SYNONYMS
maitake, pleurotus, shiitake, cordyceps

DESCRIPTION
In China and other Asian countries, mushrooms have been revered for their nutritional, as well as their medicinal properties for many centuries. Particularly within Traditional Chinese Medicine (TCM), they have long been in use as a result of their health promoting effects with regard to many different ailments. These medicinal mushrooms exhibit a broad spectrum of ingredients, the most important of which is shared among several species: a high polysaccharide content. These polysaccharides, in particular betaglucans, are endowed with a specific structure allowing them to influence the functioning of the immune system. In addition to polysaccharides, these special mushrooms offer an abundance of bioactive substances that contribute to their medicinal effect, among which one finds antioxidants, sterols, triterpenes, nucleotides, amino acids, vitamins and minerals.

EFFECT
The most important health promoting effect in medicinal mushrooms rests upon the high level of active polysaccharides. In particular betaglucans with a 1,3 -1,6 basic structure exhibit a number of immuno-stimulating properties and have shown to be of good use in the treatment of several ailments.

In particular shiitake (Lentinus edodes) and oyster mushrooms (Pleurotus ostreatus) have been known to be very rich sources of glucans, in which lentinan and pleuran are regarded as the most potent substances, respectively. D-fraction is regarded as the most important glucan extract in maitake (Grifola frondosa), and it also has powerful immuno-modulating properties. Another mushroom with a wide range of applicability and with a healthy effect on immune function, is Cordyceps sinensis.

By now, the medicinal properties of mushrooms have been researched and described in a large number of scientific publications. These publications show that medicinal mushrooms offer more than just immuno-modulating properties; they are also anti-inflammatory and have a lowering effect on cholesterol levels, blood pressure and blood sugar levels.

Each medicinal mushroom has its own unique biochemical composition, making it difficult to relate the nutritional and medicinal properties to just one single component. Scientific research confirms that the combination of ingredients warrants synergistic effects. These effects may be of vital importance to their medicinal properties.

INDICATIONS
Cardiovascular diseases
Hypercholesterolemia may cause a build-up of atherosclerotic plaques in the coronary arteries, which is a significant risk factor for coronary heart disease. Maitake, pleurotus, shiitake and cordyceps have in several studies been shown to lower total cholesterol in the serum, as well as to improve lipid metabolism. This prevents the build-up of atherosclerotic plaques. This beneficial effect may be contributed to both their fibre content, as well as to their specific substances and the interactions among them.

An important synergistic substance of oyster mushroom is lovastatin, which may inhibit cholesterol synthesis in the liver by downregulating the production of the enzyme HMG-CoA-reductase. The cholesterol lowering effects of shiitake may primarily be contributed to regulation of lipid metabolism by the component eritadenine. In a number of animal studies, several medicinal mushrooms have been shown to lower blood pressure, which may contribute to the reduction of cardiovascular diseases. Their antihypertensive effect is probably the result of betaglucans. In addition, cordyceps and D-fraction from maitake have been shown to be beneficial in the prevention and treatment of
Renal hypertension.

**Diabetes type II**
Several in vitro studies, animal studies and a small number of clinical studies have shown that medicinal mushrooms have antidiabetic properties. A significant lowering of blood sugar can in particular be observed following the use of pleurotus, maitake and cordyceps. The properties observed, included antihyperglycemic properties, decrease in insulin resistance and better regulation of blood glucose. A recent in vitro study has shown a hypoglycemic effect as a result of downregulation of the alphaglucosidase enzyme.

**Immunomodulation – anti-inflammatory effect**
The strong immunomodulating effect of medicinal mushrooms is mainly attributed to the active polysaccharides and the synergistic effect of the ingredients. As a result of increased macrophage activity, and through a number of regulatory mechanisms, the immune system is stimulated to perform a large number of reactions. Examples include:
- Increases immunity to viral and bacterial infections, in particular through lentinan and other components of shiitake (for instance, TBC, influenza, respiratory infections).
- Hepatoprotective properties, in particular cordyceps, D-fraction from maitake and shiitake.

Many in vitro and in vivo analyses have uncovered beneficial properties of medicinal mushrooms with regard to acute and chronic infectious diseases, including HIV, herpes and hepatitis, in particular D-fraction from maitake, lentinan and cordyceps.

Extracts of shiitake, maitake and oyster mushroom have been shown to offer a strong reduction in inflammatory activity, for instance through inhibition of TNF-α, NF-κB and NO synthesis. The high antioxidant activity plays an important role in the prevention and reduction of the damage resulting from oxidative stress.

**Inflammatory bowel diseases**
Both in vitro and in vivo studies show that extracts of shiitake, maitake and oyster mushroom improve severity of inflammatory conditions of the gastrointestinal tract (ulcerative colitis, Crohn's disease) by inhibiting inflammatory mediators and NF-κB activity. Due to their immunomodulatory and anti-inflammatory properties, these extracts could play a beneficial role in the therapeutic treatment of intestinal inflammation.

**Allergic) respiratory infections**
With regard to respiratory infections such as asthma, in which there is an allergic component, a number of studies suggest that betaglucans from medicinal mushrooms may improve allergy-related inflammation and thus lessen the severity and number of symptoms. The anti-allergic properties of the betaglucan extract pleuran were measured during a randomised, double-blind, placebo-controlled study in children with recurrent respiratory infections. In particular in atopic children, pleuran was shown to have a stabilising effect on serum immunoglobulin (IgE) as well as on the number of peripheral eosinophiles. Both are important biomarkers for allergic inflammation.

The effectiveness of pleuran in respiratory infections is also supported by a double-blind, placebo-controlled study in endurance athletes. Significantly less symptoms of upper respiratory tract infection were observed in the experimental group, compared to placebo. In addition, an increase in the number of Natural Killer cells was seen. Cordyceps also has a wide range of applicability with regard to the respiratory tract. Clinical studies support the beneficial effect of cordyceps in, among others, bronchitis, bronchial asthma and COPD.

**Antioxidant effect – (neuro)degenerative diseases**
Free radicals form inevitably as a result of oxidative processes in the body. It appears that there exists a direct relationship between oxidative stress and the development of degenerative diseases such as cardiovascular diseases and neurodegenerative diseases such as Alzheimer's disease and Parkinson's disease. Antioxidants lower the amount of free radicals by neutralising them. Medicinal mushrooms contain a large number of bioactive substances with antioxidant properties, including, but not limited to, phenols (for instance flavonoids), tocopherols, vitamin C, L-ergothioneine and carotenoids. L-ergothioneine is a stable antioxidant that does not occur in vegetables or fruits.

**CONTRA-INDICATIONS**
Not enough is know about the effects of medicinal mushrooms with regard tot pregnancy and lactation. Do not use when allergic or hypersensitive to (certain) mushrooms.

**SIDE EFFECTS**
The use of cordyceps or shiitake in high doses could cause stomach cramps. However, high-quality research in this area is still lacking. No serious side effects are known of medicinal mushrooms administered through commercial
INTERACTIONS
When using blood sugar lowering, antihypertensive of immunosuppressive medication, the dose may have to be adjusted accordingly, as they could interact with the medicinal mushroom extracts.

DOSEAGE
Dosage depends on indication, the combination of substances and the means of administration.

(please view the monograph beta-1,3/1,6-glucan for more information about the properties of glucans)

REFERENCES
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21. Natura Foundation – Cordyceps sinensis