Paxillus involutus & Paxillus syndrome

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Paxillus involutus is a common brown-spored, gilled mushroom, found all over our province, mycorrhizal with a variety of deciduous and coniferous trees. This is one mushroom that seems equally at home in our cities, gardens and forests. Genetic studies have shown that it is a gilled bolete, rather than a member of the agarics. It can be recognized by its brown color, the markedly inrolled 3-13 cm diameter cap, decurrent pale gills changing to brown, short, firm and straight stem and reddish to dark brown staining reaction to injury and handling. In age the mushroom becomes very dark and the cap flattens out or even becomes funnel-shaped.

As with many common species, *P. involutus* actually is one of a complex of similar species. We have recorded the similar *Paxillus vernalis* that grows with aspen in one foray and the slightly more common *P. rubicundulus*, found under alders on sandy soil, in a few others. Although known to cause some gastrointestinal distress in some people, at one time it was a favorite edible. The death of German mycologist Julius Schäffer served as warning about a potentially fatal reaction to *Paxillus involutus*, although many remained skeptical that this prized and safe edible, eaten for generations, could be harmful. A rash of deaths in the 1960s, related to *P. involutus*, confirmed its toxicity. Unfortunately, people still continue to eat and die from this mushroom.

Although it is claimed that the Paxillus syndrome has not been seen in North America, Denis Benjamin, in his book *Mushrooms: Poisons and Panaceas*, describes a report of a couple who suffered what surely must be this entity after eating *P. involutus*.

Paxillus syndrome is characterized by vomiting and diarrhea, cramps, stomach ache, back pain, acute anemia and collapse. It may be accompanied by clotting throughout the vascular system, kidney failure, often followed by multi-organ failure and death. Onset of symptoms occurs within a few hours of eating the mushroom. Characteristically, it affects people who have eaten the mushroom without incident for several years in the past.

In 1985 a Swiss physician, R. Flammer, elucidated the mechanism for the Paxillus syndrome: an allergic reaction known as immunohaemolysis. For unknown reasons the body at some point defines an unidentified component of *P. involutus* as "foreign" (the antigen) and starts to form antibodies to it. Subsequent exposures may accelerate antibody formation, and a future exposure may precipitate a massive reaction of antibodies in the blood stream "attacking" (combining with) the antigen in an effort to "neutralize" it. These antigen-antibody complexes have an affinity for the walls of red blood corpuscles, where they initiate a reaction with another body defense compound, complement, that breaks the walls. Hemoglobin from the red blood cells is released into the blood stream. Free hemoglobin molecules are small enough to pass through the filtering system of the kidneys, where they damage the small tubules, bringing kidney function to a standstill. Hemolysis causes loss of blood volume, loss of hemoglobin required for oxygen

Figure 1.

transport and loss of kidney function.

Paxillus syndrome is not a poisoning, but an allergic (immunologic) reaction to food. Peanuts, shellfish, strawberries are a few examples of other "normal" foods that cause allergic reactions, although expressed in different ways. As with most allergic reactions, it is difficult to predict who will develop the syndrome or when. For example, both Julius Schäffer and his wife ate *P. involutus*, but only Julius developed Paxillus syndrome. Clearly the incidence is quite low, given the popularity of this mushroom as a desirable edible in Europe for well over a century. Contact with the antigen is required to program antibody formation, in order to develop the syndrome. Therefore most people who develop it have eaten the mushroom for a considerable time before, with no harmful effect. This makes it likely the link of the syndrome to *P. involutus* has gone undetected in the past. No antidote is available, although some success has been reported with either filtering or exchanging blood or plasma. These procedures remove the offending antigen-antibody complexes, as well as the harmful free hemoglobin, and transfusion can replace the lost red blood cells.


Figure 2.

Figure Legends

Paxillus involutus (Fig. 1, 2) and *P. rubicundulus* (Fig. 3). Figure 1 shows the ready separation of the gill layer, just as the pore layer of most boletes, suggesting the relationship to boletes and not gilled mushrooms. Gills of agarics grow out of the cap tissue and are not readily separable from it. Images and text originally appeared in *Omphalina*, the newsletter of Foray Newfoundland and Labrador.


Figure 3.