

# Eating mushrooms for our health



# Definitions:

**Fungiphobic:** having an irrational fear of mushrooms, molds, and anything having to do with fungi!

**Fungiphilic:** being truly enlightened and knowing that fungi are gifts from the gods and that the science of mycology can provide answers to most of mankind's most pressing problems

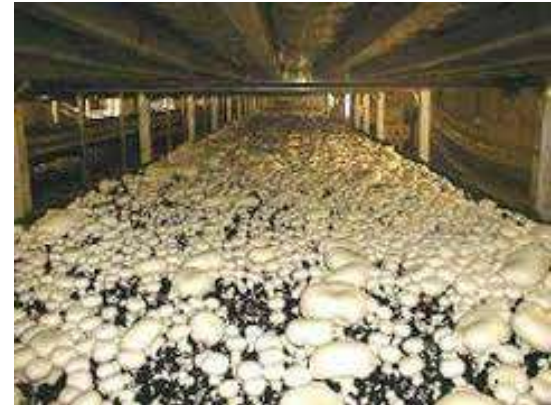


**Why are people often fungiphobic??**



# A few mushrooms are poisonous!!

- Approximately 24,000 mushroom species have been identified [Chang and Miles, 2004]
- About 1000 species (~4%) are known to be edible.
- About 60 of these have been cultivated (about 10 on a large industrial scale)
- But....about 40 species are known to be poisonous!!



*Agaricus campestris*, yummy!!



*Amanita virosa*, destroying angel



*Amanita phalloides*, death cap

**With increasing population and little increase in arable land, UA School of Plant Sciences is focused on sustainable food production systems through:**

**Plant breeding**

**Cultural practices**

**Plant protection**

**Plant biotechnology**

**Controlled environment agriculture**



**But what about mushrooms??**



**Are mushrooms a substantial, nutritious,  
and sustainable source of food?**



# Are mushrooms are a nutritious food? YES!

Myco-protein products!!  
from *Fusarium venenatum*.

## Nutrition Facts

Serving Size 5 medium (84g/3.0 oz)

Amount Per Serving

Calories 20      Calories from Fat 0

% Daily Value\*

Total Fat 0g      0%

Saturated Fat 0g      0%

Trans Fat 0g

Cholesterol 0mg      0%

Sodium 15mg      1%

Potassium 300mg      9%

Total Carbohydrate 3g      1%

Dietary Fiber 1g      4%

Sugars 0g

Protein 3g

Vitamin A 0%      • Vitamin C 2%

Calcium 0%      • Iron 2%

Vitamin D 4%      • Thiamin 4%

Riboflavin 20%      • Niacin 15%

Vitamin B6 4%      • Folate 4%

Pantothenic Acid 15% • Phosphorus 8%

Magnesium 2%      • Zinc 2%

Selenium 10%      • Copper 15%

Manganese 2%

\*Percent Daily Values are based on a 2,000 calorie diet.  
Your daily values may be higher or lower depending on your calorie needs:

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Saturated Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Potassium		3,500 mg	3,500 mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

**Mycoprotein** is a good balance of all nine essential amino acids in roughly the same proportions as egg.

A first class protein product, comparable to meat and fish but with no cholesterol, high in fiber, low in fat, and no trans-fats.

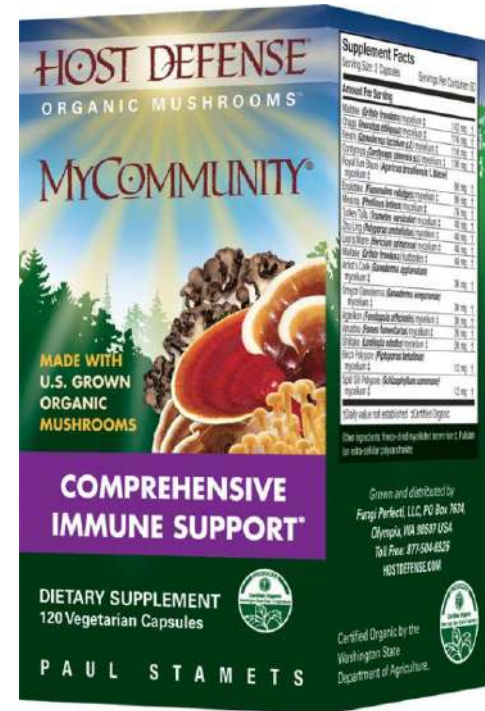
Compare this to **CORN**, which is less than 10% protein and deficient in three essential amino acids: lysine, tryptophan, and methionine.



Excellent source for B and D vitamins as well!

## Equally important, all those amazing nutraceuticals!!!

- **Egotheonine**, a natural antioxidant found in beans, oats, liver, with the highest concentration in mushrooms.
- **Conjugated linoleic acids (CLA)**, found mainly in the meat, dairy products, and mushrooms. Powerful anti-carcinogens; significant effects on metabolism by lowering body fat, increasing lean body mass
- **Beta glucans**, effective immuno-modulators that enhance the innate immune response by stimulating natural killer (NK) cells, and enhance adaptive immune response by stimulating dendritic cells (DC) maturation and their antigen-presenting functions
- **Aromatase and 5-alpha reductase inhibitors**, hormone modulators that inhibit enzymes important in the biosynthesis of estrogen and dihydrotestosterone, respectively.
- **The statins, HMG-CoA reductase inhibitors**, produced by many fungi reduce cholesterol production in the liver.





# The big Five (medicinal mushrooms)

**Shitake (the king!):** Lower cholesterol, CLAs, antimicrobial, antioxidant, anticancer



Naturally grows on logs



commercially grown on sawdust blocks



# **Maitake** (hen of the woods): Lower cholesterol, antimicrobial, antiinflammatory



Also commercially grown on sawdust blocks

Maitake burger....yummmmm!



**Almond mushroom (Himematsutake):**, lower blood sugar, Lower cholesterol, CLAs, antimicrobial, antiinflammatory, anticancer,



commercially grown on composted straw



**Reishi** (lingzhi): lower blood sugar, Lower cholesterol, antimicrobial, antihormonal,



commercially grown on sawdust blocks

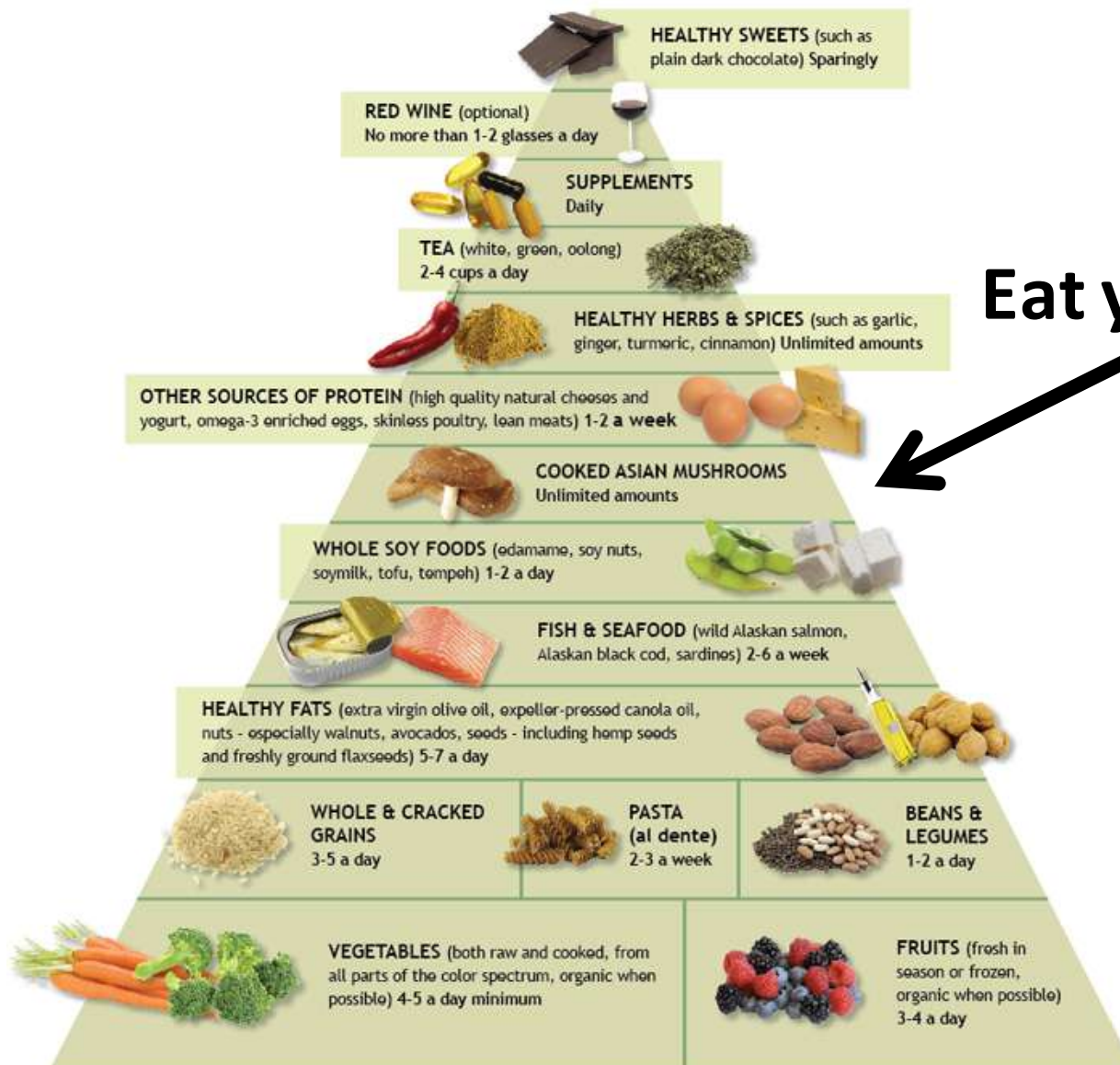


**Cordyceps:** lower blood sugar,  
antimicrobial, anti-inflammatory, popular  
with elderly



Grown in trays on live caterpillars, sold in stores still attached to the host

# Dr. Weil's anti-inflammatory food pyramid



**Eat your fungi!!**

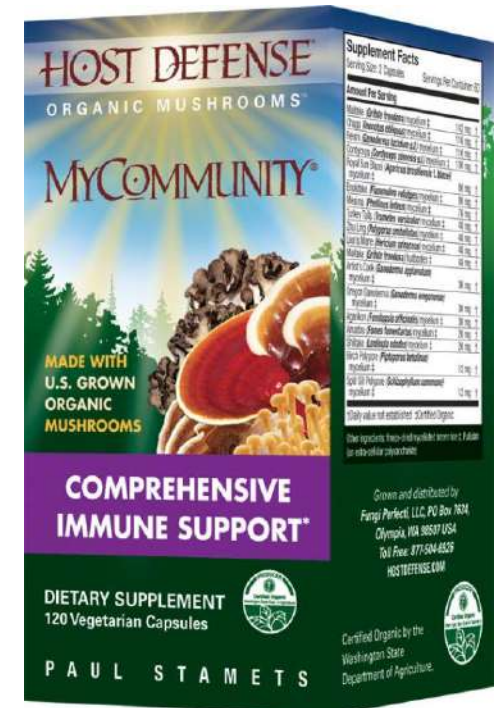


- If you want to live to be 100, eat your vegetables and EAT YOUR MUSHROOMS!**



# In Conclusion

- Mushrooms have been part of the human diet for thousands of years
- Mushrooms are competing with other fresh produce in the market, not just with other mushrooms
- In Asian countries, mushrooms are considered a staple food. In Western countries, mushrooms are an “impulse purchase”
- The health benefits of mushrooms long recognized in Asia, are starting to be recognized in the west as part of a healthy diet.
- We need to promote “fungiphilia” to stimulate a robust market for mushrooms.



# Mushrooms can help reduce cardiovascular disease



ergot

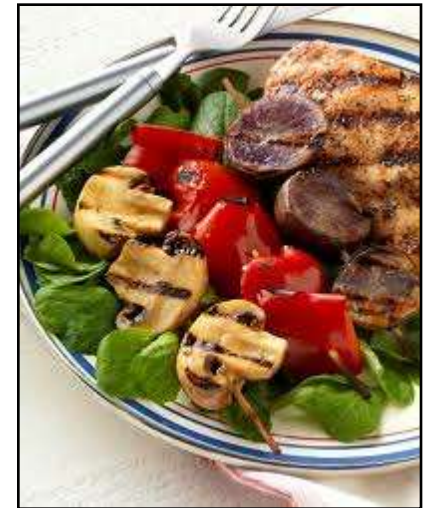
- Both common and specialty mushrooms inhibit the cellular processes associated with early heart disease
  - **Ergothioneine** is a natural antioxidant, first discovered in ergot. Cannot be synthesized by humans, so must be obtained in the diet. Also found in beans and oat bran, ruminant liver and kidney. But mushrooms have the highest concentration!!
  - Inhibits adhesion molecule expression and in vitro binding of monocytes to human aortic endothelial cells in a pro-inflammatory environment characteristic of early cardiovascular disease



➤ Mushrooms also **produce conjugated linoleic acids** (CLA), isomers of linoleic acid found mainly in the meat and dairy products derived from ruminants.

➤ CLA's are powerful anti-carcinogens, hindering tumor growth in mammary, skin, colon, and prostate tissue

➤ Also a significant effect of CLA on weight management is on body composition, a reduction in total body fat and an increase in lean body mass



Yummmm!!!

# Mushrooms can help protect against infection

- Mushrooms have **beta-glucans**, important structural components of all fungal cell walls
- Beta-glucans appear to promote **innate immune response** against viral infections and tumors by enhancing natural killer (NK) cells, cytotoxic lymphocytes that kill infected and damaged cells.
- Mushrooms also stimulate dendritic cells (DC) maturation and their antigen-presenting functions which also promote **adaptive immune response** against microbes and allergens

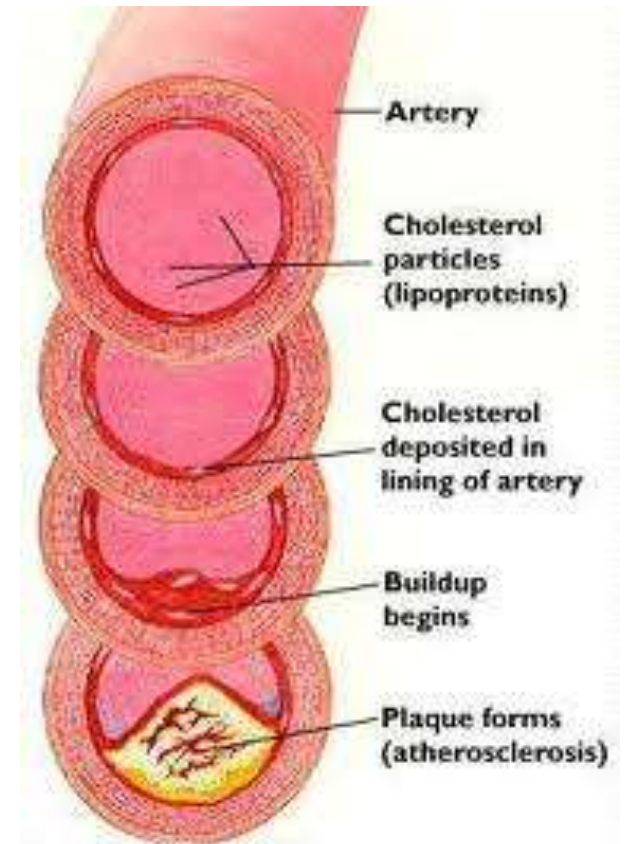


*Agaricus blazei*  
(Almond mushroom)



# Anti-Hypercholesterolemic Activity

- Mushrooms have been shown to contain several additional compounds which appear to lower serum cholesterol in mammals
- **Statins** (HMG-CoA reductase inhibitors, example is lovastatin) naturally produced in fungi (yeast, *Aspergillus*, oyster mushrooms, and others) reduce cholesterol production in the liver. Many synthetic derivatives...big pharmaceutical money behind these drugs!!!
- **Eritadenine**, first isolated from shiitake, is also a powerful cholesterol reducing agent



# Mushroom help protect against many forms of cancer as we age

- Mushrooms inhibit **aromatase** and **5-alpha reductase**
- Aromatase is an important enzyme in the biosynthesis of estrogens. Because estrogens also promote certain cancers and other diseases, aromatase inhibitors are frequently used to treat those diseases.
- 5-alpha reductase convert testosterone into the more potent dihydrotestosterone (DHT). DHT, as well as all androgens, is later converted to estrogens.



*A. bisporus*



*A. bisporus crimini*



*A. bisporus portobella*