fluid Retention 101
Gastritis 102
Hepatitis 102
Herpes 102
HIV 103
HPV 103
Hypercholesterolaemia 104
Hypertension 105
Infertility 105
Inflammatory Bowel Disease 106
Influenza 107
Insomnia/Anxiety 107
Kidney Damage 107
Liver Damage 108
Meniere’s Syndrome 108
Multiple Sclerosis 108
Nerve Damage 109
Parkinsons Disease 109
Rheumatoid Arthritis 110
Systemic Lupus Erythematosus 110

Appendix, Glossary, Index and Resources

Medicinal Mushrooms According to Traditional Chinese Medicine 116
Glossary 120
Index 125
Further Reading 128
Taiwanese name
*Niu Chang Chih*

This native Taiwanese mushroom is starting to attract interest because of the exceptionally high concentration of its triterpenoid compounds and their structural diversity. Other important bioactive compounds include polysaccharides, maleic/succinic acid derivatives, benzenoids and benzoquinone derivatives.

In the wild *A. camphorata* grows solely on the tree *Cinnamomum kanehirai*, a species of cinnamon that grows at altitudes of between 450 and 2,000m in the mountains of Taiwan. As the fruiting body only develops fully once the tree is dead, in the past many trees were felled to supply demand for this unique and extremely lucrative mushroom (wild *A. camphorata* fetches up to US$15,000/kg) and this, coupled with the fact that *C. kanehirai* itself is highly sought for furniture manufacture, has led to over-exploitation, with the result that *C. kanehirai* is now protected by the Taiwanese government.

To replace the wild-collected material, commercial cultivation of *A. camphorata* has been developed using a variety of techniques to produce either cultivated fruiting body, pure mycelium (grown by liquid fermentation), or mycelial biomass (mycelium and residual substrate). Levels of triterpenes are highest in the fruiting body products, which are also the most expensive, and lowest in the biomass products, with liquid fermentation mycelial products offering a cost-effective intermediate option.

* A. *camphorata* has a wide range of traditional indications, including: alcohol intoxication, cancer, hypertension, fatigue, viral infection and liver disease.
HEPATOPROTECTIVE - The use of *A. camphorata* by Taiwanese natives to counter the adverse effects of excessive alcohol consumption was first reported by a traditional Chinese medicine doctor, Wu-Sha in 1773. In animal experiments both the fruiting body and mycelium have been shown to protect against alcohol-induced hepatitis and liver steatosis (fatty liver), as well as CCl4 and cytokine induced liver damage, ameliorating increases in AST, ALT and ALP levels and histopathological changes in a dose-dependent manner with no observed lesions.\(^2,3\)

*A. camphorata* fruiting bodies also inhibited alcohol-induced rises in cholesterol and hepatic lipids in rats with moderate effect at a dose of 0.025g/kg and increased efficacy at a dose of 0.1g/kg.\(^4\)

Separately it has been shown that *A. camphorata* possesses strong antioxidant activity and has been suggested that this is a major contributor to its hepatoprotective properties.\(^5,6\) Its antioxidant properties are correlated with the presence of total polyphenols, crude triterpenoids and the protein/polysaccharide ratio of the polysaccharide extract.\(^7\)

*A. camphorata* polysaccharides also show hepatoprotective and anti-hepatitis B activity,\(^8,9\) while a number of maleic/succinic acid derivatives showed potent inhibitory activity against hepatitis C protease through competitive inhibition.\(^10\)

In addition *A. camphorata* has been shown to suppress the invasive potential of liver cancer cells through inhibition of NF-kappaB\(^11\) and to induce apoptosis in human hepatoma cells.\(^12,13\)

CANCER - As well as its effects on liver cancer, multiple in vitro and in vivo studies show inhibition of cancer cell growth and migration together with increase in apoptosis in various cancer cell lines including breast, prostate, liver, bladder and oral carcinoma.\(^1,14-16\)

ASTHMA - The immune modulating and anti-inflammatory actions of *A. camphorata* offer potential in asthma treatment with animal experiments showing that *A. camphorata* polysaccharides dose-dependently inhibited the development of airway hyperresponsiveness, airway eosinophilia and Th2 immune status.\(^17\)

SYSTEMIC LUPUS ERYTHEMATOSUS (SLE) - A mycelial extract of *A. camphorata* reduced urine protein and creatinine levels and suppressed changes in the kidney glomerular basement membrane (a histological hallmark of SLE) at a dose of 400mg/kg in a mouse model of SLE, suggesting ability to protect the kidney from autoimmune disease.\(^18\)

CARDIOVASCULAR DISEASE - *A. camphorata* has traditionally been used to treat a variety of heart conditions, including hypertension and atherosclerosis, and *A. camphorata* extracts have been reported to inhibit thickening of blood vessel walls and to promote vasodilation.\(^19,20\)
CLINICAL SUMMARY
Main Therapeutic Application - Liver Disease
Key Component - Triterpenes, Polysaccharides

Dose - While the more expensive fruiting body contains the highest level of triterpenes and is preferred in Taiwan for cancer treatment, mycelium produced by liquid fermentation is increasingly available and has been shown to offer a cost effective alternative for treatment of liver conditions, with a recommended dose of 1-3g/day.

Caution - Patients on anti-coagulant medication.

REFERENCES