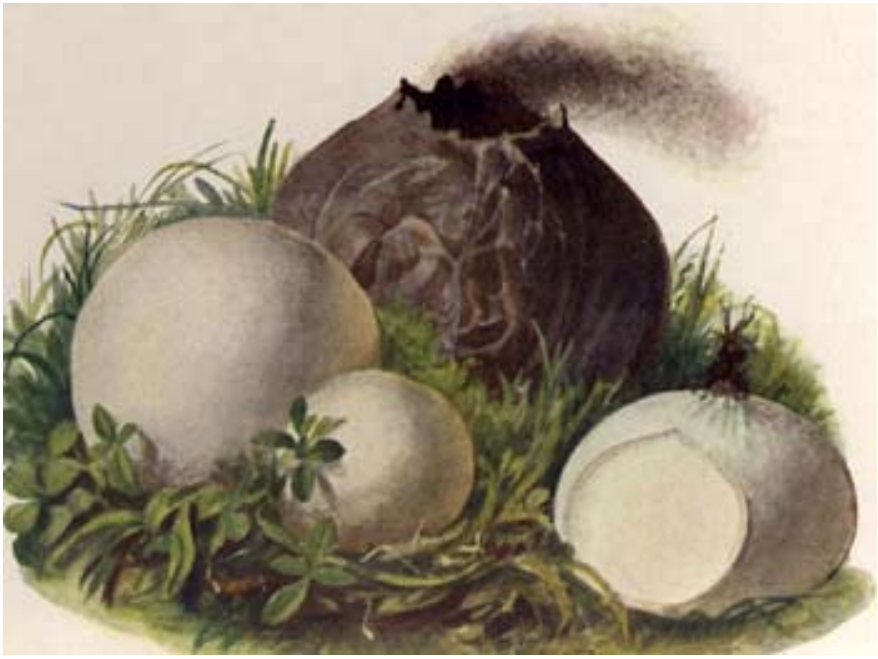
Puffballs: Overlooked Medicinals?

By Will H. Blackwell

On those occasions, of late, that I have perused the legion of books on "natural" medicine that swell the self-help shelves chain bookstores and pharmacies, I am beset by two feelings. One is an admiration for the sheer volume of information now available on the topic of natural, mostly herbal, remedies. What appears to occur at present shadows a time in the early twentieth century when active ingredients of most pharmaceuticals were of botanical extraction. The current trend seems a kind of coming to pass of predictions of a "green revolution" in medicine — a belief that medicine, due to many factors (including escalating costs), would again offer a selection of alternative treatments (see discussions in Kreig, 1964; Blackwell, 1990; and Griggs, 1991).

A second awareness is that recent herbologies often display a "sameness", in which comparable remedies are rehashed. To not offend, I single none out. And in any case, there are different ways to view the current herbal *libris similaris*. One might conclude for instance that, rather than engaging in deliberate redundancy, contemporary naturopaths must be confident that their much-alike-litanies of "cure" really work, and we can therefore be confident too. Or, can we? Not all "natural" remedies are sanctioned by the FDA. As for personal experience, valerian tea has never effectively put me to sleep. But such testimony is largely irrelevant here. A more valid consideration—and something we perhaps don't ordinarily think about—is "What do these books on natural 'simples' *not* tell us?" What is that lost treasure, of possible (perhaps special) medicinal value, not included in their pages?



Bovista nigrescens, a puffball that darkens as it gets older.

In search of more unusual, off-the-beaten-track remedies, I have had better success exploring books on local or regional practices — "folklore" as some might call it. I will indeed single out a book here, pertinent to the part of the country in which I reside, by Jack and Olivia Solomon (1979) titled *Cracklin Bread and Asfidity, Folk Recipes and Remedies*. The second part of this book is devoted to Alabama folk remedies, and it started me thinking. The most meaningful detective searches are those directed toward specific problems. I relate the discussion here, thus, to a condition with which I have been intermittently afflicted—nosebleed! I also bleed somewhat more (and longer) from minor cuts than most of my fellow humans, although not pathologically so. Hence, my *raison d'etre* in this paper. Nosebleed is scantily mentioned in the novo-herbologies (which I carefully did not list above), and puffballs (the eventual subject of my discourse) are typically not mentioned at all (one exception is *Herbal Medicine*, Buchman, 1994).

To return to *Cracklin Bread…*, nosebleed is dealt with substantially in the Solomon's book. The various home remedies offered, compiled from many sources, range from those that involve superstition, to those with a much sounder basis. In the former category we have, "let nine drops [of blood] fall on a knife and stick it into the ground, and when it [the knife] dries, it [the nose] will stop bleeding". On more solid ground is the suggestion of "snuffing" powdered alum. This alum (presumably aluminum potassium sulfate, "potash alum") has often been an ingredient of styptic (astringent) powders, and may provide relief of nosebleed, if not severe. Perhaps, though, this particular "styptic" is more appropriately applied to shaving "nicks". Another interesting, if more distasteful, suggestion is the

The giant puffball, *Calvatia gigantea*.

use of "soot and cobwebs to stop bleeding"; in other words, a bleeding nose (or wound) could be physically packed with such material to slow blood flow — sounds bad, but it just might help! The idea of physical packing of wounds, with spiderwebs for example, is pertinent to our discussion, and I will later tie this back in. Before moving on, though, I'm sure that other treatments for nosebleed — holding your head in a certain position, or putting an ice pack over your nose, or simply lying on your back — come to mind. But such considerations run somewhat away from the point.

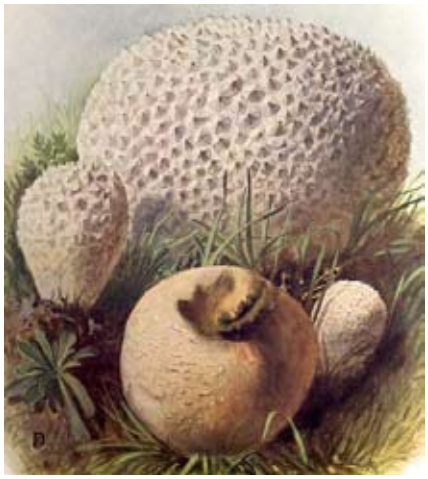
The point is, with bleeding problems (including cuts and abrasions) as a focus for investigation, what additional remedies might be unearthed with some bibliographic sleuthing? Are some remedies mycological? Ashley et al. (1976) reported, among folk medicines of the Mammoth Cave area of Kentucky, that application of pulverized mushroom to a cut would be efficacious in efforts to halt bleeding. Ashley's "mushroom" reference wasn't specific, but one cannot rule out puffball usage in this case, since puffballs were loosely known (by some) as "mushrooms" (e.g., "prairie mushrooms", see Gilmore, 1977). More explicitly, Coon (1980) discussed reports of a styptic effect of puffball spores when "dusted on wounds". Coon drew some discussion from early English herbals such as those of Gerard and Fernie. Here, superstitious belief was interwoven with fact. Gerard reported, erroneously, that receiving a cloud of puffball spores in the eye could cause a kind of blindness, called "Poorblinde" (Findlay, 1982). Coon (1980) related his discussion as well to North American "Indian" herbal use. He considered the extensive use of puffballs by Native Americans unusual because, as Coon asserted anyway, "the Indians were generally afraid of…fungi". The truth of this statement regarding "fear" is difficult to gauge, but is certainly not entirely accurate. Hutchens (1991), in *Indian Herbalogy of North America*, made note of Native American use of the "Chaga" or "Birch Mushroom" (*Inonotus obliquus*), which is actually a bracket or polypore fungus. Swanton (1946) and Hudson (1976) alluded to limited usage of kinds of mushrooms (as food) among Indians of the Southeastern United States.

But, back to puffballs, and bleeding (i.e., the stopping thereof). In an inquiry such as this, one must eventually consult "primary literature", i.e., trace information back to original reference sources. In researching information on puffballs I was fortunate to find the largely bibliographic, yet ethnographically oriented, survey by William R. Burk, of puffball usage among Native Americans (published in *Journal of Ethnobiology*, 1983). Although I was familiar with some sources (e.g., Gilmore, 1977, on uses of "plants" by Missouri River Region tribes; and Densmore, 1974, on plant use by the Chippewas), Burk covered a number of additional references (understandably, though, since no one can cover everything related to a topic, there are still other references that could be brought to bear). In any case, it is clear from the surveys of Burk, Gilmore, and others (e.g., Vogel, 1970), that the majority of Native American groups had little fear of fungi, if the fungus was a puffball! There were exceptions, however, as at least one native group referred to puffball powder (spores) as "devil's snuff" (Burk, 1983;

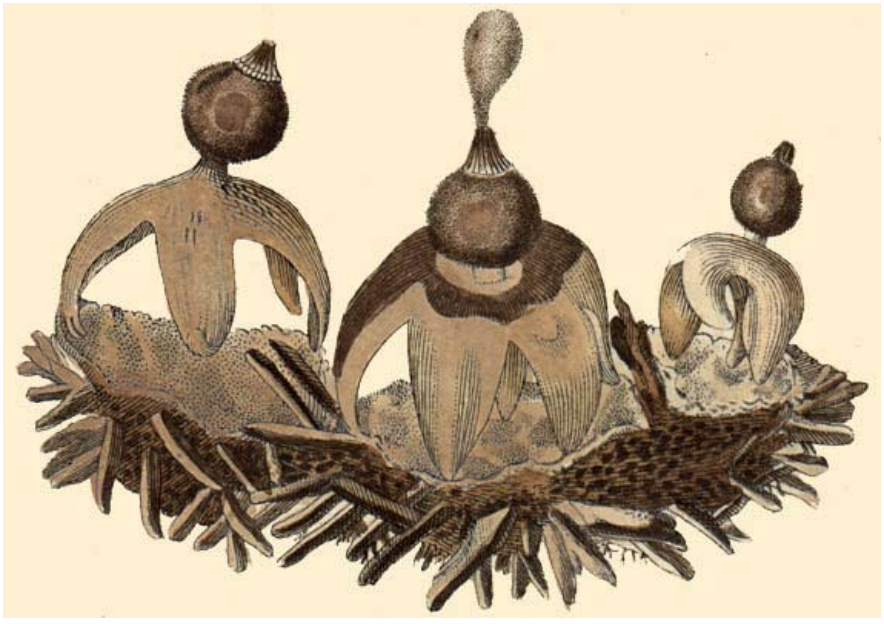
Schaechter, 1997). Nonetheless, usage of puffballs by Native American tribes was widespread, including: Blackfoot, Cherokee, Chippewa, Dakota, Iroquois, Kiowa, Makah, Mohegan, Navajo, Ojibwe, Omaha, Paiute, Pawnee, Ponca, Potawatomi, Tewa and Zuni Indians.

Native Americans used puffballs in numerous ways — as rattles, charms, other ancillary religious items, ornaments, dusting powders, poultices, and food in some instances. What ethnobiologists look for, in a broad occurrence of use of an item, is a common thread of usage, a particular use in which a majority of groups surveyed manifested similar practice. The "universal" use of puffballs was deciphered by Burk, and others, as being that of a styptic or hemostatic (blood coagulating) agent — for treatment of cuts, wounds, abrasions, nosebleed, and the like. In certain cases, the Indian name for the puffball reflected its styptic use, or the stage of growth at which it was so applied (e.g., the Pawnee name "Kaho rahik"— "kaho", the name of the puffball, and "rahik", meaning "old", Gilmore, 1977). The commonality of usage, by different tribes, imparts credence to the alleged medicinal value of an item, elevating it beyond the level of superstition. There is no doubt that puffballs, used variously in younger and older stages, are effective in slowing or stopping unwanted blood flow. A striking example of a specific hemostatic use of puffballs (or their relatives, the earthstars) by disjunct groups of native Americans (Cherokee, Missouri River Indian Groups, Rocky Mountain Indian Groups) was the control of bleeding of the navels of babies, after severing the umbilicus (Hamel and Chiltoskey, 1975; Gilmore, 1977; Burk, 1983; Powell, 1990). To continue an earlier point, several groups (e.g., Kwakiutls and Mohegans) made use of both puffball spores and spiderwebs as styptic agents (Vogel, 1970). There is, in fact, evidence that these two hemostatic materials were sometimes used in consort (Burk, 1983).

Native American use of puffballs as hemostatics is bolstered by similar use in other cultures. I previously mentioned descriptions of such use in English herbals. Keys (1976) reported comparable usage in Chinese herbology (for treatment of "hemorrhage of incised wounds") — a use substantiated by Ooi (2001). Singh (1999) and Harsh et al. (1999) made note of hemostatic use of several different puffballs by indigenous peoples in India. One example from India, *Bovista apedicellata* (employed to treat wounds), is interesting etymologically: the local name for this puffball is "phoosh". This name appears to be an instance where the sound of the word and its meaning (dust, powder blowing) are connected. If I remember from my now-long-ago English classes, this form of figurative language is *onomatopoeia*.



Lycoperdon coelatum, a small pebbly puffball



Earthstars, *Geastrum quadrifidium*

Before waxing too literary, let's return to puffballs and their spores. Given that such items are effective hemostatic (vulnerary, or wound dressing) agents, given that they help stem blood flow, the question becomes, how do they function in this way? What is the nature of the styptic mechanism? Apparently, mere physical packing of wounds, directly related to spore numbers/total volume, is part of the answer. An astounding seven trillion spores were estimated to have been produced by a single giant puffball, *Calvatia gigantea* (see Ramsbottom, 1989).

A stalked puffball in the genus *Tulostoma*

Dana Richter and Maria Beardslee, in the previous issue of *Mushroom the Journal*, set the estimate even higher (at least eight trillion spores). In puffball species of lesser size, spore numbers are still high. More than four billion spores were calculated to have been generated by one *Lycoperdon perlatum* specimen; a single ejection (puff) of spores (due to a falling drop of water striking the peridium) from *L. perlatum* may contain as many as 15 million spores (Gregory, 1949). No further calculation is required to realize that millions of absorbent spores might be laid into a wound in a single application. *En masse*, such spores are usually more than sufficient to slow blood flow or oozing, much in the manner of styptic after-shave powder. But is there more to the answer than just physical packing (and absorption)? Is a chemical mechanism at work too? Possibly, but here the answer gets complicated.

A wide variety of biologically active chemicals have been isolated from puffballs, with names like lycoperdin, lycoperdic acid, calvatic acid, and calvacin. Indeed, calvacin was one of the first glycoproteins in the thundering herd that are now being touted as anti-tumor agents, as evidenced in Everett S. Beneke's 1962 presidential address to the Mycological Society of America: "*Calvatia*, Calvacin and Cancer".

A variety of puffballs, earthstars and earthballs have been used medicinally by Native Americans, styptic use being predominant. Puffballs have been used similarly by people of other cultures in North America: Pennsylvania Germans made use of powdered puffballs as hemostatics (Brendle and Unger, 1935; Vogel, 1970); and the use of puffballs in packing nosebleeds and bleeding hemorrhoids is known from Appalachian folk medicine (Powell, 1990). Three genera of puffballs have already been mentioned in my discussion: *Calvatia*, *Lycoperdon* and *Bovista*. *Lycoperdon*s are distinguished from *Calvatia*s by characteristics of their skin (or peridium): *Lycoperdon*s have a specific apical opening through which they discharge their spores, whereas *Calvatia*s split apart entirely; and *Lycoperdons* often have an ornamented (spiny or warty) outer layer to their skin, while *Calvatia*s are smooth. *Bovista*s are tumbleweeds of the fungus world, detaching from their small stalk and being rolled by the wind to disperse their spores.

The desert stalked puffball, *Battarrea phalloides*, is also used (as a poultice) by Nevada Indian tribes for treatment (reduction) of sores, swellings and burns (Burk, 1983; Powell, 1990). An earthstar, *Astraeus hygrometricus* (the "barometer" or "water-measure" earthstar), may also be added to the "styptic list", given its use in administering to navels of the newborn (Hamel and Chiltoskey, 1975). Several styptic puffballs and relatives are illustrated, Figures 1–5.

The enumeration of taxa in the above paragraph is not to suggest that other species and genera of puffballs (and their "allies") are not effective hemostatic agents; other puffball taxa have doubtless been so employed, at one time or another. This supports a point made by Burk (1983), who stated that the medical and paramedical uses of puffballs (and relatives) should be further investigated. I would like to add my encouragement to such investigations. People obviously find puffballs fascinating (see back cover of Issues 78 and 80, 2003, of *Mushroom, The Journal*…). And there is no doubt that masses of puffball spores will stop the bleeding of a cut of modest dimension. As I see it, the main question remaining is "Which substances in these fungi contribute to their styptic properties?" Such investigations, and the eventual answering of the question, may involve further chemical extraction and determination. A chemical work-up would likely need to be followed by *in vitro* (test tube) blood coagulation experiments. Preliminary studies, though, might need only involve comparisons of the effects of puffball spores versus various types of "comparable" sterile powders. So, is anyone up for this particular challenge? The potential contribution of this kind of work to the understanding of "medicinal fungi" could be quite significant. So, who are the inveterate fungal chemists among us? Speaking literally and figuratively, who might wish to give blood for such a project?

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