Guide to Medicinal Mushrooms

by Adam Haritan

Identification
Medicinal Benefits
How to Make Decoctions
How to Make Dual Extracted Tinctures
And More
Mushrooms wear many hats.

No, not fedoras, stetsons, and top hats. Fungi don metaphorical hats. For example, mushrooms are world-class decomposers, recyclers, bioremediators, parasites, pathogens, poisons, hallucinogens, and food. Additionally, the fungal kingdom houses some of the world’s most powerful medicines. What traditional cultures have known for centuries, modern research is continually discovering:

**Mushrooms contain potent medicinal compounds that can aid the human body in functioning optimally.**
Chaga is a fungus that grows almost exclusively on birch trees in the cooler areas of the Northern Hemisphere. It has been rarely found on elm, beech, and hornbeam trees.

Traditionally, it was used as an herbal medicine in Siberian and Asian medicine, and it is often currently referred to as the “King Of The Medicinal Mushrooms.”

Mushroom hunters confuse chaga more so for a tree burl than for any other growth. At first glance, it may be difficult to discern between these two entities, though hopefully the following description will alleviate some of this confusion. A burl is an outward growth on a tree usually attributed to environmental stress, whether it be physical trauma, an insect, fungus, or even pollutants. Burls can be made up of numerous

**Identification**

**Sterile Conk:** Outer portion black, cracked, and brittle; inner portion golden orange, corky; phallic or cone-like projection from tree.

**Habitat:** Found almost exclusively on birch trees (*Betula* spp.), though rarely found on elm, beech, and hornbeam; year round.

**Range:** Northern North America

**Look-alikes:** Tree burls are extensions from their host trees, not fungi; Black knot (*Dibotryon morbosum*) is typically found on members of the *Prunus* genus. Both of these lack the golden-orange interior of chaga.

**Edibility:** Medicinal
buds that would typically develop into new shoots, but instead they remain dormant.

Whatever the true cause, a burl (pictured left) is not inherently detrimental to the tree. Rather, as trees mature, so do their burls, which develop beautiful patterns and colors that are prized by furniture makers and wood turners.

It’s important to understand that a burl is not a fungus, while chaga is. A burl is simply an outgrowth of the tree, meaning the tree’s bark extends to include the burl. The two are not necessarily separate entities.

While the colors may vary depending on the species, burls are usually the same color, if not a bit darker, than the color of its tree. Contrast this to chaga, which usually forms as a blackened crust (on its outside), and appears as a distinct entity on its host tree.

While burls can form on numerous tree species, I encounter them most frequently on oak trees (*Quercus* spp.) in Pennsylvania.

Chaga forms over several years within the tree and eventually erupts through the bark, pushing itself out from within. Thus, it is a distinct species from its host tree, and it appears as such.

Chaga — Note the black, brittle, outer material, and the golden orange inner amadou.

Chaga is not a mushroom in the truest sense of the word. Rather, it is a sclerotium — a hardened mass of compacted mycelium. The actual fruiting body typically appears after the host tree has died.
To distinguish chaga from a tree burl, ask yourself these questions:

- *Is this the right ecosystem for chaga?* Chaga usually grows in the circumpolar boreal deciduous forests.

- *On which tree is it growing?* Chaga grows almost exclusively on birch, though as stated previously, it has been found rarely on elm, beech, and hornbeam.

- *What color is it?* The outer surface of chaga is cracked, brittle, and relatively black (if not rather dark). A tree burl’s color resembles its host tree, perhaps a bit darker.

- *What color is the interior?* The interior of chaga is an unmistakable golden-orange color.

- *Does the specimen appear to be a separate species, distinct from its host tree?* If so, it may be chaga. If the specimen appears to be an extension of the tree, bark and all, you may be looking at a burl.

- *Is the growth phallic in nature, or rounded?* Chaga usually grows as a phallic, cone-like projection. Tree burls are generally rounded outgrowths.

Chaga is notoriously hailed for two of its medicinal compounds: betulin and its derivative, betulinic acid. Betulin is a triterpene, while betulinic acid is a derivative of a triterpene, known as a triterpenoid (1). Betulinic acid has demonstrated anti-bacterial, anti-viral, anti-inflammatory, anti-HIV, anti-malaria, and antioxidant effects in numerous studies (2). Its precursor, betulin, has been shown to possess anti-tumor and anti-cancer properties (3). These molecules are concentrated in the outer black portion of the fungus and can be extracted most effectively for human consumption with non-polar solvents (i.e. alcohol).

Additionally, chaga contains a diverse group of molecules known as polysaccharides. These molecules act, among other things, as antioxidants and immune system regulators (4, 5). Polysaccharides are typically most effectively extracted in hot water.
**Bulletproof Hot Chaga Chocolate Recipe**

One of the easiest ways to implement a medicinal strategy is to combine our medicinal plants and fungi with foods that taste great. Take, for instance, this recipe for hot chocolate. Instead of using Swiss Miss and tap water, we’re going to use only the finest ingredients to create a drink that’s beyond next-level good.

**Ingredients:**

- 12 oz wild harvested chaga decoction in spring water (for directions on creating a decoction, see page...)
- 1.5 T raw organic grass-fed butter
- 2 T raw organic cacao powder
- 1.5 T maple syrup
- Pinch of raw organic vanilla powder
- Pinch of sea salt

**Directions:**

Heat chaga decoction, if previously cooled, to a near-simmering temperature. Combine all ingredients in a blender, blend for 20 seconds, and enjoy!

Watch a video and see how to create the Bulletproof Hot Chaga Chocolate recipe by clicking here!
This is a North American species of reishi mushroom that grows primarily on fallen hemlock trees (*Tsuga canadensis*); early to mid summer.  

**Identification**  
**Cap:** Soft, white margin with lacquered hues of yellow, orange and red when young; dark red and corky when older; 2-12” across; usually attached to substrate by hardened and angled red stalk.  
**Underside:** White pore surface; bruising brown.  
**Spore Print:** Brown  
**Habitat:** Grows on standing dead or fallen eastern hemlock trees (*Tsuga canadensis*); early to mid summer.  
**Range:** Eastern North America.  
**Look-alikes:** *G. curtisi* and *G. resinaceum* grow on hardwoods.  
**Edibility:** Medicinal

A prominent red stalk, sometimes angled and quite long, attaches this fungus to its substrate.

*Ganoderma tsugae* has been shown to contain a significant number of immune-regulating polysaccharide fractions (1). Research shows that extracts from this fungus demonstrate anti-cancer properties against neuroblastoma, liver, breast, and colorectal cancers (2, 3).

When young, this medicinal mushroom displays beautiful lacquered hues of yellow, orange, and red with a white dough-like margin.
A new study from 2015 found that a triterpenoid extract (effectively extracted through alcohol) suppressed the allergenic response by inhibiting histamine release. Interleukin-4, another compound associated with allergies, was also effectively inhibited by the triterpenoid extract (4).

As *Ganoderma tsugae* matures and hardens, its cap displays a varnished-red color.

*Ganoderma tsugae* often grows in sets of two, connected by a central stalk to its substrate (eastern hemlock tree).

It is often stated that the classic Chinese reishi mushroom (*Ganoderma lucidum*), also known as lingzhi, grows in North America. However, newer research suggests that species once classified as *G. lucidum* in North America are actually part of either two groups — *G.curtisii* or *G.resinaceum*. This is becoming more and more discussed (and debated) in the professional mycology circles today. The true *G. lucidum* was a species originally described from Europe, and according to some researchers, its occurrence in North America hasn’t been proven with certainty (5, 6).

When hunting wild reishi mushrooms, you’ll usually find beetles, or the presence of beetles, on several fruiting bodies. These are orange and black, fungus-loving insects that belong to the genus *Megalodacne*. 

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Turkey tail is one of the most ubiquitous fungi found on dead or decaying logs and stumps. While no two specimens look exactly alike, turkey tail is one of the easier fungi to identify. It tends to grow in overlapping shelflike clusters. The caps are thin and leathery, displaying colorful concentric zones that radiate out toward the margin. As a polypore, the underside of turkey tail contains thousands of tiny microscopic pores (not gills). The pore surface is typically white to faded yellow, though with age it discolors brown. Turkey tail tends to fruit in large quantities — sometimes completely covering stumps, logs, and standing dead trees. Rarely will you see just one or two small growths. Its season begins in early summer and extends into winter.
The underside of turkey tail contains valuable information when identifying this fungus. Note the whitish color and the thousands of tiny pores.

It is easy to confuse turkey tail with several other wood-decaying polypore mushrooms; however, most look-alikes are non-toxic.

False turkey tail (*Stereum* sp.) is one particular genus of fungi that, at first glance, even a veteran mushroom hunter could confuse for true turkey tail. The species I most frequently encounter is *Stereum ostrea*, and while its caps tend to display colorful concentric zones like turkey tail, the key difference between the two can be found underneath: species of *Stereum* lack a pore surface, and instead contain a smooth underside... almost like parchment. (Remember — turkey tail has a distinct pore surface on the underside.) *Stereum* species are considered crust fungi, not polypores, thus they do not contain pore surfaces.

False turkey tail (*Stereum ostrea*) lacks a pore surface. The underside is completely smooth, as shown here in this photograph.

The violet toothed polypore (*Trichaptum biforme*) is another possible look-alike, though this fungus typically lacks the multi-colored concentric zones of turkey tail. Its cap contains hues of violet, especially when younger. As it matures, the cap surface becomes white and moss-covered. The most conspicuous difference can be seen on the underside. As its name suggests, this fungus contains contains a violet-colored pore surface (not white like turkey tail). As it matures, however, this violet color fades. Another difference between the two species is that the violet toothed polypore’s underside contains... no surprise... a toothed pore surface that extends out from the bottom of the cap. Turkey tail has a flat pore surface, not toothed.
The underside of violet toothed polypore (Trichaptum biforme). Note the violet color and the presence of "teeth."

Other look-alikes include members of the Trametes genus. For example, T. hirsuta resembles turkey tail, though the former contains a hairier cap surface. T. gibbosa is thicker with a whiter cap, and usually contains algal growth on its surface.

Turkey tail is one of the world’s most well-research medicinal mushrooms. One particular study carried out by Bastyr University and the University of Minnesota found that turkey tail can improve immune system status in immuno-compromised breast cancer patients following conventional cancer treatment (1). A more recent human trial found that a polysaccharide extracted from turkey tail mycelia displayed prebiotic effects in the human microbiome (stimulating the growth and maintenance of beneficial intestinal bacteria). In the same study, participants who were instead fed Amoxicillin (an antibiotic) demonstrated detrimental shifts towards more pathogenic bacteria in their microbiome, with effects lasting up to 42 days after their final antibiotic dose (2).

Turkey tail also contains the compound PSK, a protein-bound polysaccharide with potent anti-cancer effects (3). In Japan, PSK is prescribed to cancer patients routinely, both during and after radiation and chemotherapy.
Also known as maitake and sheep’s head, *Grifola frondosa* is a choice edible and medicinal mushroom that always demands a good hunt. It typically grows at the bases of oak trees, though it can sometimes be found at the bases of other hardwood trees, including maples and cherries.

This mushroom complements a variety of dishes, lending a hearty flavor and tender texture. With few look-alikes, hen of the woods is certainly one of the safest mushrooms to harvest.

Hen of the woods contains overlapping gray to brown caps attached to a branched base. Individual specimens can be rather large and weigh several pounds. Like other polypores (mushroom fruiting bodies with pores or tubes on the underside), *Grifola frondosa* has no gills.

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**Identification**

**Fruiting Body:** Overlapping gray to brown caps attached to a common, branched base; up to 12” in width or more.

**Caps:** Up to 2.5” each and spoon-shaped; gray-brown on surface, white underneath.

**Stalk:** White; stout and branched.

**Spore Print:** White

**Habitat:** Bases of oak trees or other hardwood trees; found throughout North America, though common in eastern half.

**Look-alikes:** Black-staining polypore (*Meripilus sumstinei*) bruises black; umbrella polypore (*Polyporus umbellatus*) contains circular caps.

**Edibility:** Edible & medicinal.
While not difficult to identify, this mushroom may resemble other non-toxic polypores. The non-toxic black staining polypore (*Meripilus sumstinei*) bruises black and can be found growing on buried wood. The umbrella polypore (*Polyporus umbellatus*) is another edible look-alike which contains white to grayish caps, though this mushroom has circular caps and is not as common.

The black-staining polypore (*Meripilus sumstinei*), pictured above, is a look-alike species. True to its name, the cap surface bruises black. When handled, it may take up to half an hour before showing any discoloration, and sometimes it will only faintly bruise black. The black-staining polypore is usually found earlier in the year, typically in the summer months. Hen of the woods, on the other hand, fruits in the fall. When younger, the black-staining polypore is edible, though at the stage pictured above, it’s much too tough to eat.

While it’s easy to identify and widely distributed, hen of the woods can be somewhat tricky to locate compared to other polypores, as the former blends in well with the autuminal foliage. Whenever you have the good fortune of finding one, walk around the tree — you may be pleasantly surprised to find a second or third.

Note the visual differences between hen of the woods (pictured above) and the black-staining polypore (pictured left). While hen of the woods may display darker shades of browns and blacks, it never bruises black when handled. Its caps are also typically smaller than those of the black-staining polypore. Additionally, hen of the woods can be found later in the year, from late August until November.
The Health Benefits of Maitake

Vitamin D

All mushrooms contain a fungal cell membrane molecule known as ergosterol. Upon UV exposure, this compound is converted into ergocalciferol, or vitamin D2. Some mushrooms contain more vitamin D2 than others depending on the species, environmental conditions, and post-harvest treatment. Maitake mushrooms, at 100 grams of fresh material, have been shown to contain more than 2,000 IU of vitamin D2 when exposed to supplementary UV treatment (1).

To increase the vitamin D2 content of your mushrooms, place them gills-side-up under direct sunlight. Sliced mushrooms will yield even more vitamin D2, as this method increases surface area and allows more ergosterol to be exposed to sunlight (2).

Cancer

There is ample research suggesting that maitake mushrooms may play a role in the protection against various cancers, with one key compound gaining most of the attention. Known as D-Fraction, this polysaccharide has the ability to enhance certain immune system cells, such as macrophages, helper T cells, and cytotoxic T cells, which all work together to attack tumor cells.

In one clinical trial, D-Fraction was administered to cancer patients without the combined use of conventional therapies. As a result, metastatic tumor growth slowed down, tumor lab markers decreased, and natural killer cell activity increased (natural killer cells are immune system cells that play a role in inducing tumor cell death). These results were witnessed in all patients (3).

Other studies have shown that D-Fraction can induce cellular death (a process known as apoptosis) in human breast cancer cells and advanced renal-cell carcinoma cells (4, 5, 6). Additionally, D-Fraction has been shown to reduce bladder cancer cell growth and has been linked to bladder cancer disease remission (7, 8).

Immune system

For many of the same reasons that maitake may help protect against cancer, it also plays a critical role in supporting immune system health. Maitake contains important polysaccharides which, as mentioned previously, help to enhance the activity of certain immune system cells, such as T cells, B cells, macrophages, and natural killer cells. Ultimately, polysaccharides from the maitake mushroom act as immune system regulators (9).

Additionally, many medicinal mushrooms are known for their immunomodulatory effects, and maitake is no exception (10). Immunomodulation is the process of enhancing, stabilizing, or depressing the immune system depending on circumstances. For example, stimulating the immune system is necessary in instances of viral or bacterial infection. Depressing the immune system may be desirable when experiencing the effects of autoimmune
Antioxidants

Oxidation is a natural process in the human body that, if left unchecked, can result in conditions such as atherosclerosis, diabetes, and Alzheimer’s disease (just to name a few). Antioxidants combat the process of oxidation, and can be produced internally as well as provided externally through the consumption of antioxidant-rich foods.

A hot-water extraction of maitake mushroom has been shown to exhibit anti-angiogenic activity through its antioxidant actions against free radicals (molecules that can lead to the oxidation cascade). Angiogenesis is the process whereby new blood vessels are formed from the preexisting vascular system. While this is a normal part of the wound healing process, angiogenesis is also involved in tumor progression from the benign to malignant state. Administration of maitake mushroom, therefore, may be a unique approach to combating angiogenesis (12).

Antioxidants isolated from maitake mushroom have been shown to be effective against other reactive molecules found in our bodies, including the hydroxyl radical and the superoxide radical (13). These molecules may play a critical role in several diseases, such as hypertension, cardiovascular disease, and myocardial infarction. Consumption of maitake mushroom with its naturally occurring antioxidants, including its phenols, flavonoids, ascorbic acid, and \( \alpha \)-tocopherol may be a wise strategy in protecting the body against diseases associated with oxidation (14).

Diabetes

Maitake mushroom extracts have been shown to demonstrate protection against diabetes in several studies. For example, research has looked at the ability of maitake mushroom extracts to inhibit alpha-glucosidase, an enzyme that breaks down starch and simple sugars to glucose (15). By inhibiting this enzyme, glucose absorption slows down in the body. Not surprisingly, many oral anti-diabetic drugs are alpha-glucosidase inhibitors.
Birch Polypore (*Piptoporus betulinus*)

This is one of the most common fungi found in birch forests. Luckily for the medicinal mushroom hunter, it's also very easy to recognize and has few (if any) toxic look-alikes.

The birch polypore grows on dead, and sometimes living, birch trees. It contains a tan-colored cap with a whitish pore surface, the latter of which turns brown with age. The cap tends to peel away as the fungus matures, revealing white patches underneath. A distinctive feature is that its cap usually contains an in-rolled margin, where the end of the cap “folds under,” causing the pore surface to appear sunken in (or “recessed”). When seen from a distance, the birch polypore can resemble a pancake. Rarely will you see just one on a single tree; more than likely, several will fruit from one substrate.

**Identification**

**Cap:** Up to 10” wide; semi-circular; tan-colored with white patches underneath; inrolled, wavy margin; tough and corky.

**Underside:** White pores, becoming brown with age; single tube layer.

**Spore Print:** White

**Habitat:** Grows on dead, sometimes living, birch trees; annual cycle with fruiting in summer months through winter; overwinters.

**Range:** Canada, Eastern United States, Washington and Idaho.

**Look-alikes:** *Cryptoporus volvatus* is typically smaller and contains a “hidden” pore surface.

**Edibility:** Edible and medicinal.
The texture of the birch polypore is very firm and corky, and it tends to get very woody and dry with age. The birch polypore is an annual — completing its life cycle in a single year. New growths tend to appear in the summer months, though because they overwinter, this fungus can be found year round. Many times I will even see young specimens in the early winter months. In birch forests, there really is no shortage of birch polypore sightings.

Birch polypore is edible when very young. Thinly sliced and boiled, it makes a good addition to soups. Perhaps even more impressive is its medicinal profile. Birch polypore has been shown to be an important species with anticancer, antimicrobial, antiviral, and antibacterial properties (1, 2). It contains betulinic acid — the same compound in chaga derived from the birch tree which demonstrates potent medicinal potential. Birch polypore has also been traditionally used as a styptic — a substance capable of stopping bleeding when applied to a wound.

Chaga (Inonotus obliquus) gets all the love, and for good reason: it’s got some fine medicine indeed. But what if we can’t find chaga, or what if we are interested in protecting its existence in the wild? Well then, we can look to the birch polypore as a useful alternative. Interestingly, it contains many of the same medicinal compounds as chaga, notably the triterpenes. For example, the birch polypore possesses betulin, betulinic acid, and lupeol, and while its content of betulin is much lower than that found in chaga, it contains a significantly greater concentration of lupeol than chaga in certain extracts. Lupeol is a compound that may be useful in treating inflammation and cancer (3). The birch polypore also contains an anti-inflammatory/anti-microbial compound not detected in chaga, known as taraxasterol (4). It seems that medicinal diversity is essential for optimal health, and cycling between chaga and the birch polypore (instead of relying solely on chaga) can benefit not only the health of the forests, but our personal health as well.

Birch/hemlock forests are great places to find this fungus. Note the many fruiting bodies, and the brownish pore surface of these older specimens.
Decoctions are extractions made from plant or fungal substances using hot water. While herbal teas or tisanes utilize shorter extraction times (5-15 minutes) with hot water, decoctions employ simmering temperatures for longer periods of time (hours). Hot water decoctions effectively extract immunomodulating polysaccharides, notably the beta-glucans.

To make your decoction:

1. Add 2 to 4 tablespoons of your dried mushroom, reduced to a coarse consistency, to 2 liters (1/2 gallon) of simmering water.

2. Allow mushroom to simmer for at least an hour. Two hours is my preferred length of time, though longer is fine as well. Some water may evaporate. Continue to add in water to produce a final product of 2 liters.

3. Remove vessel from stove, and strain the mixture.

4. Save the fungal mass. This can be dried for later use as a future decoction, or stored in the fridge for use within a couple of days.

5. Store the decoction (“tea”) in the refrigerator for up to a week. This can be consumed by itself, or added to other teas, coffee, smoothies, soups, etc.
Tinctures are typically alcohol extractions of an herbal substance. The plant or fungal material remains in alcohol for weeks at a time, allowing the non-polar chemical compounds to be extracted. For mushrooms, this generally includes the triterpenes and triterpenoids. A dual extracted tincture combines both the alcohol and hot water extracts. The best way to consume tinctures is under the tongue, allowing the extraction to become absorbed through sublingual mucus membranes.

**Part 1:**

1. Fill a glass jar halfway with your coarsely-ground, dried mushroom. I use a 32 oz. mason jar.

2. Fill the glass jar completely with alcohol. I use 80 proof organic vodka.

3. Seal the jar and label it with the date and name of mushroom.

4. Store the jar in a cool, dark place. Shake daily for the first 2 weeks.

5. Allow the jar to sit for at least 2 weeks, up to 6 weeks or more. I typically begin my extractions on the new moon, and end it on the full moon (a 6 week cycle).

6. When the allotted time is up, strain the fungal material from the jar. Put the alcohol extraction aside. (You now have an effective alcohol extraction. To create a dual extraction, continue to part 2.)
Part 2:

7. Add the strained fungal material to simmering water. Essentially, you are making a hot-water decoction.

8. Allow the material to simmer for at least an hour. I like to simmer mine for 2 hours.

9. During this process, allow the water to evaporate (keep the vessel uncovered). Monitor the process so that enough water evaporates over the course of an hour or 2 to be reduced down to 2 tablespoons of water. This ratio works if you started with a 32 ounce mason jar. If you used a bigger jar with more alcohol, you can reduce the water in this step to more than 2 tablespoons. If you used a smaller jar with less alcohol, reduce it even further to about a tablespoon or less.

10. When 2 tablespoons of the hot water extraction remain (more or less depending on your original starting size), strain the fungal material. Compost this. It has been sufficiently extracted of all its medicinal goodness.

11. Remember the alcohol extraction that you placed aside in step 6? Add the 2 tablespoons of your new hot water extraction to this jar.

12. Add a few teaspoons of your starting alcohol to the final product to ensure that the final product isn’t too diluted with water.

13. Bottle the final product in a mason jar or tincture bottle, and store away from heat and light.

14. Congrats - you successfully made your own wild medicine from the forest! Enjoy!
Adam Haritan is a wild food enthusiast, researcher, and forager who currently lives in Western Pennsylvania. He leads several classes and workshops related to plant and mushroom identification, wild food harvesting, nutritional and medicinal benefits of wild foods, the benefits of nature connection, and more. An avid proponent of wild mushrooms, Adam currently serves on the board of the Western Pennsylvania Mushroom Club. Adam is also the founder of LearnYourLand.com — an online community and database of Pennsylvania's naturalists, nature organizations, environmental centers, and state parks, including a listing of their events.

Additionally, Adam runs Wild Foodism — an online wild food supplement store, featuring medicinal mushroom extractions, wild greens powders, and more.

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