Old hair and Tryptamines

by Keeper Trout

In recent years there have been an increasing number of investigations of mummy hairs for possible evidence of early drug use; these now include a couple of searches for tryptamines. It was with great excitement that I encountered two papers by Juan P. Ogalde, Bernardo T. Arriaza, and Elia C. Soto, asserting they had found evidence of ayahuasca consumption in an ancient snuff-using population from northern Chile (Ogalde et al. 2007, 2009).

Previous analysis of six South American snuff samples by Bo Holmstedt and Jan-Erik Lindgren reported tryptamines in five of them, one of which also contained harmala alkaloids, and the sixth sample contained *only* harmala alkaloids. Speculating that the harmala alkaloids may have come from *Banisteriopsis caapi*, Holmstedt and Lindgren proposed that the MAO-inhibiting harmala alkaloids could potentiate the action of the simple indoles, noting that the "combination of β-carbolines and tryptamines would thus be advantageous" (Holmstedt & Lindgren 1967). While this combination later became known as the "ayahuasca effect," with regard to making DMT orally active within that shamanic brew, it has been suggested that the origins of this pharmacological combination may lie within the use of snuffs, with its application in ayahuasca being a recent derivation (Ott 1996). Although *Anadenanthera peregrina* is considered the primary plant source for snuff used by the Piaroa of southern Venezuela, due to their snuff testing positive for bufotenine, one Piaroa snuff sample analyzed was also found to contain harmine (Smet & Rivier 1985, in Torres & Repke 2006). In their book *Anadenanthera: Visionary Plant of Ancient South America* (see page 167), authors Manuel Torres and David Repke remark:

> There is no ethnographic evidence for use of *Banisteriopsis* species as a snuff admixture; the Piaroa did not seem to be familiar with ayahuasca potions (Smet and Rivier 1985). However, in light of the well-documented Guahibo practice of chewing *Banisteriopsis* bark in conjunction with taking snuff, we cannot dismiss the possibility that the Piaroa might have added it to their snuffs (Torres & Repke 2006).

However, readers of *The Entheogen Review* may recall mention in the Winter Solstice 2002 issue (page 139) of an aspiring anthropology doctoral candidate who observed the preparation of a snuff by the Piaroa that contained fresh shoots of *Banisteriopsis caapi* pounded into a paste along with *Anadenanthera peregrina* seeds; his bioassay reports of this snuff described enhanced and prolonged activity (Rodd 2002), echoing the results from previous insufflation experiments using the pure chemical form of assorted tryptamines in combination with harmine or harmaline (Ott 2001).

The snuffing implements from northern Argentina and Chile are quite fine, delicate and small in both the equipment and the apparent snuff aliquot size, at least in comparison to the blowpipe technology found farther north. This difference has long been a point of curiosity; a common explanation proposed has been that the snuffs from northern Argentina and Chile were substantially more potent, permitting activity from relatively tiny amounts of material.

While this certainly could be the case, the use of a tryptaminic snuff *on top of* oral consumption of *Banisteriopsis caapi* would also be expected to enable a more robust perception of the tryptamines in the snuff. (For anyone skeptical of this claim, it can be easily evaluated by ingesting an active dose of *B. caapi* or *Peganum harmala* seeds, waiting until full onset of the MAOI effects—approximately 30 to 60 minutes—and then insufflating or smoking a known and familiar dose of 5-MeO-DMT.) It could even be that the use of tryptamine snuffs concurrent with the oral consumption of *Banisteriopsis*

caapi, such as is documented with the Guahibo, may have been what inspired the addition of tryptamine-containing plants to ayahuasca brews to begin with.

Alas, my excited anticipation of possible support for the idea that the ayahuasca effect was first discovered via the potentiation of snuffs by *Banisteriopsis caapi* was about to be rudely dashed on the rocks. As I read further, I discovered that, while the authors did claim to find harmine in at least one adult mummy believed to be a snuff user, as well as in the mummy of a one-year-old infant (suspected of *not* being a snuff user), they found no tryptamines in any of their mummies. The Ogalde group made three noteworthy comments:

> [...]samples tested from individuals in the Azapa Valley showed that they did not consume [*Anadenanthera*], despite archaeological evidence of snuffing implements. This negative finding is important because a lack of tryptaminic alkaloids indicates the absence of hallucinogenic compounds during the Middle Period of the Azapa Valley.

and

> The results of 32 mummies' hair samples showed that none of the samples tested positive for 5-methoxy-*N*,*N*-dimethyltryptamine alkaloid. This information is extremely useful, because it shows the snuffing kits used in Azapa Valley were not related to *Anadenanthera* consumption.

and

> Here we present chemical evidence suggesting *Banisteriopsis* consumption during the Tiwanaku Middle Period.

Due to the lack of requisite standards related to detection times for tryptamines, and no known proof that tryptamines actually *are* detectable in hair, the first two statements are entirely unsubstantiated. The most that currently *can* be said with accuracy, based on a hair analysis showing negative results for 5-MeO-DMT in a mummy's hair, is that the hair analysis performed did not detect 5-MeO-DMT. Further, the Ogalde group's assumption that only *Banisteriopsis caapi* could have served as a harmine source needs questioning, despite the immensely fascinating line of conjecture that it raises concerning possible ancient networks of drug traders at an early date.

Oddly, the Ogalde group did not analyze snuff, seeds, or residues in their mummies' snuffing equipment. Instead, they only cited work published by the Torres group concerning materials recovered from a *different* archaeological site. Details from the Torres group's analysis may be helpfully illuminating here.

When analyzing snuff samples dated circa 780 C.E. (about 1,230 years old)[1] from Solcor-3, the Torres group was able to detect 5-MeO-DMT, DMT, and bufotenine (Torres et al. 1991). What they found was present only in small amounts, although the material probably contained a decent percentage of alkaloids when it was fresh. Their finding was not surprising, since degradation of *Anadenanthera* alkaloids in storage, within even shorter time frames, has previously been reported (Schultes et al. 1977).

The oxidation of DMT, even when pure, is a well-known phenomenon to anyone who has possessed a sample of high quality DMT for a few years. While the potency may not be diminished much, samples take on a yellow color and pungent skatole smell, both of which increase with age. Several years ago, J. Case had the good fortune to physically examine some synthetic DMT that had been legally produced in the mid-1960s by a French pharmaceutical contractor. He reported the interior of the strong-smelling material was nicely crystalline and nearly white with light peach overtones, but the exterior of the sample was intensely orange and very waxy in appearance (Case 2002). According to one underground chemist, even high-purity, colorless, and almost odorless DMT crystals are said to take on a yellow color over time (Anonymous 2008).

While I have been unable to locate any studies concerning the degradation rate for DMT or 5-MeO-DMT, I did find a study involving another

dimethylated tryptamine: psilocybin. In an analysis of dried *Psilocybe semilanceata* preserved as herbarium specimens, it was discovered that the psilocybin level had dropped below detectable levels before the samples reached a century and a half in age (Ohenoja et al. 1987). DMT and 5-MeO-DMT should be expected to be more stable than psilocybin, and bufotenine to be even more stable, but all will have some finite ceiling of detection. It seems reasonable to believe that tryptamines can stay potent for many years, and remain detectable for even longer, but it is also beginning to appear likely that the upper limit of detection is on the order of some centuries. The age of the mummies tested by the Ogalde group was not given; only a date range for archaeological evidence during the Tiwanaku empire expansion along the Atacama Desert of Chile was noted—circa 500–1000 C.E.—implying that the mummies may be somewhere between 1,000 and 1,500 years old.[1]

Among the conclusions made by the Ogalde group, two are in need of a closer look:

1) Concerning *Anadenanthera* snuffs:

> [...] samples tested from individuals in the Azapa Valley showed that they did not consume [*Anadenanthera*...]
>
> [...] Our research revealed that the snuffing paraphernalia was not directly associated with *Anadenanthera* in the Azapa Valley.

Strangely, despite these claims, and despite the observation of extensive chronic snuffing-related injury in the perinasal areas within the skulls of the mummies they examined, the Ogalde group offered no suggestion as to what snuff they thought *was* in use.

2) Concerning ayahuasca:

> We believe this plant [*Banisteriopsis caapi*] was not used to prepare hallucinogenic drinks in Azapa Valley because we did not find tryptaminic alkaloids and harmine is not hallucinogenic in its pure form [...]
>
> [...] we believe the consumption of *Banisteriopsis* was part of a medicinal practice, perhaps as [an] Ayahuasca [*Banisteriopsis* only] infusion.
>
> It is possible that *Banisteriopsis* consumption, an Amazonian plant, coincided with snuffing kits as elements of social differentiation.

Wow. The authors seem willing to go to great lengths of speculation regarding the use of *Banisteriopsis* neat, based on their inability to detect tryptamines in the mummies' hair samples.

A few years earlier Castro et al. (2003)—working with mummies from northern Chile that were older than those that the Ogalde group examined—produced similar results. The hair samples they analyzed were obtained from mummies dated around 100 B.C.E. to 140 C.E. (or about 1,870 to 2,110 years old).[1] But along with being unable to find any tryptamines, the Castro group also failed to detect any harmala alkaloids. Their wide range of speculation for the lack of such alkaloids included almost everything, *except for the possibility that the alkaloids had degraded and were no longer detectable*!

The Ogalde group was similarly operating on the assumption that snuff alkaloids would show up in their mummies, if those mummies had used the snuff. Based on their negative findings, and in order to explain the tryptamine-positive findings of the Torres group, the Ogalde group proposed that:

> While the chemical analysis suggested the Solcor-3 people were familiar with this type of drug, it does not necessarily indicate ingestion.

Several elements about this proposal are strangely lacking though, only *one* of which is the fact that no one seems to have actually done an analysis of any hair or soft tissue from the Solcor-3 population.

1) Neither the Ogalde group nor the Castro group performed analysis on modern hair from *a known user of tryptamines*, and they did not otherwise establish that drug testing of hair for tryptamines is even possible or had been done previously. While it seems likely that DMT and 5-MeO-DMT would be detectable in hair, this should not simply be

presumed to be the case. In addition, since DMT and 5-MeO-DMT are endogenously produced in humans, and what with hair being believed to help protect alkaloids from degradation for long periods, one might suspect that DMT and/or 5-MeO-DMT would *always* be present in every human hair sample (see Clarke 1986 and Davis 1989). Despite this, I have been unable to locate any analysis on ancient or modern hair that reported a positive for DMT or 5-MeO-DMT. Certainly, DMT has good oil solubility, suggesting it could successfully get into the sebum (this is believed to be the route for non-polar alkaloids to physically enter the hair before it leaves the follicle). However DMT is also extensively degraded in humans by the well-known deaminating action of MAO, and also by the action of red blood cells, which open the indole ring (see Hryhorczuk et al. 1986).

2) As mentioned earlier, at no point did the Ogalde group test the actual snuff or snuffing implements buried with their mummies to determine if alkaloids could be detected on them after so many years and, if so, what the alkaloids might be.

The Castro group commented that the porosity of their mummy hair added an undesirable permeability; so this, too, may have been a factor in their negative results. In the course of asking as many pharmacologists, toxicologists, and analytical chemists as I was able to contact about the Ogalde group's results, their data's integrity was brought into question even further. Analytical chemist Steven Barker commented that the Ogalde group's data appeared to be "overworked," misinterpreted, and did not support the presence of harmine in their hair samples (Barker 2008).

While the Ogalde group's work is fascinating, in order for it to have more meaning, appropriate standards and additional rigor must be applied to their studies. An important missing element, that needs to be established, is determining how long ayahuasca and *Anadenanthera* alkaloids remain detectable. Next, and just as importantly, it must be established that these alkaloids actually *can* be detected in the hair of modern ayahuasca and snuff users. If either of these points is lacking, then the negative analysis of a mummy's hair can offer nothing of meaning other than the outcome of that one test.

Footnotes

1. Dates presented within this paper should only be considered rough approximates, as there was not enough information included within the published accounts to understand how they were determined. Radiocarbon dating produces a range, not a set date, and should be expressed this way (or should include a numeric degree of +/- uncertainty). Also, most researchers do not perform their own dating, and mistakes in publishing dates can happen if a researcher doesn't understand or indicate that the raw figures provided by the lab are usually reported in radiocarbon years. Raw dates can be corrected to give calendar dates, but this is not always done.