

## Reflections on Mushroom Poisoning Michael Beug, March 2006

Typically there are about 70 cases of human mushroom poisoning and 30 cases of animal poisonings that are reported to NAMA for all of North America. Poison Control Centers receive about 10 times this number of calls but the vast majority of their calls involve calls where there are no symptoms – usually where a child was seen looking at a mushroom or handling it and the parents have gone into a state of panic. Of the calls to PCCs, only about 0.5% of the total are regarding mushrooms.

About 1% of the people that are made ill by mushrooms dies as a result. Most years there are no deaths due to ingestion of toxic mushrooms, but in years where the fruitings are abundant there can be several deaths in a year. The over-all average is about 1 death per year due to deadly mushrooms and 1 death every 4 years due severe allergic reaction to mushrooms.

Slide 1: *Amanita phalloides* (55 people poisoned)– 80% of all mushroom fatalities are the result of eating an *Amanita* in the Destroying Angel group. *Amanita phalloides* is the member of this group that is consumed the most frequently with 37% of the Destroying Angel poisoning incidents. Yet only 4% of the people who eat enough of this mushroom to get ill will die. Liver damage will be evident in about 50% of the cases and kidneys will also fail in 6% of the cases. Symptoms typically become evident in 6-11 hours but it can take up to 24 hours to realize you have been poisoned. Getting medical help as soon as you start to feel ill really improves your survival chances.

Slide 2: *Amanita phalloides* button

Slide 3: *Amanita virosa* (54 people poisoned) and the highly similar *Amanita verna* have a pretty good survival rate. They cause liver damage in 20% of recorded cases, kidney failure 11% of the time and death in about 9% of the cases.

Slide 4: *Amanita ocreata* (9 people poisoned) appears to be the most toxic member of the Destroying Angel group. There have only been 9 people poisoned in thirty years of record keeping but liver damage was 100%, kidney failure at 80% and death at 40%. It is important to note that in humans and dogs nursing mothers can pass Amatoxins through their milk. To spot a Destroying Angel look for white gills and a white spore print, a

cup-like volva at the base of the stipe and a ring on the stipe. The problem is that handling can obliterate the ring and the volva is below the ground surface and is easily missed. The resemblance to the choice edible Paddy Straw mushroom of Asia is striking. People also mistake these mushrooms for edible species of *Amanita*.

Slide 5: *Galerina autumnalis* (9 people poisoned). Mistaken for the Honey Mushroom and for hallucinogenic mushrooms. No deaths in the data base but I know that deaths have occurred and nursing infants have been poisoned. Contains Amatoxins in potentially lethal amounts. Liver damage in 60% of reported cases.

Slide 6: *Pholiotina (Conocybe) filaris* (0 people poisoned). Contains Amatoxins but no reported ingestions.

Slide 7: *Lepiota* sp. (3 people poisoned) Many small members of the *Lepiota* genus contain potentially lethal amounts of Amatoxins. There are two reported poisonings by *Lepiota josserandii* in New York and one in BC by *Lepiota subincarnata*. All have resulted in liver damage and 2/3 resulted in death. Also lethal in dogs, as are the Destroying Angel mushrooms. It is a good practice not to eat any small wild mushrooms.

Slide 8: *Amanita smithiana* (8 people poisoned). Poisonings are reported on average of one every other year. They are characterized by 6-11 hour onset and kidney failure, which has occurred in 75% of reported cases, though no deaths have been reported. So far most incidents have involved mistaking *Amanita smithiana* for a Matsutake.

Slide 9: *Paxillus involutus* (3 people poisoned) is also noted for causing kidney failure. A person in Oregon was poisoned and 2 in Washington over the past 30 years. Many people eat this mushroom without ill effect, but I recommend against this practice. The unknown toxin does seem to be cumulative. No deaths have been reported in North America

Slide 10: *Boletus pulcherrimus* caused a death in Oregon and the other person who consumed the mushrooms also was quite ill.

Slide 11: *Boletus satanas* (4 people poisoned) is another red-tubed Bolete with a high probability of causing gastro-intestinal distress.

Slide 12: *Cortinarius* in the *cinnamomea* group. *Cortinarius* is a huge genus with 1,000 to 2,000 species in North America, including a large number of big meaty mushrooms. I had anticipated seeing many poisonings from this group but in over 30 years of collecting data, only three mild incidents of poisoning by a *Cortinarius* species have been reported. One smallish non-descript brown member of the genus contains orellanine, a deadly toxin with a very long latent period, but while several deaths have been reported from this toxin in Europe, no poisonings have been reported from North America. Orellanine can be detected by a very strong turquoise or blue fluorescence under UV light. Both the mushroom and biopsy tissues will exhibit the fluorescence.

Slide 13: *Amanita muscaria* var. *muscaria* (109 people poisoned) is probably the most famous of all toxic mushrooms. It is the classical toadstool of Alice and Wonderland fame. It is called the Fly Agaric because if you crush some in a saucer of milk, it will attract flies, which become stupefied and drown.

Slide 14: *Amanita muscaria* var. *formosa*. The mushroom also comes in white and brown varieties, but always with the characteristic three-ribbed volva and warts that rub or wash off of the cap. The active ingredients are muscimol and ibotenic acid. In total these compounds account for about 13% of all mushroom poisonings. The toxins reveal themselves on average 2 hours after ingestion. The symptoms are vomiting and diarrhea. In about 1/3 of the cases the victim experiences a drunken-like stupor often including distortions in time and space. Muscle spasms are common followed by drowsiness or a 6 to 36 hour coma. The mushrooms are not deadly but one inebriant froze to death and a few have suffered hypothermia.

Slide 15: *Amanita pantherina* (109 people poisoned) contains the same toxins but the reactions are much stronger with a higher probability of severe GI distress and severe disorientation. A few become violent. Complications include dermatitis and respiratory failure. Dogs frequently eat *Amanita muscaria* and *Amanita pantherina*. Cats occasionally do. The mushrooms can be lethal to cats and sometimes lethal to dogs, but usually it just looks like the animal is going to die and recovery is complete after about 12 hours of supportive care. Poisonings from either *Amanita muscaria* or *Amanita pantherina* are very common – the mushrooms taste great. Indeed if you boil them and throw away the water, they are rendered edible because the particular toxins are water soluble. However, Amatoxins and many other

mushroom toxins are not water soluble so don't try boiling other species to make them edible.

Slide 16: *Amanita gemmata* (5 people poisoned) rarely causes poisoning because it contains just a small amount of ibotenic acid and muscimol. In other parts of the world, however, there are very similar mushrooms that can be lethal. In fact, a high percentage of all poisonings in North America result when people move here and pick mushrooms that look like those that they had picked in their home country. Wherever you harvest mushrooms, you need to learn the specific good mushrooms and the most dangerous poisonous mushrooms in order to collect safely. There are no general rules that work – like boiling the mushroom with a silver spoon and seeing if the spoon turns black or picking only mushrooms that grow on wood, etc.

Slide 17: *Russula densifolia* (1 person poisoned by *R. nigricans*). Some of the blackening *Russulas* can cause gastrointestinal distress, disorientation and convulsions. *Russula subnigricans*, a blackening *Russula* found in Japan is deadly poisonous.

Slide 18: *Russula emetica* group (24 people poisoned from all *Russula* species combined). Some of the *Russula* species, notably but not exclusively the hot tasting ones, can cause pretty severe gastrointestinal distress and can even cause internal bleeding.

Slide 19: *Pleurocybella porrigens*. Though there are no reported poisonings in North America, in the summer of 2004, Angel Wings, *Pleurocybella porrigens*, caused more than a dozen fatalities in Japan and sickened around 50 people. There was no GI distress. The onset was tremor and weakness of the extremities lasting 2-11 days followed by severe consciousness disturbance and intractable seizures. Deaths occurred between one week and 1 month after symptoms began. The vast majority of affected individuals had been on kidney dialysis or had previously impaired kidneys and the average age was around 70. Known as Sugihirtake, *Pleurocybella porrigens* is a popular edible in Japan. September and October of 2004 saw a huge fruiting of the mushrooms and people consumed a lot more than normal. I would avoid consumption of Angel Wings, especially if you have compromised kidneys. Always consume mushrooms in moderation.

Slide 20: *Inocybe geophylla* var. *lilacina* (4 people poisoned from all *Inocybe* species combined). This mushroom, like most members of the huge

Inocybe genus, is laced with muscarine. Surprisingly, in thirty years we have only gathered 2 reports of human poisoning by Inocybe species. Symptoms in addition to cramps, vomiting and diarrhea are perspiration, salivation and tears. Your pupils shrink to pinpoints. Inocybe species can be lethal to dogs that are probably attracted by the somewhat fishy odor of many species. Since they are small brown mushrooms they probably do not appeal to people looking for a meal. The taste is also not good, thus saving many cases of poisoning.

Slide 21: *Inocybe calamistrata* is another example of the genus. I know them as thread-caps since in most the hyphae of the cap are radially arranged and look like threads.

Slide 22: *Clitocybe dealbata* (16 people poisoned from all *Clitocybe* species combined) is another mushroom that can be laced with muscarine. In addition to the typical muscarinic symptoms, you might suffer severe flatulence.

Slide 23: *Psilocybe baeocystis* (62 people poisoned from all *Psilocybe* species combined). *Psilocybe baeocystis* is just one of over a dozen hallucinogenic species found in the Pacific Northwest. The active ingredient of these mushrooms is psilocybin and psilocin. It grows readily in bark-mulched flowerbeds in maritime areas. Possessing mushrooms containing psilocybin or psilocin in the U.S. is treated the same as possession of heroin or cocaine. I charge \$200/hour to consult in possession cases but even with help conviction is more likely than not, to say nothing of the trial and lawyer costs.

Slide 24: *Psilocybe cyanescens* is a very potent species containing over 1% hallucinogenic material. It also grows in bark-mulched beds in maritime areas. People consume these mushrooms intentionally for the hallucinations they can produce. Sometimes the effect is nightmarish instead of being pleasant. Many years ago a young Oregon child died from grazing on this mushroom.

Slide 25: *Psilocybe cubensis* grows naturally in subtropical regions and is readily cultivated. It rarely has more than 0.4% psilocybin and psilocin and is highly variable in potency. The only death that I am aware of from this mushroom was a due to anaphylactic shock – an extreme food allergy to this species.

Slide 26: *Psilocybe semilanceata*, the liberty cap, grows in marshy pastures and is a very steady 1.6 to 1.7% psilocybin. At low doses any of these species can cause uncontrolled hilarity. At higher doses hallucinations can be encountered, typically lasting 6 hours. Some people lose muscular control for several hours and so consuming these mushrooms out in the cold and rain can be disastrous. With any of the mushrooms containing psilocybin or psilocin, some individuals can suffer one or more of the following: severe gastrointestinal distress, convulsions, hypotension, dermatitis, extreme anxiety, agitation, paranoia, muscle spasms, mydriasis, atrial fibrillation, kidney failure, liver damage, suicidal tendencies, angioedema, blurred vision, flushing, tight chest, ataxia, tachycardia, dry mouth.

Slide 27: *Panaeolus subbalteatus* contains small amounts of hallucinogenic material.

Slide 28: In the Northwest, *Panaeolus foenisecii* (18 people poisoned) is normally inactive. It grows abundantly in lawns in the summer throughout North America. It is one of the most common mushrooms gathered by young children. Usually they are unaffected, but sometimes they consume some that contain enough psilocybin to cause hallucinations. Other effects in children can include gastrointestinal distress, fever, flushing, disorientation, drowsiness or insomnia, hives and dermatitis, loss of consciousness

Slide 29: *Panaeolus cyanescens* is generally a tropical hallucinogenic species but it can occur on racing horse dung since race horses are regularly trucked between subtropical regions and the Northwest.

Slide 30: *Conocybe cyanopus* is another hallucinogenic species of the Northwest but consumption of this one is particularly dangerous because of the close similarity to deadly *Pholiotina filaris* or deadly *Galerina* species.

Slide 31: *Pluteus washingtonensis* is a hallucinogenic species that could easily be picked by a person seeking the Deer Mushroom, *Pluteus cervinus*. The law doesn't distinguish between accidental versus intentional possession of controlled substances.

Slide 32: *Gymnopilus ventricosus* (16 people poisoned by *G. spectabilis*) occurs in the Northwest and the samples I have analyzed have all lacked hallucinogenic content. However, an exact look-alike, *Gymnopilus*

spectabilis, occurs in Japan and in Eastern North America. It is known as the “big laughing mushroom” and is a potent, though very bitter hallucinogen.

Slide 33: *Gymnopilus luteofolius* is a Northwest *Gymnopilus* that contains psilocybin. It is so intensely bitter that I do not know how anyone could choke it down in trying to get high.

Slide 34: *Gyromitra esculenta* (27 people poisoned) has the common name of “Beefsteak Morel” and is a species that I used to cook outdoors and eat. I cooked it outdoors because the toxin, Gyromitrin decomposes on heating and the resultant deadly hydrazine vaporizes between 70 and 80 degrees C. I quit eating it and serving it to my classes many years ago. Poisonings by various *Gyromitra*, *Helvella* and *Verpa* species account for about 4% of all poisoning cases. The most serious concern is that of the people who suffer gastric distress from *Gyromitra esculenta*, 1/3 also suffer liver damage and 11% suffer kidney failure.

Slide 35: *Verpa bohemica* (9 people poisoned) is considered poisonous capable of causing gastrointestinal distress, loss of muscular coordination and a wide range of other unpleasant side effects. However, there are only 7 reports of poisoning in the NAMA data base and the mushroom is picked and sold commercially so a lot of people eat it each year without becoming ill.

Slide 36: Blonde, black and gray Morels (52 people poisoned + 77 in one banquet). Morels are all capable of causing gastrointestinal distress and sometimes chills, disorientation, fever, flushing, sweating, hot flashes, flatulence and hallucinations. If even tasted raw, the GI can be severe. In a famous BC case chefs at a banquet served sliced raw morels and other raw mushrooms in a salad. Of 483 at the banquet, 77 wound up in the hospital with GI distress. Some people are made ill if they drink alcohol with a meal of morels.

Slide 37: *Coprinus atramentarius* (6 people poisoned) is famous for causing an Atabuse type reaction if alcohol is consumed with the meal or within three days after the mushroom meal. It contains coprine which in conjunction with alcohol triggers a racing heart and palpitations, tingling in the arms and legs, flushing and sometimes additional maladies.

Slide 38: *Coprinus comatus* (9 people poisoned). *Coprinus comatus* is a distinctive and delectable edible, can make some people ill if consumed with alcohol but the symptoms are different – GI distress. It does not contain coprine. Even consumed without alcohol it can cause GI distress in a few people, especially if eaten raw.

Slide 39: *Pholiota squarrosa* (12 people poisoned) is another mushroom that can cause GI distress and if consumed with alcohol the effects can be worse, but again it is not the coprine type reaction. While distinctive and edible for most people, this mushroom is not choice and so is not worth taking a chance with.

Slide 40: *Omphalotus olearius* (98 people poisoned), the Jack-o-lantern, causes severe GI distress and is toxic to virtually anyone who tastes it, causing 6% of all mushroom poisonings. Fortunately its range does not include the Pacific Northwest, though it is found in California. The gills are a luminescent green in the dark. It is usually consumed by people who think that they have picked chanterelles.

Slide 41: *Chlorophyllum molybdites* (176 people poisoned), the Green-gilled *Lepiota*, accounts for nearly 11% of all mushroom poisonings, more than any other single mushroom. It, too, is absent from the Pacific Northwest but is found in California and in areas with warm, wet or humid summers. Before the spores mature, *Chlorophyllum molybdites* is easily confused with a choice edible *Lepiota*. Since it grows in lawns, it is frequently consumed by young children causing severe GI distress sometimes including internal bleeding, especially if consumed raw.

Slide 42: most people consider *Lepiota rachodes* or *Chlorophyllum rachodes* edible and choice (16 people poisoned). In susceptible individuals it can cause mild to severe GI distress.

Slide 43: *Lepiota rachodes*

Slide 44: *Agaricus xanthodermus* (16 people poisoned) causes mild to severe GI distress is virtually everyone who consumes the mushroom. Since it can be found in lawns it is another mushroom that children wind up eating with unpleasant results.



Slide 45 *Agaricus praeclaresquamosus* (6 people poisoned) is another member of the *Agaricus* genus that causes GI distress in most people who consume it. The toxic *Agaricus* species all turn yellow if you take a small piece of the flesh of the stipe and add a drop of 10% KOH or 10% Drano. Also, the toxic species all smell a little to very unpleasant when cooking, often with a creosote or wet blacktop odor while the edible species all smell good, many having an almond odor.

Slide 46 *Scleroderma aerolatum* (21 people poisoned by all species of *Scleroderma* combined). *Scleroderma aerolatum* can cause very rapid vomiting and diarrhea. Someone ate the other half of this one and did not make it to the bathroom. They thought that they had a puffball and when they ate it the interior was still all white, like a puffball. However, puffballs have a marshmallow texture and these are hard.

Slide 47. *Scleroderma citrinum* is another toxic *Scleroderma*, or Earthball. *Scleroderma citrinum* causes GI distress in humans and in animals. Dogs and pigs have died from consuming this or a highly similar species. Some individuals are highly sensitive to the spores of this species. They experience lacrimation, rhinitis and rhinorrhea, conjunctivitis

The remaining mushrooms that I want to talk about are all choice edible species that can cause poisoning in susceptible individuals or if consumed raw or with alcohol.

Slide 48: *Lepista nuda* (6 people poisoned) is a choice edible if well cooked, though it is poisonous when raw and some cannot tolerate it even when cooked.

Slide 49: *Armillaria ostoyae* and other members of the *Armillaria mellea* complex are known as Honey Mushrooms (40 people poisoned) and are sought out by many people. They are tricky to identify correctly and they cause more than 2% of all mushroom poisonings – thus this is a mushroom that I have crossed off my list of edibles. The gastrointestinal distress can be severe. At first I thought that you just need to avoid Honey Mushrooms growing on conifers or on eucalyptus, but many cases involve mushrooms growing on hardwoods as well.

Slide 50. Orange to liver colored *Leccinum*s (58 people poisoned) like this *Leccinum fibrillosum* can cause mild to severe gastrointestinal distress,

sometimes lasting days. Because they cause between 3 and 4% of all mushroom poisonings, I have crossed *Leccinum* species off my list of edibles, even though I personally find them delicious to eat and have not yet become ill. Other friends who were reluctant to cross *Leccinums* off their list of favorite edibles have belatedly learned that they can be made ill by these mushrooms.

Slide 51: With many *Suillus* species, especially this *Suillus americanus*, the problem is contact dermatitis – they react to handling *Suillus* species the same way other react to poison oak and poison ivy. There were 17 people poisoned or with dermatitis from all *Suillus* species combined.

Slide 52: *Boletus edulis* (13 people poisoned) is one of my top favorite edibles and yet some people cannot tolerate it if they have alcohol with the meal. Others get GI distress, even atrial fibrillation and bradycardia just from eating the mushrooms without alcohol involved.

Slide 53: *Laetiporus sulphureus* and related species of Chicken of the Woods (37 people poisoned) is another generally edible species, yet it causes over 2% of the reported mushroom poisonings. The symptoms are mild to severe GI distress. Rarely there can be cramps, fever, flushing, headache, salivation or dermatitis. One nursing baby was made ill and one woman died of shock 19 hours after consuming 5 bites of Chicken of the Woods.

Slide 54: Here is a typical fruiting of the Chicken of the Woods mushroom up the side of a large dead tree.

Slide 55: Even Chanterelles (17 people poisoned) like this *Cantharellus formosus* can make some people ill. In one case in the fall of 2005 an Oregon woman had found great quantities of chanterelles and ate them meal after meal. Eventually she became sensitized to the mushroom and suffered GI symptoms.