



## MEDICINAL MUSHROOMS IN GERMANY

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Officially we haven't medicinal mushrooms in Germany. We only have useful mushrooms and some of them also have a medicinal effect – in other words – healing properties. This is similar to, for example, garlic, apples or red wine.

If we speak about medicinal mushrooms, the pharmaceutical industry in my country and its lobby would intervene until the German authorities produced an appropriate regulation to classify mushrooms as medicine. This would result in a long-lasting and extremely expensive process of registration before *Ganoderma* or *Grifola* could be used, and this should be avoided. Therefore, we deal with mushrooms which count only as foodstuff, like asparagus, tomato, lemon, apple and others, all of which have specific healing properties.

For many previous decades, we in the western world cultivated only the white button mushroom (*Agaricus bisporus*) and this only for consumption. Looking at the Proceedings of the International Society for Mushroom Science (ISMS) Congresses, the first contribution on medical effects was published in 1972 in London by Tokita, Shibukawa, Yasumoto and Kaneda from the Department of Food Chemistry, Tohoku University in Sendai, Japan. They isolated a plasma-cholesterol reducing substance from shiitake (*Lentinula edodes*). Two years later, during the 9<sup>th</sup> ISMS Congress in Japan, at least nine studies dealt with the medical effects of mushrooms, especially those of shiitake.

From this time, and especially from the early nineties, knowledge relating to the medical effects of large mushrooms has grown rapidly. In the interim, China has become the leading country in this context since the use of mushrooms has been part of Traditional Chinese Medicine (TCM) for several thousands of years. Numerous publications in several journals, international conferences on the topic “medicinal mushrooms” and many providers of medicinal mushroom products give the impression that East Asia - especially China - is the cradle of this field of applied mycology.

However, this statement is not absolutely true.

### History

Without doubt, East Asia and especially China, lead in the cultivation and use of medicinal mushrooms. However, this kind of medicine has also been known in the western hemisphere for thousands of years, and knowledge of medicinal mushrooms and their use was widespread in both Europe and America.

As Christopher Hobbs described in his book “Medicinal Mushrooms – An Exploration of Tradition, Healing and Culture” published in 1995, the Indians of

North America used puffballs (*Lycoperdon* sp.) and earthstars (*Geastrum* sp.) as well as *Fomitopsis officinalis* as medicine. In Central and South America, mushrooms were also well known by the native populations, but we are not entirely sure if their use was only medicinal or mainly for generating hallucinogenic or visionary effects.

Europe, especially Germany, also has a long tradition of using mushrooms as medicine. Ancient scholars such as Galen, Dioscorides and mainly Pliny (Gaius Secundus) reported on the applications of a specific mushroom called “Agaricum”, which was in reality *Laricifomes officinalis*, a wood-destroying species, especially of larch.

Later, in the Middle Ages, there are reliable reports on the use of mushrooms in herb preparations for healing purposes. The use of mushrooms, mainly Agaricum, is well documented in “Codex Manuscriptus Medicinalis”, published in Germany in 795 A.D, and also in the writings of the outstanding German natural scientist of the 12<sup>th</sup> century, Hildegard von Bingen

Friedrich Jacob Merck was a chemist who, in 1668, opened a pharmacy in Darmstadt. From his small shop grew the worldwide pharmaceutical and chemical company, Merck Corporation, which now has an annual turnover of 10 billion euros.

In those years, many herbs were used as medicine. They were both collected and also cultivated in cloistered herb gardens such as that tended to by Hildegard von Bingen. However, the selection of medicines in Friedrich Jacob Merck’s pharmacy also contained mushrooms. Species used at the time included:

- *Fomes fomentarius* – used to stop bleeding.
- *Laricifomes officinalis*, Agaricum – also used to stop bleeding, as a laxative, and for chest diseases.
- *Langermannia gigantean*, Giant Puff Ball – also used to stop bleeding. The paste made from the mature spores was a significant medium in the Middle Ages for stopping bleeding after amputation. In Germany, *Langermannia gigantean* was also used in homeopathy and always available.
- *Auricularia auricula*, Jew’s Ear – used for inflammation of the eye and throat.
- *Amanita muscaria*, Fly agaric – used for malignant tumours and for nervous disorders.
- *Phallus impudicus*, Stinkhorn – used for gout.
- *Boletus satanas*, Satan's mushroom - used for gall bladder and liver disorders.
- *Armillaria mellea*, Honey Fungus – used as a laxative.

At the beginning of the 19<sup>th</sup> century, the first small factories for herb extract production were set up and the demand for raw material increased. This demand could not be met by collecting the herbs, and cultivation gained greater importance.

So, what happened to the mushrooms? People were unable to cultivate them, and it was not easy to collect mushrooms as herbs. They do not occur in natural locations as reliably and in such abundance as do plants. Therefore, medicinal mushrooms faded more and more into oblivion until, in Europe at least, they were virtually forgotten.



Mushrooms were only regarded as edible or poisonous and, after cultivation techniques were developed, some were grown for consumption.

### **Present situation**

As mentioned above, the ISMS Congress in Japan and Taiwan in 1974 opened the eyes of the delegates from the western hemisphere. Japanese colleagues, especially Dr. Kisaku Mori, showed us several health properties of shiitake and proposed cultivating mushrooms not only for simple consumption as everyday vegetables but also as healthy food.

However, it took almost another twenty years before some western scientists began to pay more attention to the medicinal effect of mushrooms. In the USA, Kenneth Jones, Terry Willard, Paul Stamets, and especially Christopher Hobbs, published valuable information on this topic using East Asian, mainly Chinese, sources.

As early as 1950, Zeitlemayr in Germany reported on the healing properties of mushrooms. His and also other statements were based on the knowledge of the Middle Ages in Europe. They had nothing in common with the Asian sources. In 1978, Molitoris, former mycology professor in Regensburg (Germany), gave a talk at our Institute on “Fungi as herbs – historical review and outlook”. However, at that time, contributions about medicinal mushrooms in the scientific and commercial literature in America and Europe did not lead to their use in practice.

In Germany, the book “The healing power of fungi – healthy with mycotherapy “, which I published in 1997, initiated a development focused on the use, sale and manufacturing of medicinal mushroom products that, so far, remains unbroken. In the interim, the number of people in my country using medicinal mushroom products has constantly increased, and the quantity of available products has increased correspondingly.

During the last fifteen years, several small companies dealing in medicinal mushroom products have set up business in Germany. Most buy mushroom extracts and powders from China, and capsules and tablets incorporating the Chinese raw materials are produced in German factories. Only very few companies cultivate medicinal mushrooms themselves, and these are grown organically. The use of organically grown medicinal mushrooms is regarded as a useful argument when competing with companies who buy material from China. On the other hand, the prices of products imported from China are highly competitive. Let me give you some examples:

The price for powdered shiitake, reishi or maitake – including airfreight from Shanghai to Düsseldorf, Germany – averages 18 Euro/kg. It is simply impossible to produce these materials at such a low cost in Germany. The same is also true for mushroom extracts. Depending on the mushroom species, we can buy extracts in China – including airfreight – for between 90 and 140 Euro/kg.

Of course, without reliable partners, there are risks associated with buying these products in China, and it takes time to establish a good partnership with Chinese companies. However, after establishing good connections with Chinese managers, you will not have problems with the quality of the products or with the terms of shipment. Regular buyers receive an official certificate, which contains data evaluating the quality of a product.

The German market for medicinal mushroom products is still small but is constantly increasing. Considering the fact that Germans in general have a high affinity for alternative medicinal methods, the economic opportunities for companies dealing in medicinal mushrooms in my country are not bad. Different methods are used to market the products:

Sale to consumers via the internet is well established. In addition, several pharmacies place medicinal mushroom products on their shelves, or alternatively buy and sell to customers according to order. Also, some medical doctors with a special qualification in alternative medicine prescribe or recommend such products to their patients. These so-called Heilpraktiker, which is a specific medical profession in Germany, Switzerland and Austria, are also highly interested in medicinal mushrooms.

However, the problem we have to face is the still undecided status of medicinal mushrooms and their products in Germany. Manufacturing companies and consumers classify them as food supplements, while some local and federal authorities, but especially representatives of the pharmaceutical industry, classify them as medicines. The pharmaceutical industry has started to fight companies which are involved in the medicinal mushroom business and claim they are in fact dealing in and selling unauthorized medicines.

Summarizing the present situation, there is no doubt about the successful introduction of a new use of large mushrooms. They are available today not only as food but some are also used as food supplements. However, this development has not led to significantly higher mushroom production in Germany, not even in cases where they are used primarily for food supplement production.

## **Outlook**

In Germany, we anticipate a constantly increasing demand for powdered and extracts of so-called medicinal mushrooms. Although only used as food supplements, consumers like them, medical doctors and Heilpraktiker recommend them, and all involved have learned a lot about their very satisfying therapeutical effects. I believe the use of mushroom powders and extracts for maintaining good health and also for curing various disorders has been firmly established in Germany.

The question is how we handle the status of these mushrooms and the products made from them. Can we establish nutraceuticals as a new class of products, or can we use them alternatively as food supplements? Perhaps in future, some of them can also be registered as medicines. It is a very exciting question.

At the present time, it is difficult to predict whether the pharmaceutical industry has started to pay more attention to mushrooms, and also if it has perhaps started using them as a source of new medicines.

However, I believe that even if the pharmaceutical industry uses mushrooms as a source of medicines, fruit body production will not increase, not even in Germany. I suspect that, if the pharmaceutical industry does not have sufficient access to the natural fungal material, it will make tremendous efforts to establish liquid or solid state fermentation technologies to produce fungal biomass. Finally dried mycelium powder or, alternatively, mycelial extracts, will be used for manufacturing commercial products.

However, even then, the pharmaceutical industry will not seriously enter the medicinal mushroom business, and the sale of such products will remain in the hands of small companies. I do not believe such a development could help to establish relevant medicinal mushroom farms in Germany, or generally within the Western World. I believe the tremendous advantages of using Chinese suppliers, especially the offer of low prices on the one hand and the provision of good-quality material on the other, cannot be beaten, at least within the next two decades. Additionally, economic exchange with China is also a high priority from a political point of view in most industrialised countries. Consequently, it seems very clear to me that we are going to buy and use Chinese fungal material as a source for nutraceutical production in Germany. Therefore, the use of medicinal mushrooms will remain a remarkable factor in the future of health care in Germany.

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