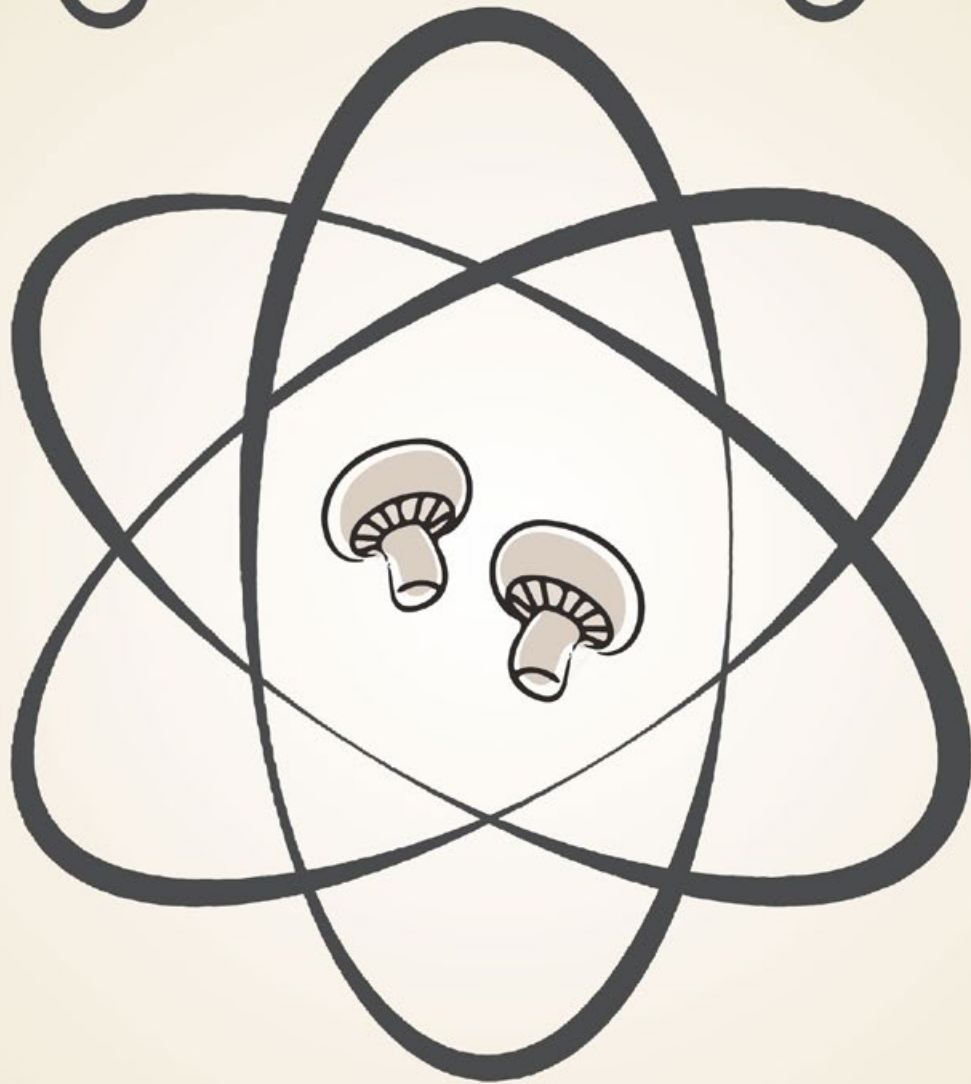


Nutrivore

GUIDE TO



Mushrooms

BY THE TEAM AT NUTRIVORE

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Introduction to Mushrooms

Edible mushrooms have a rich history of consumption in cultures around the globe. For example, the ancient Greeks believed that mushrooms could help give warriors strength while they fought, and Roman emperors employed “food tasters” to make sure the mushrooms they ate weren’t poisonous. In Chile, edible mushrooms have been found in archaeological sites dating back 13,000 years. Egyptian pharaohs prized mushrooms as a delicacy, while commoners were prohibited from eating (or even touching!) them. Even Ötzi the Iceman, Europe’s oldest known human mummy, was carrying two species of mushrooms when he died—both of which were preserved along with his body in glacier ice!



Today, mushrooms continue to be highly valued for their taste (hello, umami!), versatility, and medicinal qualities. But, the full extent of their benefits reach as far and wide as the mycelium they spring from. Let’s take a tour of the fabulous fungus among-us!

What are Mushrooms?

Although they're often lumped in with vegetables, mushrooms are technically neither plant nor animal: they're part of an entirely separate biological kingdom called fungi. Specifically, mushrooms are the fleshy, fruiting bodies of fungi, emerging from a larger underground root-like network called the mycelium. Discernable by their stem and cap structure, mushrooms can vary tremendously in size, shape, color, and texture. One of their most unique differences relative to the plant kingdom is that they don't contain chlorophyll to produce their own food (energy); rather, they extract nutrients from other organisms—both dead and alive!



While the fungi kingdom encompasses seven different phyla, the vast majority of edible mushrooms belong to only two of them: the Basidiomycota phylum (which includes "gilled" mushrooms like the common mushroom, shiitake, oyster, enoki, maitake, cremini, portabella, puffballs, boletus, and chanterelles), and the Ascomycota phylum (which features truffles and morels). Of course, many tens of thousands of mushrooms belong to these phyla, too, that aren't edible!

Currently, over 200 mushroom species are cultivated for human consumption, though only a small fraction of them are widely available.

What Makes Mushrooms So Great?

Given their unique not-a-plant, not-an-animal status, it's not surprising that mushrooms contain some important and unusual compounds. Here's a rundown of the most notable ones!

Ergothioneine

One of the most awesome nutritional features of mushrooms is their high content of ergothioneine—also known as the “longevity vitamin!”

Ergothioneine is a non-proteinogenic amino acid derived exclusively from our diet. It has powerful antioxidant, anti-inflammatory, and detoxification properties shown to combat diseases associated with aging and oxidative stress. And, it has an ability to absorb ultraviolet light—giving it a role in preventing DNA damage associated with UV radiation! Research suggests it can help protect against cardiovascular disease, cancer, liver disease, cataracts, frailty, and Alzheimer's disease, while also enhancing memory, reducing the risk of depression, reducing neuroinflammation, and improving sleep. There's even evidence for a beneficial role in female fertility and pregnancy (including supporting fetal development and reducing the risk of preeclampsia)!

Amazingly, studies show that ergothioneine reduces all-cause mortality and is associated with longer lifespan. For example, [a 2020 study](#) that followed 3200 health-conscious people for over two decades found that out of 112 different metabolites in their blood, ergothioneine was the dominant predictor of cardiovascular disease and all-cause mortality. More specifically, the higher the blood levels, the lower the risk of cardiovascular disease and death! Similarly, [another 2020 study](#) showed that lower dietary intake of ergothioneine in America compared to four European countries correlated strongly with shorter average lifespan.

Although scientists are still studying how this fascinating nutrient works, we know that it plays a major role in ageing-related signaling cascades in the body, which have a linear relationship with lifespan. And, it appears particularly important as a “stress vitamin” that comes into play during times of disease, duress, inflammation, and other damaging states.

Mushrooms exceptionally high in ergothioneine are shiitake (24.4 mg per cup), enoki (19.4 mg per cup), maitake (12.2 mg per cup), and oyster (11.3 mg per cup). In fact, these mushrooms are the very best sources of er-



gothioneine out of any food, containing many times more than the highest non-mushroom source (tempeh, which contains 3.4 mg per serving). However, all mushrooms will supply at least some ergothioneine, and collectively rank as the leading dietary source of this nutrient!

Phenomenal Phytonutrients

Mushrooms contain a truly impressive array of phytonutrients, all with their unique contributions to health. Some of the standouts include:

- **CATECHINS**, which act as antioxidants as well as boost the activity of antioxidant enzymes. Catechins are also anti-inflammatory, modulate the immune system, exert anti-bacterial activity, have anti-cancer properties, and can boost metabolism and promote healthy weight loss.
- **GALLIC ACID**, which can reduce inflammation and possibly help treat depression and infection.
- **GENTISIC ACID**, which has anti-inflammatory, antioxidant, and antirheumatic properties—while also protecting cells from gamma radiation!
- **MYRICETIN**, which can help protect against neurodegenerative diseases (like Parkinson's and Alzheimer's), glaucoma, diabetes, inflammation, liver damage, cardiovascular disease, photoaging, thrombosis, allergies, and hypertension.
- **P-COUMARIC ACID**, which can help regulate the immune system, improve bone density, protect against cancer and kidney damage, and even protect against tissue damage induced by alcohol and drugs.
- **PROTocatechuic Acid**, a potent antioxidant that can protect against liver damage, cardiovascular disease, cancer, ulcers, and bacterial or viral infection.
- **SYRINGIC ACID**, which may protect against cancer, diabetes, liver damage and lung damage.
- **VANILLIC ACID**, which can act as a pain reliever while also protecting against infection and liver damage—as well as delivering awesome antimicrobial properties!

Mushrooms are also particularly rich in a class of phytonutrient called triterpenes (including ergosterol, ganoleucoin, ganoderic acid and pyrrole alkaloids), which have wide-ranging benefits for sleep, focus, liver function, immunity, brain function, nervous system health, digestion, blood pressure regulation, and cancer protection. About 80 different triterpenes have been isolated from reishi alone, some of which are known to kill liver cells, inhibit histamine release from mast cells (providing an anti-allergic effect), and deliver cardio-protective effects.

Vitamin D

Although mushrooms are rich in a number of micronutrients (as we'll see next!), vitamin D deserves a special shout-out here! One of mushrooms' many unique features is their ability to produce vitamin D in response to UV exposure, due to naturally containing several vitamin D precursors (including ergosterol,

a precursor to vitamin D₂, and 22,23-dihydroergosterol, a precursor to vitamin D₄). In fact, mushrooms are the only non-animal food with notable amounts of bioavailable vitamin D!

In general, wild-harvested mushrooms contain high levels of vitamin D (often the entire daily value!) due to being exposed to sunlight out in nature, while commercially grown mushrooms contain negligible amounts (due to being grown in atmospherically controlled growing rooms with little to no UV light). But, some growers intentionally expose their mushrooms to UV radiation to produce vitamin D as well. These mushrooms will typically be labeled as containing vitamin D on the package, and can boast just as much—if not more—vitamin D than wild mushrooms.

And, here's where it gets exciting: mushrooms can actually generate vitamin D in response to UV exposure even after they've been harvested! A variety of studies show that exposing fresh-picked mushrooms, such as white button or oyster, to sunlight for 15 – 30 minutes increases their vitamin D content up to at least 25% of the DV, and often much higher (100% of the DV or more!). Sliced mushrooms generate even higher vitamin D quantities, due to increased surface area allowing for greater exposure of vitamin D precursors to UV light. Sun-dried mushrooms also generate vitamin D during their dehydrating process, regardless of how they were grown.

That's right: this means you can make your own "vitamin D enhanced" mushrooms at home, simply by giving them some sunlight prior to use. Pretty cool, huh?

Magnificent Micronutrients

Beyond vitamin D, mushrooms are fabulous sources of some other vitamins and minerals. They contain notable quantities of:

- **COPPER**, a trace mineral involved in glucose and cholesterol metabolism, gene expression, free radical scavenging, red blood cell production, and the growth, development, and maintenance of various organs (including the heart and brain). Mushrooms rich in copper include cremini (48% of the DV per cup!) and white button (34% of the DV); portobella, oyster, and maitake mushrooms contain about a quarter of the DV for this nutrient.
- **SELENIUM**, a trace mineral that helps form over two dozen selenoproteins involved in reproduction, thyroid hormone metabolism, antioxidant defense, DNA synthesis, and immunity. High-selenium mushrooms include cremini (41% of the DV per cup!) and portabella (29% of the DV).
- **VITAMIN B5 (PANTOTHENIC ACID)**, a water-soluble B vitamin that serves as a cofactor for coenzyme A—which in turn is critical for metabolizing many drugs and toxins and synthesizing cholesterol, fatty acids, melatonin, the neurotransmitter acetylcholine, steroid hormones, heme, and vitamins A and D. White button, cremini, and shiitake mushrooms all contain a little over a quarter of the DV for this nutrient per cup!
- **VITAMIN B2 (RIBOFLAVIN)**, a vitamin that helps form important coenzymes involved in oxidation-reduction reactions, antibody production, energy production, growth and development, skin and hair health, and the metabolism of several other nutrients. Mushrooms rich in riboflavin include cremini (33% of the DV per cup), white button (30% of the DV), and oyster (23% of the DV).

- **VITAMIN B3 (NIACIN)**, a water-soluble B vitamin that's needed for over 400 enzymes involved in DNA repair, fatty acid synthesis, antioxidant systems, detoxification, hormone synthesis, and macronutrient breakdown. Maitake mushrooms contain 32% of the DV for niacin per cup, while oyster, portabella, and white button mushrooms contain around a quarter of the DV.
- **VITAMIN B7 (BIOTIN)**, a water-soluble B vitamin that plays an important role in energy metabolism (serving as a coenzyme for five carboxylase enzymes), neurotransmitter production, cellular function, and the function of various organs. Per cup, maitake mushrooms contain 65% of the DV for biotin, while white button, portabella, and cremini mushrooms contain around half the DV.

Fabulous Fiber

One of the most fascinating differences between plants and mushrooms lies in their fiber type. While the cell walls of plants are made of cellulose, the cell walls of mushrooms are composed of entirely different carbohydrate structures—namely chitin, chitosan, and glucans. And, these fibers offer some powerful perks, especially for the gut!

- **CHITIN** is a type of fermentable oligosaccharide fiber found only in a handful of foods (apart from mushrooms, it's in insect exoskeletons, fish scales, and the shells of crustaceans). It's particularly beneficial for immunity and gut health, with studies showing it can support the growth of beneficial bacteria such as Bifidobacterium, Lactobacillus, Bacteroides, and Akkermansia, while also decreasing levels of the inflammatory microbe Desulfovibrio. Chitin has also been shown to protect gut barrier integrity in animal models of metabolic syndrome, while also normalizing the gut microbiota composition.
- **CHITOSAN** is a polysaccharide that's only naturally occurring in the cell walls of fungi, including mushrooms. A variety of experiments show chitosan increases gut microbial diversity and decreases levels of potential pathogens (such as Escherichia and Shigella), while also reshaping the gut microbiota to induce anti-diabetic effects. It's also been shown to suppress the growth of Helicobacter, a microbe responsible for stomach ulcers.
- **GLUCANS** are polysaccharides with impressive immune-modulating and anti-inflammatory qualities. Mushrooms are particularly rich sources of beta-glucans (more specifically, (1-3),(1-6)-beta-glucans, which are different than the type of beta-glucans in grains like oats), which play an extremely positive role in gut health—including feeding populations of beneficial bacteria like Lactobacillus and Bifidobacterium, and increasing the production of short-chain fatty acids. Research suggests that this fiber's actions upon the gut microflora (as well as bacterial metabolites) contributes to its anti-cancer, anti-inflammatory, anti-diabetic, cardio-protective, and immune-modulating effects!

Health Benefits of Mushrooms

When it comes to human health, mushrooms' nutritional uniqueness translates to some powerful disease protection. An ever-growing body of research suggests mushrooms (and their unusual compounds) can boost our health on a number of fronts. Here's a rundown of their best-studied health benefits!



Reduced risk of cancer:

Mushrooms and their polysaccharides have been shown to exhibit anti-tumor activities across a number of cancer cell types. So far, at least 32 species of mushrooms have shown anti-cancer potential! And, human studies confirm a protective effect of mushrooms on cancer incidence and death. A [2021 meta-analysis](#) found that people with the highest versus lowest mushroom consumption had a 34% lower risk of cancer. Additional research suggests a protective effect of mushrooms against some specific cancer types, including:

- **BREAST CANCER:** [A 2021 meta-analysis](#) found that people with the highest versus lowest intake of mushrooms had a 35% lower risk of developing breast cancer. And, [a 2010 study](#) suggested that greater mushroom intake was particularly protective against hormone receptor positive tumors (a 70% lower risk for highest versus lowest mushroom intake).
- **LIVER CANCER:** In [a 2013 analysis](#) of the Shanghai Women's and Men's Health Studies, participants in the highest quartile of mushroom intake (over 10 g daily) had a 34% lower risk of developing liver cancer, compared to people in the lowest quartile (2 g or less daily).
- **OVARIAN CANCER:** [A case-control study from 2013](#) found that people who consumed more than 2 g of mushrooms per day on average had a 32% lower risk of ovarian cancer, compared to people whose mushroom consumption was under 2 g daily.
- **PROSTATE CANCER:** In a [2020 pooled analysis](#) of cohort studies, participants eating mushrooms at least three times per week (compared to less than once per week) had a 17% lower risk of developing prostate cancer.
- **STOMACH CANCER:** [A 2023 meta-analysis](#) of 11 studies found that higher mushroom consumption was associated with a significantly lower risk of stomach (gastric) cancer. Specifically, people with the highest versus lowest consumption had an 18% lower risk.

What's more, several compounds extracted from mushrooms form the basis of cancer drugs! For example, the drug lentinan is derived from shiitake mushrooms, and has demonstrated anti-cancer activity through its ability to inhibit tumor angiogenesis. It's also used in some countries to boost the efficacy of cancer treatments. [A 2019 review](#) of clinical studies confirmed that lentinan could improve the quality of life for

cancer patients, while also boosting the effectiveness of chemotherapy and radiation therapy. Another drug called polysaccharide-K (brand name Krestin) is derived from turkey tail mushroom, and is an approved adjuvant for cancer therapy in Europe and Japan.

In all, we're still just scratching the surface of how mushrooms, including specific varieties and individual compounds, affect cancer in humans. Future research will continue to expand our knowledge here!



Anti-diabetic effects:

A number of mushroom varieties have demonstrated blood sugar-lowering effects, including white button, cremini, shiitake, oyster, maitake, cordyceps, chaga, shaggy mane, and reishi mushrooms. Likewise, specific components of mushrooms (including their polysaccharides and terpenoids) have been shown to impact insulin receptors in ways that increase insulin sensitivity and reduce insulin resistance, while also inhibiting glucose absorption, increasing pancreatic beta-cell mass, and increasing insulin signaling pathways. So far, at least 104 different mushroom polysaccharides have been identified as having anti-diabetic effects! More studies (especially clinical trials) are needed in humans to explore these exciting findings.



Cardiovascular protection:

A variety of in vitro, animal, and human studies have demonstrated a possible protective effect of mushrooms on cardiovascular health. This includes both individual mushroom types, and mushrooms as a collective group! Oyster mushrooms, for example, have been shown to reduce levels of triglycerides and oxidized LDL (the latter being a major component of arterial plaque); experiments show that shiitakes can likewise inhibit LDL oxidation, while maitake and shiitake mushrooms can decrease both VLDL levels and blood pressure. And [2019 experiment](#) found that in an animal model, a mixture of portabella and shiitake mushrooms was able to reduce the formation of atherosclerotic plaque.

A [2021 randomized controlled trial](#) found that in people with elevated blood lipids, 66 days of shiitake mushroom consumption reduced triglyceride levels by 10%. And, [a 2021 systematic review](#) of prospective studies determined that edible mushrooms have favorable impacts on LDL cholesterol, HDL cholesterol, total cholesterol, and triglycerides, while also potentially helping lower blood pressure.

However, some studies on this subject have yielded conflicting findings, and more research is needed to determine the effects of mushroom consumption on actual cardiovascular outcomes.



Healthy pregnancy:

Mushrooms may help protect against some maternal complications during pregnancy—especially related to blood pressure and weight. [In a 2020 clinical trial](#), participants were required to eat 100 g of mushrooms daily, beginning before pregnancy and extending to the 20th week of gestation. Compared to the placebo group, participants in mushroom group had a significantly lower incidence of high blood pressure, preeclampsia, gestational diabetes, and excessive gestational weight gain. Likewise, they were three times less likely to have a baby with macrosomia (excessively large size)!



Reduced anxiety:

Could a mushroom a day keep the anxiety away? Research suggests it very well may! So far, animal studies have shown that mushrooms (particularly specific varieties like lion's mane and reishi) exert anti-anxiety effects. One [mouse experiment from 2021](#) found that lion's mane helped relieve anxiety by improving sleep disruptions, while [a 2018 experiment](#) determined that lion's mane (in the form of an extract) quelled anxiety by promoting neurogenesis in mood-related brain regions (particularly the hippocampus). Additional animal research suggests specific phenols and flavonoids in mushrooms may be responsible for some of these effects. More research is needed in humans!



Lower risk of depression:

[A 2021 analysis](#) of prospective cohort data found that people who reported consuming mushrooms (compared to people who didn't) had a 69% lower risk of depression. Intriguingly, even eating relatively small amounts of mushrooms (just shy of 5 g daily) was associated with this protective effect. Likewise, [a 2022 study](#) of nearly 88,000 Korean adults found that compared to people who rarely or never ate mushrooms, those who ate at least one serving per month had significantly lower incidence of depression. Specifically, eating mushrooms monthly was associated with an 8% lower risk of depression; eating mushrooms between once a month and three times per week was associated with a 12% lower risk of depression; and eating mushrooms at least three times weekly was associated with a 14% lower risk of depression.

And, [a 2022 review](#) determined that lion's mane mushroom, in particular, was beneficial for patients with major depressive disorder—likely due to its content of 5-hydroxy-L-tryptophan (5-HTP), a direct precursor to the neurotransmitter serotonin (which itself plays a role in regulating mood)!



Protection against cognitive decline:

[In a 2022 analysis of prospective cohort data](#), participants in the highest category of mushroom intake (13.4 g daily on average) versus the lowest intake had significantly better scores on cognitive tests, suggesting a protective effect against cognitive decline.



Improved gut health:

Due in large part to their unique polysaccharides, mushrooms have phenomenal benefits for gut health. Individual mushroom types have been studied here: in mice, white button mushrooms have been shown to increase microbial diversity and expedite healing from gut infections, while oyster mushrooms stimulate the growth of important Bifidobacterium strains. Shiitake mushroom polysaccharides can alter the spatial structure of rodent gut microbiomes and significantly (and beneficially!) alter bacterial ratios. Reishi mushrooms contain polysaccharides that feed Bifidobacteria members, with the potential to improve intestinal barrier function and reduce obesity by modulating the gut microbiota.

And while studies on specific gut disorders are more limited, evidence here, too, points to a beneficial role of mushrooms. In [a 2011 trial](#), a mushroom extract (from the species *Agaricus blazei*) was given to patients with irritable bowel diseases (ulcerative colitis or Crohn's disease) for 12 days. The results showed significant decreases in levels of inflammatory cytokines in blood, with ulcerative colitis patients also seeing a reduction in fecal calprotectin, a marker of intestinal inflammation and disease activity. [A 2016 study](#) using the same extract found improvements in fatigue, intestinal symptoms, and quality of life in ulcerative colitis patients!

Interestingly, [a 2016 study](#) also found that in a mouse model of ulcerative colitis, lion's mane mushroom extract significantly decreased intestinal bleeding, improved body weight and colon length, and beneficially altered the production of nitric oxide, malondialdehyde, and superoxide dismutase in ways that suppressed oxidative stress. Similar findings came from [a 2021 study](#) of experimental colitis in rats.



Improved bone health:

Fascinatingly, studies suggest mushrooms could help support healthy bones. [In a 2016](#) experiment using a mouse model of osteoporosis, extracts of turkey tail mushroom, maitake mushroom, and shiitake mushroom were able to decrease the activity of osteoclasts (cells that break down bone tissue), while shiitake extract increased the activity of osteoblasts (cells that build bone tissue). A combination of shiitake and maitake mushrooms, in particular, were able to reduce bone loss at the animals' lumbar spine. Additional research shows that a number of commonly eaten mushrooms, including oyster, are able to improve bone stability by influencing various steps of bone formation and mineralization.

[A 2021 experiment](#) using bone cells from healthy and osteopenic women found that treatments with oyster and reishi mushrooms (in the form of powders and extracts) had beneficial effects on bone physiology, at least in part by altering the gut microbiota and short-chain fatty acid production. And, several studies suggest that vitamin D-enhanced mushrooms support bone formation by providing a bioavailable source of this nutrient.

More studies are needed in humans to understand the potential benefits of mushrooms on osteoporosis and other bone-related disorders.



Lower all-cause mortality:

Eating more mushrooms appears protective against death from all causes. In [a 2021 analysis](#) of Third National Health and Nutrition Examination Survey (NHANES III) data, people who reported eating mushrooms (compared to those who didn't) had a 16% lower risk of all-cause mortality. This finding persisted even after adjusting for important confounders like major lifestyle factors, overall diet quality, demographic features, total energy intake, and other dietary components.

Mushroom Nutrivore Scores

Thanks to their incredibly low energy density and high micronutrient content, mushrooms have some truly impressive Nutrivore Scores. In fact, the average Nutrivore Score for this food group is 2704! For some specific common mushrooms, the Nutrivore Scores are:

Chanterelle	1555
Cremini	2279
Enoki	4434
Maitake	3551
Morel	2271
Oyster	2550
Portobella	1483
Shiitake	4343
White button	1872

Some Practical Pointers

Properly selecting and storing mushrooms is key for maintaining their quality and flavor! Here are some important tips to help maximize the lifespan (and minimize the waste!) of your mushrooms.

Selection:

- Make sure your mushrooms are fresh by looking for ones that have a firm texture and smooth caps, while being free from blemishes, bruises, or discoloration.
- Avoid mushrooms that appear slimy or have a strong, unpleasant odor.
- Buy your mushrooms in small batches! Mushrooms are highly perishable, so it's best to buy only what you need for immediate use.



Storage:

- To keep mushrooms fresh, store them in a paper bag or a porous container in the refrigerator. Avoid storing in plastic bags or airtight containers, since this can cause moisture to build up (in turn accelerating spoilage)!
- As tempting as it may be to get the dirt off ASAP, avoid washing your mushrooms before storing them. Mushrooms are like sponges, and can easily absorb water—leading to a loss of texture and flavor. Wait to wash them until just before use.
- Remove packaging immediately. If your mushrooms come in a plastic-wrapped container (especially one without perforations), remove the packaging as soon as you get home. This helps prevent moisture buildup and prolongs the mushrooms' freshness.
- Use mushrooms within a few days of purchase. The longer they sit in the refrigerator, the higher the chances of spoilage.
- If you have an abundance of mushrooms, consider preserving them by drying, freezing, or pickling them. This can help extend their shelf life by several months or more!



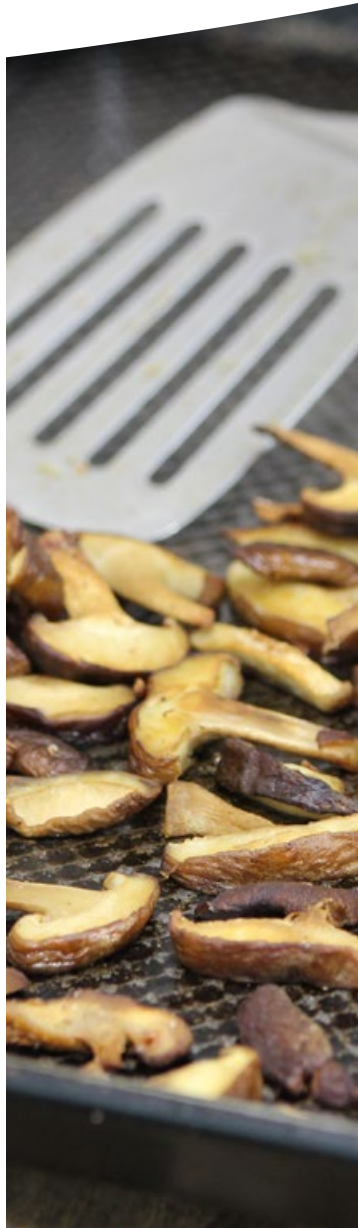
- Speaking of freezing: to freeze mushrooms properly, first clean and slice them, then spread them in a single layer on a baking sheet. Place the sheet in the freezer until the mushrooms are firm, then transfer them to a freezer-safe storage bag.
- Before cooking, clean your mushrooms by gently wiping off any dirt or debris with a damp paper towel. You can also trim the mushroom ends if they appear dry, woody, or discolored.

Seasonality:

The seasonality of edible mushrooms varies depending on the species and geographic location. But, here's a general rundown of when the most common mushrooms are available!

- **MOREL MUSHROOMS:** Morels typically appear in the spring, usually from late March to early May.
- **CHANTERELLE MUSHROOMS:** Chanterelles are often found in late summer and early autumn, typically from July to October.
- **PORCINI MUSHROOMS:** These are usually found in late summer to early autumn, ranging from August to October.
- **OYSTER MUSHROOMS:** Oyster mushrooms can be found year-round, but they're most abundant in the late spring and early autumn. They tend to thrive in cooler and more humid conditions.
- **SHIITAKE MUSHROOMS:** Shiitakes are cultivated year-round, and are available commercially throughout the year. But, they can also be found in the wild during the late summer and early autumn!
- **ENOKI MUSHROOMS:** Enoki mushrooms are available throughout the year (due to being typically grown indoors), but they're more commonly associated with winter.
- **MAITAKE MUSHROOMS:** Maitake mushrooms are typically found in late summer to early autumn, ranging from August to October.
- **WHITE BUTTON AND CREMINI MUSHROOMS:** these mushrooms are available year-round, do to being widely commercially grown. (Fun fact: they're actually the same variety of mushroom, just harvested at different stages of growth!)

Recipes



BREAKFAST

Veggie Frittata

PREP TIME

5 minutes

COOK TIME

15 minutes

YIELD

3-4 servings

½ medium yellow onion, finely chopped
½ red bell pepper, finely chopped
1½ cups mushrooms, thinly sliced
2 cups fresh kale, chopped
2 cups fresh spinach, chopped
8 eggs, beaten
1 tablespoon butter or oil of choice

1. Heat an oven proof skillet over medium high heat and set broiler to high to preheat oven.
2. Add oil to hot skillet and add onion, pepper and mushroom and sauté, stirring occasionally, until vegetables are starting to soften, about 3 to 4 minutes.
3. Add kale and continue to sauté, until all vegetables are cooked, about 8 to 10 minutes.
4. Add spinach, and stir until spinach is wilted.
5. Add beaten eggs and let cook on stove top for 1 to 2 minutes, stirring a couple of times.
6. Place skillet in the oven and broil until eggs are completely cooked, puffed up and starting to brown on top.



Mushroom and Spinach Omelet

PREP TIME

2 minutes

COOK TIME

5 minutes

YIELD

1 serving

2 tablespoons butter or oil of choice, divided

1 cup mushrooms

½ cup baby spinach

2 large eggs

2 tablespoons milk or water

Pinch of sea salt and black pepper

¼ cup cheese (gruyere, cheddar, mozzarella), optional

1. Heat the oil in an omelet pan or 8-inch skillet over medium heat.
2. Add the mushrooms and saute until cooked, about 6-8 minutes.
3. Add the spinach and cook until wilted, about 2 minutes.
4. Set the veggie mixture aside and place the pan back on the stove. Add additional tablespoon of oil.
5. Meanwhile, whisk the eggs, milk and salt and pepper, then pour into the hot pan. Cook for 4 to 5 minutes, until the egg mixture looks fairly solid.
6. Pour the spinach and mushroom mixture over half of the omelet and top with cheese if using.
7. Wiggle a spatula underneath the half that does not have the filling on it and flip that half over the filling. Slide onto a plate and enjoy.



SIDES

Stir-fried Turnip Greens with Mushrooms and Almonds

PREP TIME

10 minutes

COOK TIME

15 minutes

YIELD

4-6 servings

1 bunch turnip greens, washed and chopped
1 pound mushrooms, sliced
1 teaspoon finely grated fresh ginger
½ cup whole raw almonds (you could also use blanched almonds)

2 garlic cloves, crushed
2 tablespoons olive oil or oil of choice
¼ cup orange juice
1 tablespoon soy sauce or coconut aminos
2 teaspoons arrowroot powder or cornstarch

1. Heat a wok or large skillet on medium high heat. Once hot, add the oil, garlic and ginger, cooking until fragrant, about 1 to 2 minutes.
2. Add the mushrooms and turnip green stems and cook, stirring frequently, until they start to stick.
3. Add the orange juice and continue to cook until the stems are starting to soften.
4. Add the rest of the turnip leaves and the almonds. Cook, stirring frequently, until the leaves are fully wilted.
5. Add the soy sauce and sprinkle the arrowroot powder over the top. Cook, stirring frequently, until the arrowroot powder thickens the juices left in the bottom of the wok, about 3 to 4 minutes.



Eggplant and Mushroom Casserole

PREP TIME

15 minutes, plus time to
salt eggplant

COOK TIME

1 hour

YIELD

4 to 6 servings

2 large eggplants, peeled and cut into ½-inch dice
2 tablespoons sea salt
6 ounces bacon, chopped
2 to 3 tablespoons butter, olive oil or oil of choice
1 medium yellow onion, finely chopped
2 to 3 stalks celery, cut into ¼-inch slices
2 pounds mushrooms
1 tablespoon fresh parsley, finely chopped
1 tablespoon dried savory
Sea salt and black pepper, to taste
1 cup bone broth

1. Put the eggplant in a colander and sprinkle liberally with the salt. Place the colander in the sink and let sit for at least one hour. This step is critical for getting the eggplant to hold its shape and not turn to mush.
2. Rinse the salt off the eggplant, then place the eggplant on several paper towels on the counter or a rimmed baking sheet. Cover with more paper towels and gently squeeze the excess water out of the eggplant. Set aside.
3. Add the bacon to a cold skillet, then heat the skillet over medium-high heat, stirring frequently. When the bacon is mostly cooked, add the eggplant and cook, stirring frequently, until the eggplant is starting to brown. If the eggplant starts to stick to the pan, add additional tablespoon of butter or oil.



4. Set the bacon and eggplant aside in a large bowl and return the skillet to the stovetop. Add 1 tablespoon of butter to the skillet with the onion and celery and cook until softened.
5. Add the mushrooms to the skillet. If the vegetables start to stick, add another tablespoon of butter. Cook until the mushrooms are nicely sauteed but still firm. Add the mushrooms to the eggplant and bacon in the bowl.
6. Toss the vegetables with the savory and parsley until well combined. Taste and add salt and pepper, if desired.
7. Preheat the oven to 325°F.
8. Place the vegetable mixture in a casserole dish and pour the broth over the top. Bake for 30 minutes.



TIP: Using an assortment of wild mushrooms, such as morels, chanterelles, and oyster mushrooms adds a depth of flavor and more varied texture to this dish.

Crispy Oven-Roasted Mushrooms

PREP TIME

15 minutes

COOK TIME

15 minutes

YIELD8 to 10 stuffed
mushroom caps

12 ounces mushrooms, stems trimmed
and sliced ½-inch thick

⅓ cup olive oil or oil of choice

½ teaspoon sea salt

1. Preheat oven to 425°F. Arrange oven rack in the lowest position in the oven.
2. Toss sliced mushrooms with oil and salt and arrange in a single layer on a rimmed baking sheet.
3. Bake for 15 to 20 minutes, until mushrooms are browned and crispy.



TIP: These mushrooms make a great side dish on their own, but also work as a condiment. Try sprinkling them over a salad instead of croutons or

bacon bits! My favorite mushroom to use for this recipe is shiitake mushrooms, which have an impressive Nutrivore Score of 4343.



SOUP

Cream of Mushroom Soup

PREP TIME

15 minutes

COOK TIME

30 minutes

YIELD

4 to 5 servings

1 pound mushrooms, divided
2 tablespoons olive oil or oil of choice
1 medium yellow onion, diced
1 stalk celery, chopped
2 to 3 cups beef stock
1 cup chopped and peeled zucchini or chopped cauliflower florets

1 ¼ teaspoon salt, plus more to taste
¼ teaspoon dried thyme
¼ teaspoon dried tarragon
½ cup heavy cream or full fat coconut milk
3-4 tablespoons flour, grain-free flour alternative, or your favorite flour blend

1. Roughly chop 12 ounces of mushrooms. For the remaining 4 ounces, either cut into ¼-inch cube or very thinly slice and set aside.
2. In a large pot, heat olive oil over medium-high heat. Add onion and celery and sauté, stirring frequently, until onion starts to brown, about 8 minutes. Add the 12 ounces of roughly chopped mushrooms and sauté until lightly browned, about 5 more minutes. Add beef stock, zucchini, thyme and tarragon. Bring to a boil and then reduce heat to maintain a simmer.
3. Simmer until the zucchini is very soft and starting to fall apart, about 6 to 8 minutes.
4. Using an immersion blender, blend until completely smooth. Alternatively, use a countertop blender and work in batches, then return blended soup to the pot.
5. Whisk heavy cream and flour together until smooth. Add to soup and stir to combine.



6. Add the remaining 4 ounces of mushrooms. Over low heat, stirring very frequently, simmer until the mushrooms are cooked, about 5 minutes. If the soup is too thick, add additional bone stock or water, until the consistency is to your liking. If the soup is too thin, add an additional tablespoon of flour and cook until incorporated and thickened to your liking.
7. Taste and add additional salt, if needed.



TIP: For a thicker soup or to use in place of condensed mushroom soup in your favorite recipes, use 2 cups of beef stock. For a thinner soup, use 3 cups.

Turkey Meatballs and Mushroom Ratatouille

PREP TIME

30 minutes plus
salting time

COOK TIME

1 hour

YIELD

8 servings

2 eggplants, peeled and cut into
½-inch cubes

2 tablespoons plus ½ teaspoon sea
salt, divided

3 pounds ground turkey

⅔ cups chopped fresh oregano

1 large egg

3 tablespoons olive oil or oil of choice

2 medium onions, diced

6 stalks celery, diced

8 cloves garlic, finely chopped

4 medium zucchini, quartered and
cut into ¼-inch slices

1 pound mushrooms, sliced

2 28-ounce cans of plum tomatoes

¼ cup finely chopped fresh basil

1 cup Kalamata olives

1. Coat eggplant with 2 tablespoons of salt and place in colander in the sink for 1 to 3 hours. Rinse well then place on layered paper towel on a baking sheet or your counter, cover with more paper towel, and press the excess water out. Set aside.
2. Preheat oven to 400°F. Line a baking sheet with tin foil, parchment paper or a silicone liner.
3. Combine ground turkey, oregano, egg and ½ teaspoon salt and mix to thoroughly combine. Form 1½-inch diameter meatballs and place on prepared baking sheet.
4. Bake meatballs for 15 minutes, until internal temperature reaches 160°F.
5. Heat a large stockpot over medium-high heat. Add olive oil, onion, celery and garlic. Cook, stirring frequently, onion is starting to brown, about 15 minutes.



6. Add canned tomatoes, zucchini, mushrooms and eggplant. Bring to a simmer and then reduce heat to medium-low. Simmer covered for about ten minutes, until vegetables are starting to soften.
7. Remove lid and simmer uncovered for 20 to 30 minutes (or longer), stirring occasionally, until vegetables are fully cooked.

ENTRÉES

Beef and Mushroom Parsnip Risotto

PREP TIME

15 minutes

COOK TIME

30 minutes

YIELD

3-4 servings

2 pounds parsnips (5 to 6 medium parsnips), or 2 cups rice (see note below for traditional rice risotto instructions)

1 tablespoon olive oil or oil of choice

½ medium white onion, diced

1 carrot, diced

1 pound ground beef

8 ounces mushrooms, sliced

2 cups beef stock, divided (4 cups beef stock if making risotto with rice instead of parsnips)

1 tablespoon apple cider vinegar, or ¼ cup wine (red or white)

1½ teaspoons sea salt

1 tablespoon finely chopped fresh tarragon, or 1 teaspoon dried tarragon

½ cup heavy cream or full-fat coconut milk

Chopped fresh parsley, for garnish

- 1. TO RICE THE PARSNIPS:** Peel the parsnips and chop into big chunks. Place in a food processor and pulse until the pieces are fairly uniform in size and about the size of a large grain of rice. (You should have 6 to 7 cups of riced parsnips.)
- 2.** Heat a large skillet over medium-high heat. Add the olive oil, onion, and carrot. Sauté until the vegetables are tender, about 5 minutes.
- 3.** Add the ground beef to skillet and cook, stirring to break up the beef, until browned, about 3 to 5 minutes.
- 4.** Add the mushrooms, 1 cup of stock, vinegar, and salt. Increase the heat to high and cook until the liquid is mostly evaporated, about 5 to 8 minutes.
- 5.** Add the riced parsnips and remaining 1 cup of stock to pan and stir just to mix. Reduce the heat to medium-low, and cover. Cook for 8 to 10 minutes, until the parsnips are tender and mushy, stirring once or twice



during that cooking time. If the vegetables start to stick because the pan is starting to become dry, add another few tablespoons of stock or water to the pan. If your largest skillet isn't big enough for all of these ingredients, you can remove the beef mixture before adding the parsnips and then mix the beef mixture back in right before serving.

6. Add the cream and tarragon and stir to incorporate. Turn off the heat and let sit on the stovetop covered for 2 to 3 minutes more. Taste and add more salt, if needed.
7. Garnish with chopped parsley, if desired.



TIP: If you'd like a more traditional risotto, feel free to use 2 cups of uncooked rice in place of the parsnips (or do half and half!). You will also need to double the beef stock and cook a little longer until the rice absorbs all the liquid and is fully cooked.

Mushroom and Sausage Lasagna

PREP TIME

20 minutes

COOK TIME

1 hour 30 minutes

YIELD

10 servings

1 16-ounce package of lasagna noodles (about 16 noodles)
1 pound bulk spicy Italian sausage
1 pound extra lean ground beef
1 medium onion, diced
1 can (28 ounces) Italian plum tomatoes
2 tablespoons tomato paste
1½ pounds mushrooms, thinly sliced
1 teaspoon sea salt

½ teaspoon dried oregano
¼ teaspoon dried thyme
¼ teaspoon dried rosemary
1 container (15-ounces) ricotta cheese
8 ounces mozzarella cheese, shredded (about 2 cups), divided
1 large egg
1 package (10 ounces) frozen chopped spinach, thawed and squeezed dry

1. Prepare lasagna noodles as label directs. Drain and rinse with cold running water. Return to saucepot with cold water to cover and set aside. (Skip this step if using fresh pasta that does not require pre-cooking).
2. **PREPARE SAUCE:** In a large skillet, cook sausage, ground beef and onion over medium-high heat, stirring frequently to break up the meat, until meat is browned. Spoon off and discard fat. Add tomatoes with their juice, tomato paste, mushrooms, salt, oregano, thyme and rosemary. Heat to boiling, breaking up tomatoes with the back of a spoon. Reduce heat to low, and simmer uncovered, stirring occasionally for 30 minutes. Set aside.
3. Preheat oven to 375°F.
4. In a medium bowl, mix ricotta, half of the mozzarella, egg and spinach. Drain noodles and gently dry with clean kitchen towels.



5. In a 13"x9" lasagna or casserole dish, spoon $\frac{1}{3}$ of meat sauce, add a layer of noodles (using $\frac{1}{3}$ of the noodles and overlapping slightly to completely cover the meat sauce), spoon ricotta mixture evenly for the next layer, add another layer of noodles, add another $\frac{1}{3}$ of meat sauce, and then the final layer of noodles. Top with remaining meat sauce and sprinkle remaining mozzarella over the top.
6. Cover with foil and bake for 30 minutes. Remove foil and bake an additional 15 minutes, until sauce is bubbly and top is lightly browned. Let stand for 15 minutes before serving.



TIP: For the lasagna noodles you can use rice noodles, traditional wheat noodles, grain free lasagna noodles, or zucchini slices. To make zucchini "lasagna noodles", slice 2 large zucchini lengthwise into very thin slices. Sprinkle slices lightly with salt; set aside to drain in a colander while preparing the meat sauce. Rinse off excess salt and then dry zucchini slices on kitchen towels.

Chicken Breast with Mushroom and Tarragon Sauce

PREP TIME

20 minutes

COOK TIME

30 minutes

YIELD

4 servings

3 tablespoons olive oil or oil of choice, divided

2 large shallots, thinly sliced

1 pound wild mushrooms, sliced

1½ teaspoons sea salt

2 tablespoons chopped fresh tarragon or 2 teaspoons dried tarragon

3 tablespoons flour, grain-free flour alternative, or your favorite flour blend, divided

4 chicken breast halves (about 2 ½ pounds), skin removed

1½ cups chicken stock

2 tablespoons arrowroot powder or cornstarch

1 clove garlic, crushed

1 tablespoon fresh lemon juice

1. In a large skillet, heat 2 tablespoons oil over medium heat. Add shallots and mushrooms and cook until tender and lightly browned. With slotted spoon, transfer to a small bowl.
2. On a plate, mix salt, tarragon, and flour. Use mixture to coat chicken breast. In the same skillet, add the remaining 1 tablespoon oil and increase to medium-high heat. Add chicken and cook, turning once, until golden brown. Reduce heat to medium-low, cover and cook about 10 minutes longer, until internal temperature reaches 160°F or juices run clear when pierced with a knife.
3. Set chicken aside and keep warm.
4. In a cup, mix arrowroot powder with broth. Pour into skillet and heat to boiling over high heat, stirring to deglaze the skillet. Add garlic, lemon juice, and browned shallots and mushrooms. Pour over chicken and serve.



TIP: Using an assortment of wild mushrooms, such as morels, chanterelles, and oyster mushrooms adds additional depth of flavor and increases the Nutrivore

Score of this dish.



Chicken and Dumplings

PREP TIME

20 minutes

COOK TIME

1 hour

YIELD

6 servings

6 small skinless chicken breasts
(about 2 ½ pounds)

1½ teaspoons sea salt, divided

3 tablespoons olive oil or oil of choice,
divided

1 medium onion, diced

4 large carrots, sliced into ¼-thick
rounds

6 large celery stalks, sliced ¼-inch
thick

8 ounces mushrooms

3 bay leaves

6 cups of chicken stock, divided

1 cup less 1 tablespoon flour, grain-free
flour alternative, or your favorite flour
blend

2 teaspoons chopped fresh rosemary

1 teaspoon baking soda

1 teaspoon cream of tartar

1 large egg

2 pounds zucchini, peeled and roughly
chopped

10 ounces frozen peas, thawed (about 2
cups)

1 cup cream or full fat coconut milk,
optional

1. Season both sides of each chicken breast with salt, about ½ teaspoon total. In a large Dutch oven, heat 2 tablespoons of oil over medium-high heat. Sear chicken breast, working in batches as necessary, until lightly browned, about 4 to 5 minutes per side. Remove chicken breast from Dutch oven and set aside.
2. Add remaining tablespoon of oil to the Dutch oven and sauté onion, carrots and celery until starting to brown, about 10 minutes.
3. Return chicken breast to Dutch oven. Add mushrooms, bay leaves, and 5½ cups of chicken stock. Heat to boiling over high heat.
4. Make dumplings: In a medium bowl, combine flour, ½ teaspoon salt, baking soda and cream



of tartar. In a separate small bowl, combine remaining $\frac{1}{2}$ cup of chicken stock (it should be cold or room temperature) and egg. Whisk to combine. Add broth mixture to flour mixture and stir just until a dough forms. Immediately spoon rounded tablespoons full and drop into Dutch oven, forming 12 dumplings, each spaced a little apart.

5. Cover and reduce heat to low to simmer for 15 minutes.
6. With a slotted spoon, transfer dumplings, chicken and vegetables to a large shallow serving bowl. Discard bay leaves. Cover with tinfoil or a lid to keep warm
7. Add zucchini and remaining $\frac{1}{2}$ teaspoon salt to broth in Dutch oven. Bring back to a boil over medium-high heat and cook until zucchini is tender, about 5 minutes.
8. With an immersion blender, puree zucchini and broth until completely smooth. (This can also be done in batches with a countertop blender.) Taste and add additional salt, if needed.
9. Add peas and cream if using and cook for 1 to 2 minutes, just to heat through. Pour over dumplings, chicken and vegetables and serve!

Chicken Chop Suey with Almonds

PREP TIME

20 minutes

COOK TIME

10 minutes

YIELD

4 to 5 servings

3 tablespoons olive oil or oil of choice
1 ½ pounds chicken boneless skinless thigh, sliced into half inch cubes
2 cups diced carrots
2 cup sliced mushrooms
2 cups diced celery
2 cups diced onions
1 cup diced green pepper

3 cups mung bean sprouts
1½ cup whole blanched almonds
2 teaspoons sea salt, plus more to taste
1 tablespoon honey
2 tablespoons arrowroot or cornstarch
1 teaspoon sesame oil
1 cup chicken stock

1. Heat a wok or large skillet over high heat. Add oil to pan. Add chicken, carrots, mushrooms, celery, onions and green pepper. Cook, stirring constantly, for 6 to 8 minutes, until chicken is fully cooked. If a lot of liquid is accumulating in the wok, turn up the heat to reduce or spoon the excess liquid out of the wok and discard.
2. Add almonds and mung beans sprouts and cook, stirring constantly, for an additional 1 to 2 minutes until sprouts have wilted.
3. Mix salt, honey, arrowroot starch, and sesame oil with chicken stock. Add to wok and stir until the sauce has thickened, about 1 to 2 minutes. Taste and add additional salt, if needed.
4. Serve over rice or cauliflower rice if desired.



DESSERT

Dark Chocolate Bark with Mushroom Extract

PREP TIME

15 minutes plus
chilling time

COOK TIME

7 minutes

YIELD

18-20 pieces

½ cup Brazil nuts

½ cup almonds

½ cup cashews

9 ounces bittersweet chocolate

1 tablespoon olive oil, or oil of choice

⅓ cup mushroom extract (e.g., chaga, reishi, turkeytail, cordyceps, maitake, lion's mane, etc.)

¾ cups raisins (or half and half raisins and dried cranberries)

½ teaspoon Maldon sea salt (optional)

1. Preheat oven to 350°F.
2. Roughly chop the Brazil nuts, almonds and cashews (the largest pieces will determine the thickness of the bark) and place on a rimmed baking sheet. Bake to lightly toast, for 5 to 7 minutes, giving the baking sheet a shake every couple of minutes (watch carefully since they can burn quickly).
3. Melt the chocolate and olive oil over a double boiler or in the microwave on medium power. Stir in the mushroom extract until completely smooth and fully combined.
4. Line a rimmed baking sheet with parchment paper, wax paper, or a silicone baking mat.
5. Mix the chopped nuts and raisins into melted chocolate. Pour onto the prepared baking sheet and spread to ¼- to ⅜-inch thick. Sprinkle the salt over the top, if using.
6. Refrigerate until chocolate bark is cold and hard. Remove from the fridge and cut into pieces (however big or small you like). Store in an airtight container in the fridge for up to a month.



TIP: The bitter earthy flavor of the mushroom extract is masked by the sweetness of semisweet chocolate. However, some mushroom extracts, like reishi, are extremely bitter. If you're worried the bark won't be sweet enough, add the mushroom extract a teaspoon at a time, tasting to make sure the sweet taste still comes through. The finished bark should taste as though it's made with 80% to 90% dark chocolate. My preference is to use Real Mushrooms 5 Defenders for this recipe.



About the Creators of this Book

Dr. Sarah Ballantyne, PhD

FOUNDER OF NUTRIVORE

Award-winning public speaker, New York Times bestselling author and world-renowned health expert, Dr. Sarah Ballantyne, PhD believes the key to improving public health is scientific literacy. She creates educational resources to help people improve their day-to-day diet and lifestyle choices, empowered and informed by the most current evidenced-based scientific research.



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Charissa Joy has over 15 years of experience working in the wellness space. Charissa has many roles on the team. She is Dr. Sarah's right hand woman and touches every part of Dr. Sarah's businesses. She manages all communications for Nutrivore, both external and internal. She is the project and team manager. She handles all marketing internal and external marketing, as well as all brand/affiliate partnerships.



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REFERENCES

- Abrams DI, Couey P, Shade SB, Kelly ME, Kamanu-Elias N, Stamets P. Antihyperlipidemic effects of *Pleurotus ostreatus* (oyster mushrooms) in HIV-infected individuals taking antiretroviral therapy. *BMC Complement Altern Med*. 2011 Aug 10;11:60. doi: 10.1186/1472-6882-11-60.
- Ahmad R, Riaz M, Khan A, Aljamea A, Algheryafi M, Sewaket D, Alqathama A. *Ganoderma lucidum* (Reishi) an edible mushroom; a comprehensive and critical review of its nutritional, cosmeceutical, mycochemical, pharmacological, clinical, and toxicological properties. *Phytother Res*. 2021 Nov;35(11):6030-6062. doi: 10.1002/ptr.7215.
- Aramabašić Jovanović J, Mihailović M, Uskoković A, Grdović N, Dinić S, Vidaković M. The Effects of Major Mushroom Bioactive Compounds on Mechanisms That Control Blood Glucose Level. *J Fungi (Basel)*. 2021 Jan 16;7(1):58. doi: 10.3390/jof7010058.
- Arunachalam K, Sreeja PS, Yang X. The Antioxidant Properties of Mushroom Polysaccharides can Potentially Mitigate Oxidative Stress, Beta-Cell Dysfunction and Insulin Resistance. *Front Pharmacol*. 2022 May 5;13:874474. doi: 10.3389/fphar.2022.874474.
- Ba DM, Gao X, Al-Shaar L, Muscat J, Chinchilli VM, Ssentongo P, Beelman RB, Richie J. Mushroom intake and cognitive performance among US older adults: the National Health and Nutrition Examination Survey, 2011-2014. *Br J Nutr*. 2022 Dec 14;128(11):2241-2248. doi: 10.1017/S0007114521005195.
- Ba DM, Gao X, Al-Shaar L, Muscat JE, Chinchilli VM, Beelman RB, Richie JP. Mushroom intake and depression: A population-based study using data from the US National Health and Nutrition Examination Survey (NHANES), 2005-2016. *J Affect Disord*. 2021 Nov 1;294:686-692. doi: 10.1016/j.jad.2021.07.080.
- Ba DM, Gao X, Muscat J, Al-Shaar L, Chinchilli V, Zhang X, Ssentongo P, Beelman RB, Richie JP Jr. Association of mushroom consumption with all-cause and cause-specific mortality among American adults: prospective cohort study findings from NHANES III. *Nutr J*. 2021 Apr 22;20(1):38. doi: 10.1186/s12937-021-00691-8.
- Ba DM, Ssentongo P, Beelman RB, Muscat J, Gao X, Richie JP. Higher Mushroom Consumption Is Associated with Lower Risk of Cancer: A Systematic Review and Meta-Analysis of Observational Studies. *Adv Nutr*. 2021 Oct 1;12(5):1691-1704. doi: 10.1093/advances/nmab015.
- Ba DM, Ssentongo P, Pelucchi C, Negri E, Palli D, Ferraroni M, Zhang ZF, Yu GP, Tsugane S, Hidaka A, Hamada GS, Zaridze D, Maximovich D, Obón-Santacana M, Álvarez-Álvarez L, Vioque J, Garcia de la Hera M, López-Carrillo L, López-Cervantes M, Mu L, Lagiou A, Lagiou P, Boffetta P, Camargo MC, Curado MP, Lunet N, La Vecchia C, Muscat J. Mushroom consumption and risk of gastric cancer: a pooled analysis within the stomach cancer pooling project and a combined meta-analysis with other observational studies. *Eur J Cancer Prev*. 2023 May 1;32(3):222-228. doi: 10.1097/CEJ.0000000000000754.

- Beelman RB, Kalaras MD, Phillips AT, Richie JP Jr. Is ergothioneine a 'longevity vitamin' limited in the American diet? *J Nutr Sci.* 2020 Nov 11;9:e52. doi: 10.1017/jns.2020.44.
- Borodina I, Kenny LC, McCarthy CM, Paramasivan K, Pretorius E, Roberts TJ, van der Hoek SA, Kell DB. The biology of ergothioneine, an antioxidant nutraceutical. *Nutr Res Rev.* 2020 Dec;33(2):190-217. doi: 10.1017/S0954422419000301.
- Cardwell G, Bornman JF, James AP, Black LJ. A Review of Mushrooms as a Potential Source of Dietary Vitamin D. *Nutrients.* 2018 Oct 13;10(10):1498. doi: 10.3390/nu10101498.
- Cerletti C, Esposito S, Iacoviello L. Edible Mushrooms and Beta-Glucans: Impact on Human Health. *Nutrients.* 2021 Jun 25;13(7):2195. doi: 10.3390/nu13072195.
- Cheah IK, Halliwell B. Ergothioneine, recent developments. *Redox Biol.* 2021 Jun;42:101868. doi: 10.1016/j.redox.2021.101868. Epub 2021 Jan 26.
- Dai X, Stanilka JM, Rowe CA, Esteves EA, Nieves C Jr, Spaiser SJ, Christman MC, Langkamp-Henken B, Percival SS. Consuming *Lentinula edodes* (Shiitake) Mushrooms Daily Improves Human Immunity: A Randomized Dietary Intervention in Healthy Young Adults. *J Am Coll Nutr.* 2015;34(6):478-87. doi: 10.1080/07315724.2014.950391.
- Dasgupta A, Acharya K. Mushrooms: an emerging resource for therapeutic terpenoids. *3 Biotech.* 2019 Oct;9(10):369. doi: 10.1007/s13205-019-1906-2.
- Durmus A, Durmus I, Bender O, Karatepe O. The effect of *Hericium erinaceum* on the prevention of chemically induced experimental colitis in rats. *Korean J Intern Med.* 2021 Mar;36(Suppl 1):S44-S52. doi: 10.3904/kjim.2019.050.
- Elieh Ali Komi D, Sharma L, Dela Cruz CS. Chitin and Its Effects on Inflammatory and Immune Responses. *Clin Rev Allergy Immunol.* 2018 Apr;54(2):213-223. doi: 10.1007/s12016-017-8600-0.
- Erjavec I, Brkljacic J, Vukicevic S, Jakopovic B, Jakopovich I. Mushroom Extracts Decrease Bone Resorption and Improve Bone Formation. *Int J Med Mushrooms.* 2016;18(7):559-69. doi: 10.1615/intjmedmushrooms.v18.i7.10.
- Fijałkowska A, Jędrejko K, Sułkowska-Ziaja K, Ziaja M, Kała K, Muszyńska B. Edible Mushrooms as a Potential Component of Dietary Interventions for Major Depressive Disorder. *Foods.* 2022 May 20;11(10):1489. doi: 10.3390/foods11101489.
- Førland DT, Johnson E, Saetre L, Lyberg T, Lygren I, Hetland G. Effect of an extract based on the medicinal mushroom *Agaricus blazei* Murill on expression of cytokines and calprotectin in patients with ulcerative colitis and Crohn's disease. *Scand J Immunol.* 2011 Jan;73(1):66-75. doi: 10.1111/j.1365-3083.2010.02477.x.
- Fu TT, Shen L. Ergothioneine as a Natural Antioxidant Against Oxidative Stress-Related Diseases. *Front Pharmacol.* 2022 Mar 18;13:850813. doi: 10.3389/fphar.2022.850813.

- Jayasuriya WJ, Wanigatunge CA, Fernando GH, Abeytunga DT, Suresh TS. Hypoglycaemic activity of culinary *Pleurotus ostreatus* and *P. cystidiosus* mushrooms in healthy volunteers and type 2 diabetic patients on diet control and the possible mechanisms of action. *Phytother Res.* 2015 Feb;29(2):303-9. doi: 10.1002/ptr.5255.
- Jeong SC, Jeong YT, Yang BK, Islam R, Koyyalamudi SR, Pang G, Cho KY, Song CH. White button mushroom (*Agaricus bisporus*) lowers blood glucose and cholesterol levels in diabetic and hypercholesterolemic rats. *Nutr Res.* 2010 Jan;30(1):49-56. doi: 10.1016/j.nutres.2009.12.003.
- Kabir Y, Yamaguchi M, Kimura S. Effect of shiitake (*Lentinus edodes*) and maitake (*Grifola frondosa*) mushrooms on blood pressure and plasma lipids of spontaneously hypertensive rats. *J Nutr Sci Vitaminol (Tokyo).* 1987 Oct;33(5):341-6. doi: 10.3177/jnsv.33.341.
- Kameda M, Teruya T, Yanagida M, Kondoh H. Frailty markers comprise blood metabolites involved in antioxidantation, cognition, and mobility. *Proc Natl Acad Sci U S A.* 2020 Apr 28;117(17):9483-9489. doi: 10.1073/pnas.1920795117.
- Kerezoudi EN, Mitsou EK, Gioti K, Terzi E, Avgousti I, Panagiotou A, Koutrotsios G, Zervakis GI, Mountzouris KC, Tenta R, Kyriacou A. Fermentation of *Pleurotus ostreatus* and *Ganoderma lucidum* mushrooms and their extracts by the gut microbiota of healthy and osteopenic women: potential prebiotic effect and impact of mushroom fermentation products on human osteoblasts. *Food Funct.* 2021 Mar 1;12(4):1529-1546. doi: 10.1039/d0fo02581j.
- Krittanawong C, Isath A, Hahn J, Wang Z, Fogg SE, Bandyopadhyay D, Jneid H, Virani SS, Tang WHW. Mushroom Consumption and Cardiovascular Health: A Systematic Review. *Am J Med.* 2021 May;134(5):637-642.e2. doi: 10.1016/j.amjmed.2020.10.035.
- Lee AH, Pasalich M, Su D, Tang L, Tran VD, Binns CW. Mushroom intake and risk of epithelial ovarian cancer in southern Chinese women. *Int J Gynecol Cancer.* 2013 Oct;23(8):1400-5. doi: 10.1097/IGC.ob013e3182a41dd8.
- Li TJ, Lee TY, Lo Y, Lee LY, Li IC, Chen CC, Chang FC. *Hericium erinaceus* mycelium ameliorate anxiety induced by continuous sleep disturbance in vivo. *BMC Complement Med Ther.* 2021 Dec 5;21(1):295. doi: 10.1186/s12906-021-03463-3.
- Lindequist U, Haertel B. Medicinal Mushrooms for Prevention and Therapy of Osteoporosis (Review). *Int J Med Mushrooms.* 2021;23(4):13-22. doi: 10.1615/IntJMedMushrooms.2021038084.
- Panda SK, Sahoo G, Swain SS, Luyten W. Anticancer Activities of Mushrooms: A Neglected Source for Drug Discovery. *Pharmaceuticals (Basel).* 2022 Jan 31;15(2):176. doi: 10.3390/ph15020176.
- Park SK, Oh CM, Ryoo JH, Jung JY. The protective effect of mushroom consumption on depressive symptoms in Korean population. *Sci Rep.* 2022 Dec 19;12(1):21914. doi: 10.1038/s41598-022-26549-5.
- Paul BD. Ergothioneine: A Stress Vitamin with Antiaging, Vascular, and Neuroprotective Roles? *Antioxid Redox Signal.* 2022 Jun;36(16-18):1306-1317. doi: 10.1089/ars.2021.0043.

- Preuss HG, Echard B, Fu J, Perricone NV, Bagchi D, Kaylor M, Zhuang C. Fraction SX of maitake mushroom favorably influences blood glucose levels and blood pressure in streptozotocin-induced diabetic rats. *J Med Food*. 2012 Oct;15(10):901-8. doi: 10.1089/jmf.2012.0011.
- Qin M, Geng Y, Lu Z, Xu H, Shi JS, Xu X, Xu ZH. Anti-Inflammatory Effects of Ethanol Extract of Lion's Mane Medicinal Mushroom, *Hericium erinaceus* (Agaricomycetes), in Mice with Ulcerative Colitis. *Int J Med Mushrooms*. 2016;18(3):227-34. doi: 10.1615/IntJMedMushrooms.v18.i3.50.
- Rahman MA, Abdullah N, Aminudin N. *Lentinula edodes* (shiitake mushroom): An assessment of in vitro anti-atherosclerotic bio-functionality. *Saudi J Biol Sci*. 2018 Dec;25(8):1515-1523. doi: 10.1016/j.sjbs.2016.01.021.
- Rodriguez MN, Lippi SLP. Lion's Mane (*Hericium erinaceus*) Exerts Anxiolytic Effects in the rTg4510 Tau Mouse Model. *Behav Sci (Basel)*. 2022 Jul 15;12(7):235. doi: 10.3390/bs12070235.
- Ryu S, Kim HG, Kim JY, Kim SY, Cho KO. *Hericium erinaceus* Extract Reduces Anxiety and Depressive Behaviors by Promoting Hippocampal Neurogenesis in the Adult Mouse Brain. *J Med Food*. 2018 Feb;21(2):174-180. doi: 10.1089/jmf.2017.4006.
- Shamim MZ, Mishra AK, Kausar T, Mahanta S, Sarma B, Kumar V, Mishra PK, Panda J, Baek KH, Mohanta YK. Exploring Edible Mushrooms for Diabetes: Unveiling Their Role in Prevention and Treatment. *Molecules*. 2023 Mar 21;28(6):2837. doi: 10.3390/molecules28062837.
- Shin A, Kim J, Lim SY, Kim G, Sung MK, Lee ES, Ro J. Dietary mushroom intake and the risk of breast cancer based on hormone receptor status. *Nutr Cancer*. 2010;62(4):476-83. doi: 10.1080/01635580903441212.
- Singh R, Dhingra GS, Shri R. Evaluation of Antianxiety Potential of Four *Ganoderma* (Agaricomycetes) Species from India in Mice. *Int J Med Mushrooms*. 2016;18(11):991-998. doi: 10.1615/IntJMedMushrooms.v18.i11.40.
- Smith E, Ottosson F, Hellstrand S, Ericson U, Orho-Melander M, Fernandez C, Melander O. Ergothioneine is associated with reduced mortality and decreased risk of cardiovascular disease. *Heart*. 2020 May;106(9):691-697. doi: 10.1136/heartjnl-2019-315485. Epub 2019 Oct 31.
- Spim SRV, Pistila AMH, Pickler TB, Silva MT, Grotto D. Effects of Shiitake Culinary-Medicinal Mushroom, *Lentinus edodes* (Agaricomycetes), Bars on Lipid and Antioxidant Profiles in Individuals with Borderline High Cholesterol: A Double-Blind Randomized Clinical Trial. *Int J Med Mushrooms*. 2021;23(7):1-12. doi: 10.1615/IntJMedMushrooms.2021038773.
- Sun L, Niu Z. A mushroom diet reduced the risk of pregnancy-induced hypertension and macrosomia: a randomized clinical trial. *Food Nutr Res*. 2020 Jun 8;64. doi: 10.29219/fnr.v64.4451.
- Therkelsen SP, Hetland G, Lyberg T, Lygren I, Johnson E. Effect of a Medicinal *Agaricus blazei* Murill-Based Mushroom Extract, AndoSan™, on Symptoms, Fatigue and Quality of Life in Patients with Ulcerative

Colitis in a Randomized Single-Blinded Placebo Controlled Study. *PLoS One*. 2016 Mar 2;11(3):e0150191. doi: 10.1371/journal.pone.0150191.

Valverde ME, Hernández-Pérez T, Paredes-López O. Edible mushrooms: improving human health and promoting quality life. *Int J Microbiol*. 2015;2015:376387. doi: 10.1155/2015/376387.

Varshney J, Ooi JH, Jayarao BM, Albert I, Fisher J, Smith RL, Patterson AD, Cantorna MT. White button mushrooms increase microbial diversity and accelerate the resolution of *Citrobacter rodentium* infection in mice. *J Nutr*. 2013 Apr;143(4):526-32. doi: 10.3945/jn.112.171355.

Zhang M, Zhang Y, Zhang L, Tian Q. Mushroom polysaccharide lentinan for treating different types of cancers: A review of 12 years clinical studies in China. *Prog Mol Biol Transl Sci*. 2019;163:297-328. doi: 10.1016/bs.pmbts.2019.02.013.

Zhang S, Sugawara Y, Chen S, Beelman RB, Tsuduki T, Tomata Y, Matsuyama S, Tsuji I. Mushroom consumption and incident risk of prostate cancer in Japan: A pooled analysis of the Miyagi Cohort Study and the Ohsaki Cohort Study. *Int J Cancer*. 2020 May 15;146(10):2712-2720. doi: 10.1002/ijc.32591.

Zhang W, Xiang YB, Li HL, Yang G, Cai H, Ji BT, Gao YT, Zheng W, Shu XO. Vegetable-based dietary pattern and liver cancer risk: results from the Shanghai women's and men's health studies. *Cancer Sci*. 2013 Oct;104(10):1353-61. doi: 10.1111/cas.12231.

Zhao J, Hu Y, Qian C, Hussain M, Liu S, Zhang A, He R, Sun P. The Interaction between Mushroom Polysaccharides and Gut Microbiota and Their Effect on Human Health: A Review. *Biology (Basel)*. 2023 Jan 12;12(1):122. doi: 10.3390/biology12010122.

Kim SH, Thomas MJ, Wu D, Carman CV, Ordovás JM, Meydani M. Edible Mushrooms Reduce Atherosclerosis in *Ldlr*^{-/-} Mice Fed a High-Fat Diet. *J Nutr*. 2019 Aug 1;149(8):1377-1384. doi: 10.1093/jn/nxz075.