

Revisiting Wasson's Soma: Exploring the Effects of Preparation on the Chemistry of *Amanita Muscaria*

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Abstract—In 1968 R. Gordon Wasson first proposed his groundbreaking theory identifying Soma, the hallucinogenic sacrament of the Vedas, as the *Amanita muscaria* mushroom. While Wasson's theory has garnered acclaim, it is not without its faults. One omission in Wasson's theory is his failure to explain how pressing and filtering Soma, as described in the Rig Veda, supports his theory of Soma's identity. Several critics have reasoned that such preparation should be unnecessary if equivalent results can be obtained by consuming the raw plant, as is done with other psychoactive mushrooms. In order to address these specific criticisms over 600 anecdotal accounts of *Amanita muscaria* inebriation were collected and analyzed to determine the impact of preparation on *Amanita muscaria*'s effects. The findings of this study demonstrated that the effects of *Amanita muscaria* were related to the type of preparation employed, and that its toxic effects were considerably reduced by preparations that paralleled those described for Soma in the Rig Veda. While unlikely to end debate over the identity of Soma, this study's findings help to solidify the foundation of Wasson's theory, and also to demonstrate the importance of preparation in understanding and uncovering the true identity of Soma.

Keywords—*Amanita muscaria*, hallucinogen, Rig Veda, soma, Wasson

In 1968, R. Gordon Wasson first proposed his groundbreaking theory identifying Soma, the hallucinogenic sacrament of the Vedas, as the classic spotted fairy tale mushroom—*Amanita muscaria*. While Wasson's theory is compelling on many levels he neglected to explain how the pressing and filtering of Soma, as described in the Rig Veda, supported his theory of Soma's identity. This omission has led to several criticisms of his theory, including: (1) that such an elaborate process of extraction and preparation should be unnecessary if Soma were a mushroom; and (2) that no procedure of preparation is known to reliably reduce or eliminate the often unpleasant effects of *Amanita muscaria*. In order to address these specific criticisms over 600 anecdotal accounts of *Amanita muscaria* inebriation

and poisonings were collected and analyzed to determine the impact of preparation on *Amanita muscaria* inebriation. The findings of this study demonstrated that the effects of *Amanita muscaria* were related to the type of preparation employed, and that the often-toxic effects of *Amanita muscaria* were considerably reduced by preparations that paralleled those described for Soma in the Rig Veda. Before addressing this analysis, however, it is important to establish a foundational understanding of the chemistry of *Amanita muscaria*, as it is currently understood, and to understand Wasson's ideas around preparation and the criticisms that have been leveled against this portion of his theory.

The pharmacology of *Amanita muscaria* is not entirely understood. Two primary compounds, ibotenic acid and muscimol, are known to occur in pharmacologically active levels and are partially, if not entirely, responsible for *Amanita muscaria*'s psychoactive effects. Another notable constituent of *Amanita muscaria* is muscarine. Muscarine is a cholinergic agonist which produces significant physiological changes in

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sufficient doses, but is not known to produce psychoactive effects and does not contribute to the psychoactivity of *Amanita muscaria*. Muscazone, a compound related to ibotenic acid, has also been reported from *Amanita muscaria*, but may simply be a by-product of procedures used to isolate ibotenic acid (Catalfomo & Eugster 1970). The psychoactivity of muscazone is unknown, but is considered doubtful (Ott 1993). There is also evidence that the degradation of ibotenic acid results in the production of another, as of yet unidentified, compound (Ott 1976).

Ibotenic acid is the most abundant of the principal compounds, and easily degrades into muscimol through the loss of a carboxyl group. Dehydration of the mushroom is the easiest way to promote decarboxylation of ibotenic acid to muscimol. It has been suggested that heating or cooking may also promote degradation of ibotenic acid due to its low stability (Catalfomo & Eugster 1970). Jonathan Ott (1976) has found that ibotenic acid decarboxylates to muscimol when exposed to acidic conditions, and suggested that ibotenic acid may be converted to muscimol in the acidic environment of the stomach. Interestingly, most ibotenic acid passes through the system unmetabolized and may be reingested in the form of urine to prolong its psychoactive effect. Ibotenic acid is a water soluble compound, but is apparently difficult to dissolve in cold water (Catalfomo & Eugster 1970).

Dr. Scott Chilton (1975), a specialist on mushroom toxins, detailed the following effects from his experiments with pure ibotenic acid: unsteadiness, dizziness, narrowed field of vision, mild visual spasms, muscular twitches, and sleep. Dr. Chilton reported no actual hallucinations from his experiments. According to Chilton, 53 mg was sufficient to produce psychoactive effects, while a dose of 93 mg produced a strong inebriation, including a brief bout of vomiting. Peter G. Waser, a Professor at the University of Zurich, has also reported on his experimentation with a low dose of ibotenic acid. With 20 mg, Waser (1979) reported experiencing flushing, lassitude, and sleep. The psychoactivity of ibotenic acid has been pegged at 1 mg/kg (Ott 1993), making Waser's dose a very light one. It is not clear whether ibotenic acid itself is psychoactive, or whether the psychoactivity is caused purely by the decarboxylation product of ibotenic acid, muscimol (Ott 1993).

Muscimol is five to 10 times more potent than ibotenic acid, and is likely the primary contributor to the psychoactive effects of *Amanita muscaria* intoxication. Muscimol is a salt and is very soluble in water. It is also a thermostable compound, and will not degrade with cooking or boiling. There is some uncertainty as to whether muscimol occurs in fresh specimens of *Amanita muscaria*, or whether it only appears once drying and decarboxylation of ibotenic acid commences (Catalfomo & Eugster 1970). There is still heavy speculation that other, as of yet unidentified, compounds may contribute to the intoxicating properties of *Amanita muscaria*.

Waser (1979: 435), experimenting with 15 mg of muscimol, reported the following effects:

After a phase of stimulation, concentration became more difficult. Vision was altered by endlessly repetitional echopictures of situations a few minutes before . . . I felt sometimes as if I had lost my legs, but never had hallucinations as vivid and colourful as with LSD.

The echopictures experienced by Waser under the influence of muscimol have also been described by others after having ingested *Amanita muscaria* mushrooms, supporting the idea that muscimol is the primary inebriating agent. One individual described his experience as follows:

As I sat on the toilet watching [my son] splash in the tub I had the most peculiar visual experience . . . As I watched him, say laying belly down, my mind captured this image so it remained in my perception, till another motion, say my son sitting upright, caught my attention, of which the new image would appear. The whole effect was sort of a still frame slide show, where an image would remain in perception till a new one burst from the center of the old one (ChemBob 2005).

Other symptoms known to be caused by muscimol include altered auditory and visual perception, visual disturbances, loss of equilibrium and mild muscle twitching. Unlike ibotenic acid, only trace amounts of muscimol pass through the urine unmetabolized (Ott 1993).

Discovered in 1869, muscarine was the first compound isolated from the *Amanita muscaria* mushroom, from which the compound derives its name. It was originally thought to be the active intoxicating agent, a notion that has long been abandoned. Muscarine, however, does produce notable physiological changes, typically characterized by excessive perspiration and salivation, blurring of vision, abdominal pain, nausea, vomiting and diarrhea. These effects usually develop within 15 to 30 minutes after ingestion, but symptoms may take up to an hour to occur in some cases. Muscarine is both water soluble and thermostable, and does not degrade with cooking or heating.

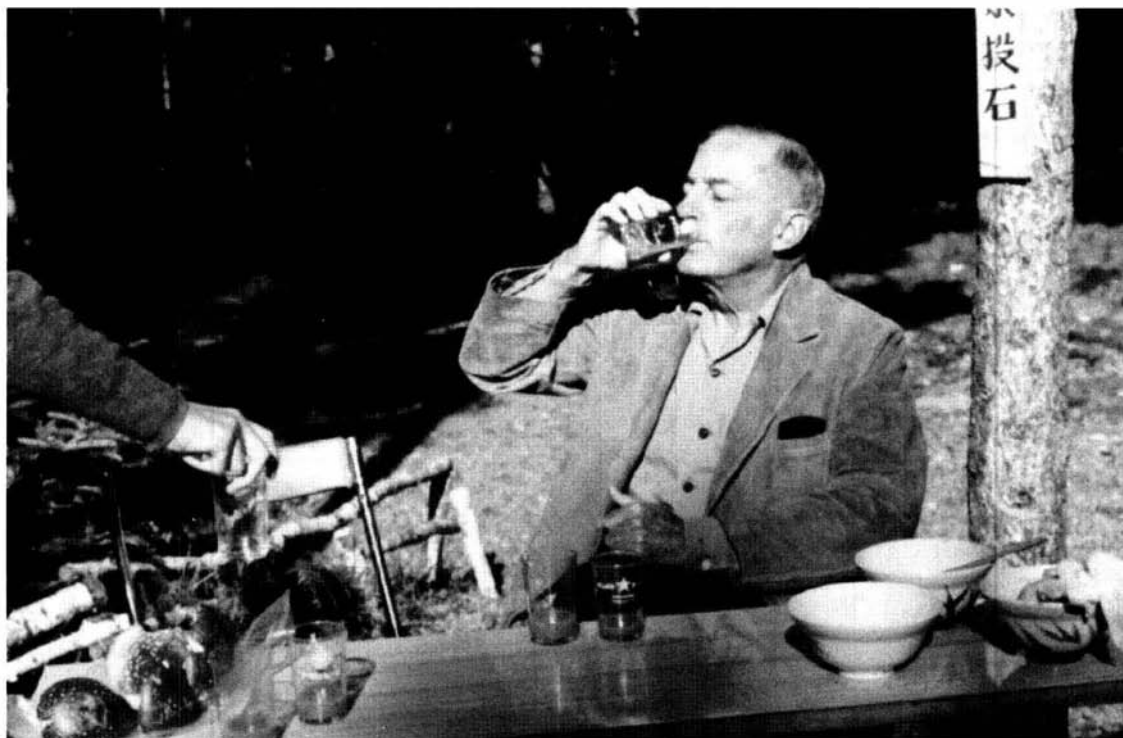
WASSON ON PREPARATION

The Rig Veda speaks of three filters used to purify and prepare Soma for sacramental use. Wasson (1968) has identified these three filters as: (1) a celestial filter, or filter of sunlight; (2) a filter of woolen cloth; and (3) the human body. Wasson focuses predominantly on the first and third filters, providing varying degrees of support for his Soma theory. This section provides an overview of Wasson's thinking on these three filters and also examines the criticisms leveled against this portion of his theory.

The first filter, according to Wasson, is a "celestial filter," which purifies Soma with sunlight. Wasson explained that Soma "catches the sun's rays on its back and holds them there, where they filtre the Soma juice into the plant"

FIGURE 1

Photo of R. Gordon Wasson Sampling the Pressed Juice of *Amanita muscaria* in Japan, circa 1965
(Photo Provided by the Wasson Archives, Courtesy of Robert Forte)



(Wasson 1968: 53). In support of his interpretation Wasson cited several passages from the Rig Veda, including the following:

9.76.4: He [Soma] who has been cleansed by the sun's ray.
(Wasson 1968: 38).

9.86.32: The Soma envelopes himself all around with rays of the sun . . . (Wasson 1968: 54).

Wasson's theory is that the filter of sunlight represents drying or dehydration of the Soma plant, a process that is essential in the preparation of *Amanita muscaria* in Siberia. Among the Kamchadal of the Kamchatka peninsula, it is believed that *Amanita muscaria* that have been sun dried while still in the ground are the most potent, while the Koryak and other Siberian peoples consider fresh *Amanita muscaria* to be toxic (Wasson 1968). These views are likely connected to the change in chemistry of the mushroom through the dehydration process, which increases the strength of the mushroom through decarboxylation of ibotenic acid to the more potent muscimol.

Providing additional support to Wasson's interpretation of the first filter are complementary verses from the Rig Veda that suggest Soma is in a dry state before application of the second filter, when Soma is mixed with water and strained through a woolen cloth. The following passages suggest

that when mixed with water the Soma plant swells in size, a characteristic absent in most fresh plants but familiar to some dried plants, particularly dried mushrooms. Mushrooms are exceptional among plants and vegetables in their ability to reconstitute from a dried state, swelling both significantly and rapidly when soaked in water.

8.9.19: When the swollen stalks were milked like cows with [full] udders . . . (Wasson 1968: 43).

9.74.9: Clarifying Soma, when you are sated with waters your juice runs through the sieve made of wool (Doniger 2005: 123).

10.125.2: I carry the swelling Soma . . . I bestow wealth on the pious sacrificer who presses the Soma and offers the oblation (Doniger 2005: 63).

The second filter is a filter of lamb's wool, used to strain and remove the solids of the Soma plant in order to produce the sacramental beverage. Wasson expended little time examining this filter, stating that it "presents no problems," presumably because this filter is described directly and without any ambiguity (Wasson 1968: 51). Wasson's failure to examine the significance of this stage of the purifying process has led to several criticisms of his work. Professor John Brough (1971: 338) challenged Wasson on this omission, pointing out that "if the Soma-plant had been a mushroom, it would be strange that the elaborate

Vedic process of pounding out and filtering the juice should have been necessary. Why should the plant not have been simply eaten?" David Stophlet Flattery, who proposed that Soma is the plant *Peganum harmala*, also argued that such preparation should be unnecessary if equivalent results can be obtained "by simply chewing the plant materials, as is the case with psychotropic mushrooms" (Flattery & Schwartz 1989: 33).

While Brough and Flattery make a good point, their challenge is based on incorrect assumptions. The first assumption is that *Amanita muscaria* shares similar chemical properties with *Psilocybe* mushrooms, which allow it to be eaten fresh or dried without preparation. The active compounds in *Psilocybe* mushrooms (psilocybin and psilocin), however, have never been isolated from *Amanita muscaria*, do not contribute to its intoxicating effects, and are completely irrelevant to understanding the pharmacology of *Amanita muscaria*. While it is true that *Amanita muscaria*, like *Psilocybe* mushrooms, can produce psychoactive effects when eaten fresh or dried, it does not follow that the pharmacology of the two mushrooms would be similarly affected by the extraction process described for Soma. The second assumption is that the Soma plant cannot simply be eaten, which appears to be based on a bias towards identifying Soma as a woody or fibrous plant (such as *Ephedra* or *Sarcostemma*), which would require water extraction in order to render the drug consumable. Both of these assumptions ignore passages in the Rig Veda that suggest that Soma can be consumed "pressed" or "unpressed." More importantly, however, are indications in the Rig Veda that Soma that has not been pressed is inferior to Soma that has been pressed, suggesting that there is some chemical change that occurs during the extraction process.

6.41.4: Soma when pressed excels the unpressed Soma, better, for one who knows, to give him pleasure (Griffith 1890: 367).

7.26.1: Soma unpressed ne'er gladdened liberal Indra, no juices pressed without a prayer have pleased him (Griffith 1891: 35).

The passages above suggest, regardless of what Soma's true identity is, that pressing and extracting Soma alters the chemistry of the sacrament in some beneficial way. While it has typically been presumed that the "pressing" of Soma is used to extract an active agent from a benign but indigestible plant, hymns describing the ritual preparation of Soma repeatedly speak of Soma being cleansed or purified by the water employed during pressing. For example:

9.62.6: The beautiful plant beloved of the gods, [the Soma] washed in the waters, pressed by the masters, the cows season [it] with milk (Wasson 1968: 28).

9.109.17: The prize-winning Soma has flowed, in a thousand drops cleansed by the waters, mixed with the milk of cows (Wasson 1968: 28).

9.2.5: The ocean [of Soma] has been cleansed in the waters; mainstay of the sky, the Soma in the filtre, he who is favourable to us (Wasson 1968: 47).

The focus on cleansing and purifying Soma through pressing and straining would suggest that Soma is not pressed for the sake of rendering it in a consumable form, as seems to be assumed by Brough, Flattery and others, but rather for eliminating impurities and/or toxic qualities that would otherwise be present in the Soma plant. While Wasson was unable to explain the significance of the second filter as applied to *Amanita muscaria*, this study seeks to illustrate how this step may provide further support for his theory.

The third filter, as proposed by Wasson, is the human body. Wasson advanced his proposition for the third filter by citing the traditions of urine drinking in Siberia and by relying on limited Vedic references to urine, including the following passages from the Rig Veda:

9.74.4: The swollen men piss the flowing [Soma] (Wasson 1968: 29).

8.80.3: In the belly of Indra the inebriating Soma clarifies itself (Wasson 1968: 56).

Wasson went on to explain that "the Soma juice that is drunk by 'Indra' and 'Vayu' in the course of the liturgy is filtered in their organisms and issues forth as sparkling yellow urine, retaining its inebriating virtue but having been purged of its nauseating properties" (Wasson 1968: 55). From a pharmacological perspective Wasson may indeed be correct. While ibotenic acid, one of the mushrooms active constituents, passes in the urine unmetabolized, it is likely that other components of *Amanita muscaria* that contribute to nausea and vomiting, such as muscarine, have been metabolized (filtered) into inactive by-products. This biological process would leave a fairly pure extraction of ibotenic acid in the consumer's urine. Unfortunately, there were an insufficient number of anecdotal reports on urine consumption to provide a proper analysis of the third filter in Wasson's theory.

Pharmacology aside, Wasson's assertion that the third filter is the human body and that mushroom-infused urine is the purest form of Soma has been challenged on two substantial grounds. First is that Wasson's interpretation assumed that "priests appointed to impersonate Indra and Vayu" urinate the intoxicating Soma (Wasson 1968: 30), despite a lack of evidence "in the whole of the Rigveda that priests ever impersonate the gods in any capacity" (Ingalls 1971: 189). The second argument relies on the mere paucity of references to urinating Soma in the Rig Veda, as well as the ambiguity of these rare passages. As noted by one detractor, "the verb to urinate is used in connection with the word soma only twice in the Rig Veda" (Ingalls 1971: 189).

While Wasson's interpretation of the third filter is intriguing, other more feasible explanations present themselves in the text of the Rig Veda. Milk is frequently spoken of as being mixed with pressed Soma or used to further purify Soma, as in the following passages:

TABLE 1
Frequency of Nausea and Vomiting Associated with Different Preparation Types
of *Amanita muscaria* and *pantherina* Mushrooms

Preparation	Nausea	Vomiting	Inebriating
Fresh (n = 41)	49% (20)	37% (15)	81% (33)
Dried (n = 283)	39% (109)	17% (49)	77% (218)
Tea w/ Solids (n = 40)	50% (20)	18% (7)	80% (32)
Tea (n = 94)	31% (29)	7% (7)	79% (74)
Cooked (n = 67)	58% (39)	45% (30)	84% (56)
Total (n = 525)	41% (217)	21% (108)	79% (413)

9.8.5 : When through the filter thou art poured, we clothe thee with a robe of milk to be a gladdening draught for gods (Griffith 1891: 370).

7.21.1: Pressed is the juice divine with milk commingled: thereto hath Indra ever been accustomed (Griffith 1891: 30).

Frequent reference is also made to purifying prayers that were recited over the Soma bowl prior to consumption of the sacred beverage. For example:

9.113.2: Pressed with sacred words, with truth and faith and ardour, O drop of Soma, flow for Indra (Doniger 2005: 133).

9.74.9: Polished by the poets, Soma who brings supreme ecstasy, be sweet for Indra to drink (Doniger 2005: 122).

The addition of milk to Soma and the recitation of prayer during the preparation of Soma are well described steps in the Soma ceremony, as illustrated by the passages above, and either process would make a more plausible candidate for the third filter than recycled urine, as proposed by Wasson.

METHODS

Accounts of *Amanita muscaria* inebriation and poisonings were collected in order to analyze variations in the reports of nausea and vomiting, symptoms often associated with *Amanita muscaria* inebriation/poisoning, by style of preparation. The hypothesis was that each of the first two filters identified by Wasson, the celestial and woolen filters, when applied to *Amanita muscaria* would produce a substantial reduction in the incidence of nausea and vomiting. Such a showing would address criticisms that the elaborate preparation of Soma is unnecessary when applied to *Amanita muscaria*, and that the effects of *Amanita muscaria* are too unpleasant to warrant a sacramental status like that of Soma.

Over 600 accounts of inebriation and poisoning with either *Amanita muscaria* or *Amanita pantherina*¹ were compiled. These accounts were collected from journals (D.D. 1999; Tengu 1998; MN 1996; Salzman et al. 1996; BD 1994; BF 1994; Anonymous 1993; Ott 1976; Pollock 1975), newspaper articles (*Seattle Times* 2006), toxicology reports (Beug 2007, 2006; Cochran 2000, 1999, 1985; Trestrail 1998, 1997, 1996, 1995) and various websites

(Erowid 2009; Lycaeum 2010; Tolento 2008) and forums (Drugs Forum 2010; Entheogen Dot Com 2010; Mycotopia 2010; Shroomery 2010).

The anecdotal accounts of *Amanita muscaria* experiences described a variety of preparation types, including: (1) fresh/raw, (2) dried, (3) tea with solids consumed, (4) tea with solids removed, and (5) cooked. In the fresh category only reports where mushrooms were consumed without preparation (i.e., eaten as is) have been included. The dried category included reports where mushrooms were air or oven dried. The tea with solids consumed category included all water extractions (hot and cold) of dried mushrooms where the mushroom solids were also consumed. The tea category included all water extractions (hot and cold) of dried mushrooms that were strained before consumption. The cooked mushrooms category consisted of reports where mushrooms were prepared by oven or stove, but were not cooked to a dehydrated state. Within each category the reports were examined for frequency of the following symptoms: nausea, vomiting, and inebriation. The resulting differences between each category were then examined through application of logistic regression to determine whether there was a statistically significant relationship between preparation style and effects of the mushroom. Unfortunately, insufficient anecdotal evidence was available on *Amanita muscaria* and urine recycling to analyze the properties of recycled urine in terms of nausea and vomiting.

RESULTS

Considering Table 1, there appear to be some clear trends in the frequency of nausea and vomiting depending on how the mushroom is prepared. Both nausea and vomiting decreased when the mushroom was consumed dried rather than fresh. Vomiting appeared to stay about the same when dried mushrooms were prepared as tea (with solids consumed), but again both nausea and vomiting decreased when the mushroom was consumed as a tea rather than dried or as a tea with solids consumed. While these numbers appeared significant, the difference in population sizes between preparation types made it difficult to come to any conclusions without applying some method of statistical analysis.

The data listed in Table 1 were analyzed using logistic regression to determine whether any of the differences in frequency of nausea and vomiting among preparations were truly significant. The results of this analysis showed that type of preparation was a significant factor in predicting the likelihood of nausea (χ^2 (4, $N = 525$) = 15.19, $p < .01$); and that preparation type was also a significant factor in predicting the likelihood of vomiting (χ^2 (4, $N = 525$) = 39.87, $p < .001$).

While the frequency of nausea appeared to decrease when dried preparations were used instead of fresh preparations, the only preparation type that had a significant effect on the odds of experiencing nausea was tea with solids removed. A preparation of tea reduced the odds of experiencing nausea over a fresh preparation by 53% ($p < .05$). Changes in preparation type had a more substantial effect on the frequency of vomiting experienced during *Amanita muscaria* inebriation; still, only two preparation types had a significant effect on the odds of experiencing vomiting. Eating dried mushrooms reduced the odds of experiencing vomiting over a fresh preparation by 64% ($p < .01$). Drinking a tea also reduced the odds of experiencing vomiting over a fresh preparation by 86% ($p < .001$). While not statistically significant, a preparation of tea (with solids consumed) tended to show reduced odds of experiencing vomiting over a fresh preparation by 63% ($p < .10$).

Finally, a comparison of the different preparation types showed no significant variation in the likelihood of experiencing psychoactive effects (χ^2 (4, $N = 525$) = 1.60, $p > .05$), indicating that while preparation may have influenced the frequency of nausea and vomiting, preparation did not have a similar effect on the production or frequency of psychoactive effects.

DISCUSSION

The change in *Amanita muscaria*'s effects when the mushroom was prepared similarly to Soma, as described in the Rig Veda, was remarkable. Results of the current study showed a significant reduction in the odds of vomiting in consumers of dried preparations as compared to those who consumed the mushrooms fresh. This result serves as an example of how the dehydration process can cause statistically significant changes in the toxic effects of *Amanita muscaria*, and supports Wasson's theory that the first filter used in purifying Soma was a celestial filter, or filter of sunlight. According to the current understanding of *Amanita muscaria*'s chemistry, the biggest difference between fresh and dried *Amanita muscaria* is in the levels of ibotenic acid and muscimol present. Because the drying process decarboxylates ibotenic acid to muscimol, dried preparations have lower concentrations of ibotenic acid than do fresh specimens. This chemical change may account for the differences in the prevalence of vomiting between fresh and dried preparations. The difference in effects between

fresh and dried specimens of *Amanita muscaria* is also supported by the taboo against eating fresh *Amanita muscaria* mushrooms among several Siberian groups with a traditional use of this mushroom (Wasson 1968).

The differences in ill effects between dried preparations and preparations of tea showed that when applying Soma's second filter, a filter of woolen cloth, a significant change in the effects produced by *Amanita muscaria* also occurred. This change could certainly be perceived as beneficial, and could also explain why "Soma unpressed ne'er gladdened liberal Indra" (Griffith 1891: 35). Perhaps unsurprisingly, preparations of the tea in which the solids were consumed shared a similar prevalence of vomiting when compared to dried preparations. This suggested that a component of the mushroom that contributed to the effect of vomiting remained in the mushroom after a hot or cold water extraction. This information seemed to indicate that at least one of the compounds responsible for producing nausea and vomiting was not destroyed by high temperatures (as many preparations were boiled) and was not water soluble. Strained tea still contained ibotenic acid and muscarine, both of which are known to produce symptoms of nausea and vomiting, but the severely toxic components seem to have been removed. Because of the purported difficulty of dissolving ibotenic acid in cold water, a cold water extraction may have lower concentrations of ibotenic acid than hot water extractions, and thus reduce the risk of vomiting even further.

Complicating our understanding of *Amanita muscaria*'s pharmacology, however, is a recent article by William Rubel and mycologist David Arora (2008) that reveals a history of culinary use of this mushroom by scattered populations throughout the world. The most common method of detoxifying this mushroom has been to parboil it in several changes of water, which eliminates all negative and inebriating effects (Rubel & Arora 2008). This would seem to suggest, assuming both methods are valid, that any compound contributing to nausea and vomiting that remains in the mushroom after boiling does not itself produce these results but does so only by acting in concert with *Amanita muscaria*'s water soluble components. More research is needed to determine the specific chemical changes that render water extractions of *Amanita muscaria* less toxic than the dried mushroom.

While there is no indication in the Rig Veda that Soma is cooked, a comparison between fresh and cooked preparations of *Amanita muscaria* has been included in order to address an observation made by Wasson during his unsuccessful experiments with *Amanita muscaria*. Wasson observed one of his colleagues, Rokuya Imazeki, become inebriated after cooking the mushroom caps over an open fire. He and his colleagues were at a loss to explain why Imazeki had become successfully inebriated while the others had not, and could only conclude that cooking had something to do with it (Wasson 1968). While it has been suggested that cooking might cause ibotenic acid to break down due to its instability (Catalfomo & Eugster 1970),

the results here suggested that cooking *Amanita muscaria* did not significantly impact the chemistry of the mushroom as it related to the production of nausea or vomiting. The results also showed that none of the preparation types, including cooking, were significantly more likely to produce psychoactive effects than any other preparation type. This suggested that inebriation may be produced through any of the discussed preparations and that the successful experience of Wasson's colleague was likely a function of dose rather than preparation.

LIMITATIONS

The anecdotal reports used for this study were collected from a variety of sources, and the extent of details provided varied from source to source. As a result, the data used were not entirely uniform and may have been incomplete in some instances. One limitation resulting from the variation in detail is a lack of information on dose and how dose impacted the experiences of nausea, vomiting, and inebriation among preparation types. Without this information it is difficult to gauge how much preparation style, as opposed to dose, contributed to variance in the frequency of nausea and vomiting. Similarities in the frequency of inebriation among preparation types suggested some uniformity of dosage across types, perhaps indicating a limited impact of dose on the analyzed sample. Even with accurate dosage information, however, there remain difficulties in making comparisons among preparations, such as comparing dosages of fresh and dried mushrooms. Direct data collection with uniform questions would help to clarify the impact of preparation versus dose on the occurrence of nausea and vomiting.

The results were also limited by a lack of information on diet and variations in set and setting, factors that may have accounted for some of the differences in reactions among the surveyed reports. Another potential limitation is that no distinction was made between degrees of nausea. As a result,

individuals with mild stomach discomfort were grouped together with those who experienced violent illness. A closer inspection may have shown that preparation also predicted the degree of nausea experienced by the consumer.

CONCLUSION

It has been over 40 years since the publication of Wasson's *Soma: Divine Mushroom of Immortality*, and in that time his theory identifying Soma as the *Amanita muscaria* mushroom has remained one of the most viable proposals to date. One failure of Wasson's, however, was to demonstrate how the preparation of Soma, as described in the Rig Veda, supported his identification of *Amanita muscaria*. The research presented above fills this gap by demonstrating that the effects of *Amanita muscaria* are related to the type of preparation employed, and that the optimal effects of *Amanita muscaria* are produced through preparations that parallel those described for Soma in the Rig Veda. Wasson's theory is further supported by a reading of the Rig Veda that interprets the preparation of Soma as not merely an extraction process, but also a purifying process, since the techniques of Soma preparation when applied to *Amanita muscaria* not only extracted the active principles of the mushroom but also significantly reduced the presence of its nauseating and emetic properties. While this effort in no way closes the door on the debate over the identity of Soma, these findings help to solidify the foundation of Wasson's theory, as well as demonstrate the utmost importance of preparation in understanding and uncovering the true identity of Soma.

NOTE

1. *Amanita pantherina* is a close relative of *Amanita muscaria*, producing the same symptoms as *Amanita muscaria* poisoning and containing the same primary compounds: ibotenic acid, muscimol and muscarine.

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