

Mushroom poisoning: Know what's in the basket!

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[Home](#) / [Web Exclusives](#) / [Guides](#) / [Harvesting and Processing Edible Wild Plants of the Boreal Forest](#)

Harvesting and Processing Edible Wild Plants of the Boreal Forest

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- * [Preparation for Harvest: Guidelines, Rules](#)
- * [Recommendations for Harvesting: What, Where, for Whom](#)
- * [Washing and Handling: General Washing & Handling, Plants/ Mushrooms](#)
- * [Storage: Drying, Blanching & Freezing, Canning/Preserving/Bottling](#)
- * [Rules for Selling Edible Wild Plants: Health Guidelines, Additional Rules](#)





Summary of US mushroom poisonings (1985-2005)

Classification	Individuals Reported Sick	Typical # Reported Cases/Year	% of total	Number of Deaths (not counting shock)	% Deaths
Grand Total	1,641	70		17	1%
Amatoxins	147	6	8.9%	16	11%
Gyromitra, Helvella, Verpa	68	3	4.1%	0	0
Morels	52 + 77 (one big case)	3	3%	0	0
Isoxazoles	218	10	13%	0	0
Psilocybin	108	5	6.6%	0	0
Total GI	959	40	58%	1	0.1%
Chlorophyllum	176	8	10.7%	0	0
Omphalotus	98	4.5	5.9%	0	0
Leccinum	58	3	3.5%	0	0

Beug et al., *Mcllvainea* 16(2): 47-68, (2006)

Toxicological groupings of mushroom poisoning

Group	Toxin
1	Amatoxin
2	Ibotenic acid / muscimol
3	Gyromitrin / monomethylhydrazine
4	Muscarine
5	Coprine
6	miscellaneous

Group 1: Amatoxin-type

Amatoxins

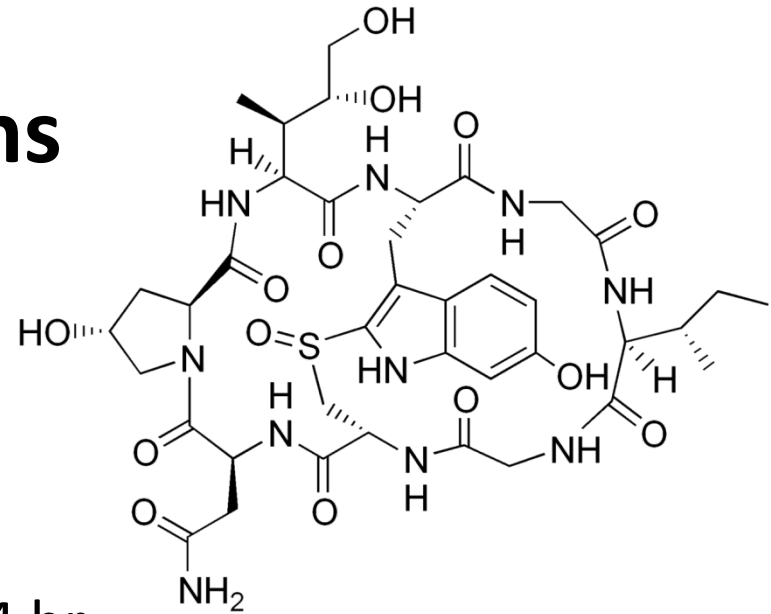
Season: Summer to late fall

Onset: (6-) 12-24 (-48) hr pp

- Sx:**
- 1) GI symptoms lasting 1-2 d
 - 2) Treacherous remission 12-24 hr
 - 3) Liver/ kidney failure, death in 4-7 d

Toxin: α -Amanitin inhibits RNA II pol

- Tx:**
- treat symptoms, follow liver enzymes
 - interrupt enterohepatic circulation
 - keep pt hydrated (some toxin is excreted in urine)
 - liver transplant has been successful
 - silymarin (milk thistle extract) may reduce reabsorption



Amanita bisporigera





Pamela Kaminski

Amanita phalloides



Conocybe filaris

Amatoxin content

Species	Amatoxin*
<i>Amanita phalloides</i>	1.4 - 6.8 mg/g
<i>Amanita virosa</i>	1.9 - 2.6
<i>Lepiota brunneoincarnata</i>	1.3
<i>Lepiota josserandi</i>	3.5

* lethal dose for adult approx. 10 mg

Group 2: Ibotenic acid / Muscimol

Ibotenic acid / Muscimol

Season: Summer to late fall

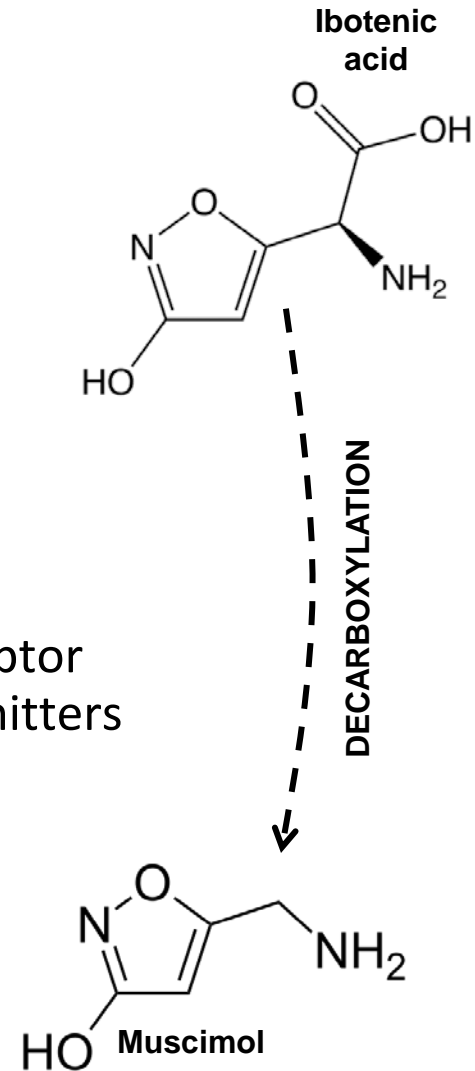
Onset: 30-120 (180) min pp

Sx: - dizziness, muscle cramps, mood swings, nausea, vomiting, often with rapidly alternating symptoms
(*very little muscarine in North American biotypes*)

Toxins:

- atropine-like toxicosis
- **Ibotenic acid:** binds to N-methyl-D-aspartate (NMDA) receptor mimics glutamate, leads to neurotoxic ↑ of neurotransmitters
- **Muscimol:** GABA_A agonist, exerts CNS sympathetic effects

Tx: - GI decontamination, charcoal
- conservative symptom treatment





Amanita amerimuscaria





Amanita caesarea

Group 3: Gyromitrin & monomethylhydrazine (MMH)

Gyromitrin & monomethylhydrazine (MMH)

Season: Early to late spring

Onset: (2-) 6-12 hr postprandial

Sx: 1) **Mild:** GI symptoms, abdominal pain, muscle cramps, vertigo, headache

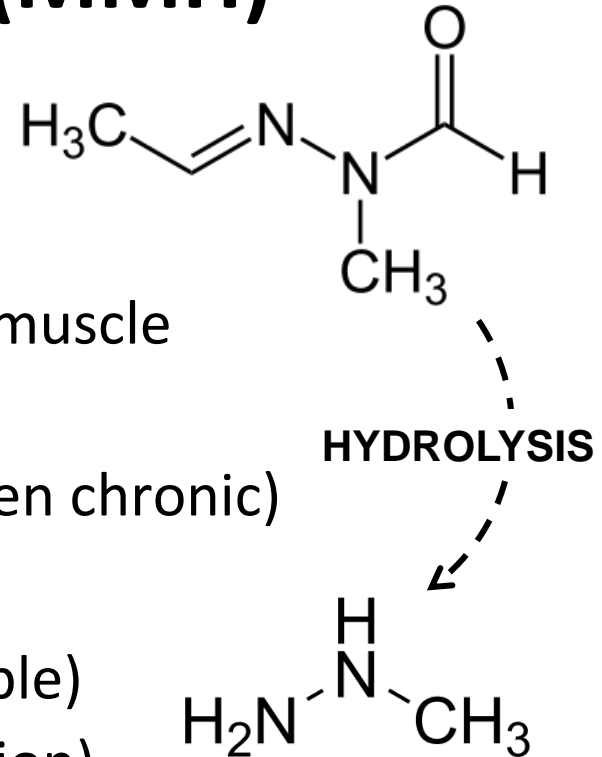
2) **Severe:** convulsions, death (more often chronic)

Toxin: MMH

- thermolabile (bp 143 C but water soluble)
- cumulative (acute vs. chronic intoxication)

Tx: - monitor LFTs, treat symptoms

- pyridoxine (B6) can be used to preserve GABA synthesis





Gyromitra esculenta

Speisemorchel



***Morchella esculenta* group**

Group 4: Muscarine

Muscarine

Season: Summer to late fall

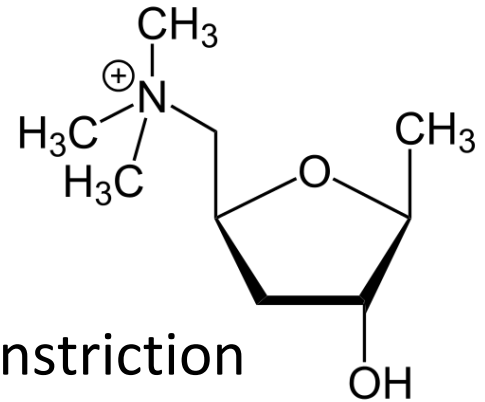
Onset: 30-120 (180) min pp

Sx: - perspiration, SLUDGE syndrome, pupilar constriction
blurred vision, bradycardia, hypotension

Toxin: cholinergic (aka muscarinic) effects

- competes with acetylcholine due to its structural similarity
- potent activator of the peripheral parasympathetic nervous system
- excreted unchanged in urine (not metabolized by humans)

Tx: - atropine is antedotal





2002/10/23 5:10pm

Inocybe geophylla





Clitocybe dealbata

Eastern North American strains of *Amanita muscaria*, despite the name, do not contain much muscarine



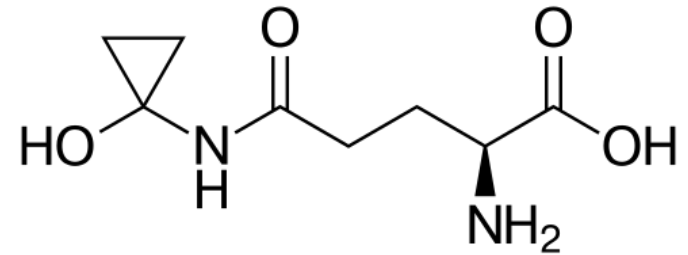
West coast biotype



Central and east coast biotype

Group 5: Coprine

Coprine



Season: Late spring to late fall

Onset: Usually 30 min after EtOH ingestion

- reaction possible up to 6 d after ingestion of mushroom
- may occur in children following cough elixir

Sx: Flushing of upper body, swelling/ tingling of hands, metallic taste, tachycardia, tachypnea, headache, nausea/ vomiting

Toxin: Antabuse / disulfiram-like reaction

- amino alcohol, inhibits alcohol dehydrogenase (AHD)
- causes accumulation of acetaldehyde

Tx: Supportive care



Coprinus atramentarius

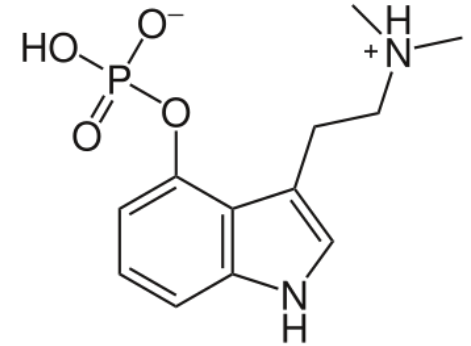
Spitzmorchel



***Morchella elata* group !!**

Group 6: Psilocybin-type

Psilocybin



Season: Summer to late fall

Onset: Usually 20-30 min after ingestion

- duration up to 8 h after ingestion of mushroom

Symptoms:

- primarily hallucinogenic; may provoke fear/ anxiety response ("bad trip"); psychotropic effects often preceded by acute nausea/ vomiting (about 25% of people)

Toxin:

- alkaloid, structurally similar to serotonin
- metabolized by the liver on first pass, absorbed agent excreted in urine

Tx: Supportive care



Psilococybe cubensis



Psilocybe semilanceolata



Panaeolus cinctulus





Panaeolina foenicicii





Gymnopilus spectabilis



Galerina autumnalis

Group 7: Miscellaneous GI irritants
(may include some muscarine)

Miscellaneous

Season: Late spring to late fall

Onset: 30 min to (2-) 4 hr pp

Sx: - nausea, vomiting, diarrhea, other symptoms

- typically "miscellaneous" poisonings are not serious

- there are some exceptions, e.g., "*Paxillus* syndrome"

 - immune complex mediated hemolytic anemia leading to acute renal failure

 - associated with *Paxillus involutus*, *Ampulloclitocybe clavipes*, *Boletus luridus*

Toxin: various, poorly-defined

- in *Paxillus* syndrome, the toxin is the diarylcyclopentenone, "involutin"

Tx: - treat symptoms, replace fluids

- charcoal may be useful in severe poisonings



Omphalotus illudens



Cantharellus cibarius



Armillaria ostoyae



Armillaria mellea



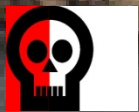
Chlorophyllum molybdites



Lepiota procera



Russula emetica group



Boletus satanus



Paxillus involutus



Ampulloclitocybe clavipes

Other considerations

- Bioconcentration
 - Pb, Cs, Co, Hg, U, Zn
- Bacterial overgrowth
- Food sensitivity
 - trehalose intolerance

Summary

Avg Onset	Symptoms	Toxin
< 45 min pp	flushing or face & neck, tingling of arms	Coprine
15-120 min pp	PSL/ SLUDGE syndrome, constricted pupils	Muscarine
1-3 hr pp	muscle spasms, hyperactivity/ lethargy, nausea/ vomiting	Ibotenic acid/ Muscimol
	nausea, vomiting, diarrhea	misc. GI irritants
(2)6-12(48) hr pp	bloated feeling, nausea/ vomiting, headache, ↑elevated liver enzymes	MMH
(6)12-24(48) hr pp	severe gastroenteritis, remission, ↑ elevated liver enzymes, symptom progression	Amatoxins