

ADVERSE REACTIONS TO COMMON WILD MUSHROOMS

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When *Mushrooms: Poisons and Panaceas* was released (Benjamin, 1995), we celebrated by inviting friends for a foraged meal. I provided the mushrooms and the wild edible greens; another couple dove in Puget Sound for rock scallops, octopus and other delectables; a hunter in the group donated pheasant and one couple scoured their wine cellar for their best vintages. Each couple also invited friends who had never attended one of our repasts. Fourteen of us sat around the table. The second course was a chanterelle soup served in those cute little pumpkins usually available around Halloween. Sometime during the fourth course, one of the guests began turning a cadaverous olive green. He excused himself from the table and seconds later we were all reminded of those sounds from the driveway common after fraternity parties. He returned looking better, apologized, wiped the sweat off his forehead and announced, “I had this same reaction to chanterelles many years ago, but I thought that I had outgrown it.” All I envisaged was the headline in the morning newspaper announcing “Mushroom Expert Poisons Dinner Guest.”

Mycophagists have a little secret. At least one in five of us has suffered following a meal of wild mushrooms. How do we know this? We asked. The first survey was done in the 1970s, initially by the Mycological Society of San Francisco and then by the Puget Sound Mycological Society, two of the largest groups on the West Coast. The results were consistent. The toxicology committee of NAMA noted many reports of adverse reactions to wild “edible” mushrooms over the next four decades. Most reports appeared reliable—not the result of some misidentification or an overindulgence of wine. Foraging has burgeoned in the new century, so the survey was repeated between 2013 and 2015, this time country-wide, with questionnaires received from over 500 mycophagists.

Even Texas, for goodness sake.

To be fair, the questionnaire was imperfect, suffering all the problems of a retrospective study, including acquisition bias and self-reporting. Even so, there was enough useful information worth sharing. Another disclaimer. Why is Benjamin such a killjoy? A curmudgeon indeed. Everyone else sees the magic in mushrooms. He sees the dark side. For forty years he was paid to be a pessimist. Pathologists focus on finding problems and that is where he honed his skills. But let’s begin on a very positive note. Nearly eighty percent of all mycophagists have happily consumed a wide variety of wild mushrooms with nary a problem. That’s quite remarkable considering the high percentage of the general public who claim some form of food related disorder. Perhaps we are an especially hearty and resilient bunch. Perhaps some of Charles McIlvaine rubbed off on us.

From the data we are able to draw a few generalizations. Precise numbers for the incidence of adverse reactions is not possible as we do not have a reliable denominator—the number of people who regularly eat a particular mushroom. Instead the results are grouped into three broad categories—relatively common (up to 15 % of individuals have some trouble); uncommon—more than 1%, and thirdly the rare—generally a single case or a couple of reports. Before announcing the winners, or losers as it were, I can already hear the outcry from those who love a particular indicted species, only to discover that not everyone is enamored of its virtues. But such is life.

The culprits

The mushrooms producing the most adverse effects are chicken-of-the-woods (COWs), honey mushrooms, and parasols. The first two are difficult to evaluate with precision, as there are a number of different taxa in what mycophagists blithely label as COWs or honeys.

Opinions vary about the edibility of chicken-of-the-woods (*Laetiporus sulphureus*, *L. cincinnatus*, and *L. conifericola*). There used to be more

cases of adverse effects reported from western North America, suggesting that *L. conifericola* (on conifers) is more problematic than *L. sulphureus*, an eastern species. Western mycophagists might have gotten the message, as in the latest survey the majority of the adverse reports were from the East or Midwest. There may be other reasons for this as well. Western mycophagists have access to a more abundant selection of edible mushrooms, and few would take up basket space with a sour, woody, and rather bland *L. conifericola*. Their midwestern and eastern brethren on the other hand, while having a great diversity of edible mushrooms, seldom find them in huge quantities, so COW tipping is a particular hobby. And the eastern species might even be worth eating, although there is great variation in peoples’ declarations of edibility—some claiming it to be really delicious, while others find it tasteless. Most symptoms involve the GI tract and are the usual suspects of bloating, cramps, nausea, vomiting, and diarrhea. There are scattered reports of more disturbing symptoms such as facial swelling, incoordination, paresthesias and extreme lethargy. Common reasons blamed for these unfortunate reactions include undercooking, the host tree (e.g. *L. gilbertsonii* on eucalyptus or *L. huroniensis* growing on conifers), the season, or the habitat.

Honey mushrooms (*Armillaria* spp.) are similar to COWs in the number of adverse reactions, and similar reasons are given, of which undercooking is the most frequent. It appears to be more common in the West where *A. solidipes* (= *ostoyae*) is the usual table fare, while *A. mellea* or *A. tabescens* (the latter now in the genus *Desarmillaria*) in the East less frequently cause issues. GI symptoms dominate the clinical picture, but hallucinations are reported in few cases. Parasols (*Chlorophyllum rachodes*, *C. brunneum*, and *Macrolepiota “procera”*) can produce similar GI upsets. The symptoms can be considerably more severe. It is not known how much of this is due to misidentification with *C. molybdites*, but

it is well described from regions where the latter does not occur.

Leccinum spp. deserve special mention, as there are reports from some regions, Colorado being the most noteworthy, where a substantial fraction of scaber eaters experience GI symptoms which may last for a number of days. Whether this is due to differences in species, habitat or availability is still unclear.

The next group produces symptoms in a small minority of people (1-5%), but they include many of the most commonly eaten wild mushrooms. Because of this the NAMA registry has accumulated numerous reports over the years. In this group morels stand out, with chanterelles and boletes distant contenders. An article in *FUNGI* last year documented the neurological issues with morels (Benjamin, 2016). To paraphrase Dr. Beug, in his annual review of mushroom poisonings in *McIlvainea* “that if morels were not so delicious, they could have been labelled as toxic” (Beug, 2016). In fact, in the extensive NAMA review, morels accounted for over 3% of all the documented adverse effects.

The final group includes just about every mushroom that anyone has attempted to eat. Some of these reactions are not trivial as noted by one unfortunate after a meal of lion’s mane (*Hericium erinaceus*): “spent the entire weekend in the bathroom.” Even the usually bland and benign puffballs (*Calvatia*, *Lycoperdon*, etc.) have produced unexpected symptoms.

A striking finding in reviewing the results of the questionnaires and all the NAMA reports for the past 50 years is the number of people who still insist on eating raw mushrooms or who barely cook them. This habit is clearly responsible for some of the adverse affects ascribed to morels, COWs, leccinums, boletes, shiitake, and others. The other “perversion” is the mixed stew, in which the participants feel compelled to dump the entire day’s find into the same pot. Not only is this a culinary nightmare, but it complicates the toxicologist’s ability to sort out the culprits following a miserable outcome.

The pathophysiology of these adverse effects is entirely unknown. Most do not appear to be classic allergic reactions, although clearly some are. There is a report of a young girl dying from an anaphylactic reaction to matsutake

(Ichikawa, 2006). Similar anaphylactic reactions have followed enoki (*Flammulina velutipes*) (Otsuji, 2015) as well as a couple of deaths following *L. sulphureus* and *L. conifericola*. Each of us is genetically distinct, as well as having personalized microbiomes, all of which determines how we digest, metabolize and react to a given mushroom. When no clear allergic mechanism is involved physicians use jargon words like “idiosyncratic,” which is a fancy way of saying that *we don’t know*.

There may also be relationship in a few individuals between the combination of alcohol and a wild mushroom meal. This is not confined to the classic *Coprinopsis atramentarius* (“tippler’s bane” inky cap), but has been reported with morels, boletes and oyster mushrooms, among others. The cause of this association, if real and not pure coincidence, is unknown. There are some individuals who are convinced that they are fine when they avoid alcohol. Should you be one of these unfortunates, abstinence is the simple solution.

As an aside, and a topic for future study and publication, was the observation that a substantial number of professional mycologists do not eat wild mushrooms at all, or at best only a few selected species. What do they know that we don’t?

Amateur mycophagists continue the long tradition of being willing human “guinea pigs,” slowly discovering what is safe to eat. We do it without formal protocols or approval by Institutional Review Boards, things that are normally required for any human experimentation. We should share any adverse reactions by reporting them to organizations like

NAMA. In this way we all learn. All mycophagists are encouraged to review the extensive and well done reports that Dr. Beug has routinely published in *McIlvainea* over the years. Chances are high that you will find a report on the mushroom that made you ill last night.

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