



UNAUTHORIZED RESEARCH ON CLUSTER HEADACHE

by R. Andrew Sewell, M.D.

[...] I was going crazy; I have a ghastly memory of hammering on a wall with my cast in impotent anguish as a continuous white-hot blade of agony sliced through my brain for two consecutive hours, only to begin again two hours later. I screamed and wept; I prayed to a God I wasn't sure I believed in to forgive sins I wasn't sure I'd ever committed. My wife could do nothing except stand helplessly by while I went nuts. There was no painkiller that could touch this affliction; all that resulted from multiple-capsule doses of Seconal was that I was unpleasantly, stupidly stoned while left to cope with the undiminished torment in my head.

— Jim DeKorne, founding editor of *The Entheogen Review* (DeKorne 1994)

PERHAPS THE GREATEST TRIUMPH of unauthorized research on visionary plants and drugs to date is the discovery that small doses of LSD, psilocybin, and LSA (lysergic acid amide) are more effective than any conventional medication in treating the dismal disorder, cluster headache. Five years ago, no one other than cluster headache patients or neurologists had ever heard of cluster headache. Now, treatment of cluster headache is routinely listed among potential therapeutic uses for psychedelics, and has even penetrated popular culture to the point that the character Gregory House, M.D. has used a psychedelic drug to treat headache on the TV show *House* not once, but twice (Kaplow 2006; Dick 2007)!

The first mention of therapeutic effect from a psychedelic on headache comes from Drs. D. Webster Prentiss and Francis P. Morgan, professors of medicine and pharmacology at Columbian University (now George Washington University), who began to conduct animal and human experiments with peyote in 1894 in order to determine whether or not it had any valuable medicinal properties. Two years later, their report concluded: "The conditions in which it seems probable that the use of mescal buttons will produce beneficial results are the following: In general 'nervousness,' nervous headache, nervous irritative cough... [etc.]." In their account are a number of cases, including #5: "The same

gentleman reports that his wife formerly used to take the tincture [anhalonium¹] for nervous headaches and that it always relieved her. She has them so seldom now that she does not use it" (Prentiss & Morgan 1896).

Intrigued by Prentiss and Morgan's reports of mescaline's psychological properties, the psychologist, sexologist, and women's rights champion Havelock Ellis decided to try peyote ("a decoction of three mescal buttons") himself the following year, taking it for the first time on Good Friday at 2:30 pm. His 1897 trip report states: "The most noteworthy, almost immediate, result of the first dose was that a headache which for some hours had shown a tendency to aggravation was somewhat relieved." He continues: "At 3 began to feel drowsy. At 3:30 took another third of the infusion. My headache was speedily still further lightened, and I now felt a certain consciousness of energy and intellectual power." Strangely, the report ends with: "I have myself never felt hopeful about mescal as a therapeutic agent [...] it is not easy to see in what diseased conditions the crude drug itself is indicated," and Ellis never investigated headache further (Ellis 1902).

Ultimately, the use of mescaline to treat headache never caught on, perhaps because most of the early American and European peyote users complained





What is Cluster Headache?

Everyone's had a headache, much to the chagrin of cluster headache sufferers, who find scant sympathy for their torment. Unlike your average hangover, a cluster attack is considered the most painful condition known to man, and has been compared to having a lit cigarette held to the side of one's face, or "giving birth through the eyesocket." Men who have experienced both kidney stones and cluster headache rate the cluster attacks more painful. Women with cluster headache who have given birth without anaesthesia rate the pain of a cluster attack worse. Cluster headache is about a thirtieth as common as migraine, and is five times more common in men. Unlike migraine pain, which is described as dull and throbbing, the pain from cluster headache is sharp, steady, and intense. Also unlike migraine, which feels better if one lies down in a dark room, cluster headache patients are restless and agitated, compelled to pace around, press their temples, and sometimes even bang their heads on walls and doors.

Perhaps the most striking feature of cluster attacks is their periodicity, which is the cardinal feature of the disease. At peak, there can be between one and eight attacks per day, usually at the same times each day, especially about ninety minutes after going to sleep, with the onset of REM sleep. This association with sleep frequently leads to sleep deprivation or "sleep fear." The first cluster period usually lasts four to eight weeks and recurs thereafter once or twice a year, but the pattern is strikingly consistent for a given patient. Ten percent of cluster headache patients get no remission period. The attacks never go away. These are the ones who kill themselves, leading to the nickname "suicide headache" for this disorder.

One morning I returned to the house, the pain undiminished, and decided that I'd had enough. I was loading my shotgun to kill myself when my housemate came downstairs and took the gun away from me. He said: "Don't you think that's a bit extreme? Why don't you go down to the clinic and have them shoot you up with morphine, knock you out, or something?" — Jim DeKorne (DeKorne 2006)

that peyote *caused* headache (Perrine 2001). The pharmacologist Arthur Heffter's trip report of June 5, 1887 reads: "Nausea, occipital headache, intense dizziness, and clumsiness in moving began about half an hour after the last dose" (Heffter 1898). Prentiss and Morgan reported that one of their experimental subjects experienced a three-day headache following a dose of mescaline, severe enough to be debilitating on the second day (Perrine 2001). Investigations all but ceased when anhalonium was removed from the U.S. *Pharma-*

copeia, and by 1938, when Richard Evans Schultes published his summary of peyote's therapeutic effects, headache does not even rate a mention (Schultes 1938).

The torch then passed to psychiatry. The first modern-day observations of the psychedelic treatment for headache came from psychotherapists who were using LSD to treat neurosis in the late 1950s and early 1960s. They observed some startling remissions. "Case I—Mrs. M., aged 51.

TABLE ONE

DRUG	AVERAGE CLINICAL DOSE	EFFECT*
LSD-25	50 to 100 µg	++
BOL-148 (2-bromo-LSD)	2 to 4 mg	+
LAE-32 (D-lysergic acid ethylamide)	1 to 3 mg	+
PML-146 (1-methyl-d-lysergic acid propanolamide)	1 to 3 mg	+++
UML-491 (1-methyl-lysergic acid butanolamide)	2 to 6 mg	++++

* RESULTS OF THERAPEUTIC EXPERIMENTS BASED ON 390 CASES OF HEADACHE OF VARIOUS ORIGINS (SICUTERI 1963).





A happily married drama teacher who had complained of a severe migraine since age 9 [...]. She had six weekly sessions of LSD in doses of 40 to 90 micrograms. Eight months since her last treatment, she has had no more attacks of migraine,” reads one account of psycholytic psychotherapy. “LSD is particularly suitable for anxiety states with accompanying tension.... *We have been particularly successful with migraine*” [*emphasis added*] (Ling & Buckman 1960). Jay Stevens refers to this in his book, *Storming Heaven*: “A number of therapists talked about the serendipitous side effects that they sometimes saw in their patients. They would be in the middle of a postsession interview, perhaps two or three weeks after the original LSD session, and the patient would suddenly say, ‘Oh and the headache is gone too.’ What headache?, they’d ask. Why, the headache I’ve had for ten or fifteen years, would be the answer” (Stevens 1987). In every case, however, resolution of the headache was attributed to resolution of the underlying psychodynamic conflicts. Not one person suggested that it might be a direct pharmacologic effect of the drug itself. It was a near miss, scientifically speaking—the answer was in plain sight, but nobody asked the right question.

The first mention of LSD specifically to treat cluster headache can be credited to Dr. Federigo Sicuteri in 1963. A giant in the field of headache medicine, Dr. Sicuteri founded the first headache center in Europe, introduced the serotonin theory of migraine—which formed the basis for all subsequent experiments with lysergic acid derivatives, from the early ones with LSD to the most recent development of sumatriptan (Imitrex™)—and developed the first prophylactic drug for migraine, methysergide. Methysergide, which is basically LSD with one of the ethyl groups changed to a methoxy, is—like LSD—also psychotropic in suprathreshold doses (Abramson & Rolo 1967; Bender 1970). This “safe,” legal version of LSD was marketed as Sansert™ for many years, but removed from the U.S. market in 2002 because of its unpredictable propensity to cause “retroperitoneal fibrosis”—an uncontrollable growth of scar tissue that chokes the internal organs, leading to death. Dr. Sicuteri died in April of 2003, and was honored by the entire world of headache specialists. “Sicuteri has changed the life of a million sufferers,” wrote Donald Price (Puca 2003).

PATIENT ZERO

This 34-year-old Scottish man had his first onset of episodic cluster headache at the age of 16, with headaches recurring regularly every seven months. They consisted of one month of four to six left orbital attacks per day that lasted from 30 minutes to three hours and were precipitated by alcohol and stress. At worst, he rated the pain of the attacks as being 10 out of 10 in intensity, and they occurred almost continually for five days in the third week of each cluster period.

He was prescribed the histamine receptor blocker pizotifen, which was ineffective. In January 1993, at the age of 22, he took LSD recreationally and was surprised when his anticipated February attack did not occur. Over the next two years, he took LSD three or four times and missed his next four consecutive cluster periods. In April 1995, at 24, following a 12-month abstinence from LSD, he experienced another attack and was prescribed propranolol and amitriptyline, both of which were ineffective. Suspecting that his use of a psychedelic drug had prevented his cluster periods from recurring, he ingested psilocybin-containing mushrooms the following October and did not experience his anticipated November cluster period.

After that, until December 1996, he consumed 10 to 12 fresh “liberty cap” mushrooms (*Psilocybe semilanceata*) every three months—about a quarter of the usual recreational dose required for psychedelic effects—suffering no attacks whatsoever until he discontinued his use of the mushrooms in order to test whether there was a correlation between their use and the absence of cluster periods. He was right: in January 1998, his next cluster period began, and he was again prescribed propranolol, which mitigated some of his attacks but which he was unable to tolerate because of an overly slowed heart rate.

His first post to the Internet on this subject was on July 28, 1998. From then on, he ingested liberty caps every six months, and has since been almost pain-free on this regimen, with two exceptions. The first was in 2001 when he had destroyed his supply because he feared being discovered by the police, and as a result took a smaller than usual dose, which resulted in a seven-day cluster period. He was prescribed oxygen, but the episode ended before his insurance approved this treatment. Another cluster period occurred in April 2003 when he deliberately took a smaller dose as an experiment and again suffered a week of attacks, which he then aborted with a second dose of psilocybin-containing mushrooms.





Table 1 (see page 118) is reproduced from Dr. Sicuteri's summary of the effects of lysergic acid derivatives other than methysergide on 390 headache patients (Sicuteri 1963). Standards for scientific reporting were somewhat more lax forty years ago than they are now; we can tell from his paper that 25 of the 238 patients treated with methysergide had cluster headache, but there is no indication that Sicuteri thought to treat the cluster attacks acutely, measured whether the LSD had any cluster-period-terminating effects, or followed the patients to see if they skipped their next cluster period. Moreover, he referred to cluster headache by the archaic term "histamine cephalgia" (cluster headache was not formally defined using modern nomenclature until 1980), so there is no guarantee that what he considered cluster headache is what we would consider the same thing today. Needless to say, Sicuteri saw much more promise in methysergide than he did in LSD, and spent a considerable portion of his career developing it as a medication. The true potential of LSD in treating cluster headache was thus unfortunately overlooked.

The next scientist to investigate the use of visionary plants to treat headache was Dr. Ethan Russo, who later went on to found the *Journal of Cannabis Therapeutics* and is well-known for his interest in migraine. In the early 1990s, Dr. Russo made two expeditions to Peru's remote Manu National Park (in the same fashion as Schultes' Amazonian research fifty years earlier), researching the use of medicinal plants by members of the Machiguenga tribes, about whom he had written earlier (Russo 1992). "Sometimes they crush leaves or flowers which they drip into their eyes to treat migraine or enhance their hunting prowess," he writes; in a later work, he described the use of several psychedelics by the natives to treat headache, including *Brugmansia arborea*. Apparently, longitudinal cuts were made in the stems or branches of this small tree and these branches were then applied to the skin; an anesthetic and soporific effect became apparent after fifteen minutes. Over fifteen years later, Russo's manuscript, *An Ocelot for a Pillow: Researching Headaches, Hallucinogens, and Hunting Magic Among the Machiguenga of Manu* remains unpublished, unfortunately, so it is unclear what else he discovered. He has since devoted his career to exploring the therapeutic use of *Cannabis*. Although *Cannabis* appears to have utility in the treatment of

CASE CH037

Authorized Research

This 46-year-old man with restless legs syndrome began to have cluster headaches at age eight. He was taken to many doctors and suffered severe disruptions of his schooling owing to his need for frequent hospitalization. His headaches came without warning, were described as being "like a red hot poker being poked through my eye," and were associated with runny nose, drooping eyelid and teary eye on one side, and whole-body perspiration. The pain was overwhelming and rendered him incapable of speaking or doing anything. He often screamed, flailed around, pounded his head with his fists and banged against anything he could find without regard for his personal safety. He described these episodes as "degrading" and "exhausting" (he was woken two or three times a night by an attack) and distressing for his companions. Until his mid-20s, his cluster periods were regular—twice a year—and lasted six to eight weeks, but as he grew older, the cluster periods gradually lengthened, and 15 years ago, they became secondary chronic, at which point he had to stop working and was classified as disabled, not leaving his home for months on end. In 1998, he participated in a functional imaging study that demonstrated, for the first time, hypothalamic perfusion changes during a cluster attack (May et al. 1998; Kaplow 2006).

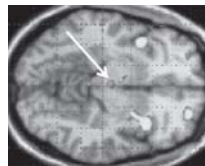
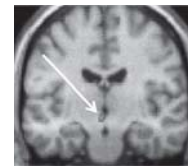


FIGURE ONE:



Brain of CH037 clearly shows hypothalamic activation during experimentally induced cluster attack.

Unauthorized Research

Unfortunately, amitriptyline, propranolol, and lithium were ineffective in controlling his headaches. Verapamil was partially effective, and oxygen and sumatriptan worked well as abortives; prednisone was also effective. In November 2004, he took a two-gram dose of psilocybin-containing mushrooms but did not note any change in his headaches. After a second dose a week later, however, his headaches remitted completely and have not returned as of July 2008. He is now able to sleep through the night and has resumed a "normal life," completely without medications. He currently uses tea, coffee, cigarettes, and *Cannabis* daily, but no other drugs except for a sub-psychedelic maintenance dose of mushrooms every two or three months.





migraine, there is no evidence—anecdotal or otherwise—to suggest that it is helpful in treating cluster headache.

In 2003, Otto Snow published a book, *LSD*, in which he describes his extraordinary results in treating migraine with psychedelics. Although headache terminology can sometimes be confusing (the term “cluster migraine” always makes me shudder), the symptoms that Snow describes—double vision, unsteady gait, right arm and leg numbness, difficulty speaking—localize to the brainstem, not the hypothalamus, which is where cluster headache originates (Snow 2003). These symptoms are consistent with a rare form of migraine called basilar-type migraine, or Bickerstaff Syndrome; if this is the case, then ergotamine, triptans, and beta-blockers such as propranolol can be dangerous and should not be used. His experiences with LSD treating migraine are interesting, and conform with the observations of other researchers; but cluster headache is not migraine!

In 1998, unauthorized research on cluster headache stepped in where authorized research had drawn a blank. Scotsman Craig Adams,³ proprietor of The Moorings Bar in Aberdeen (an unusual profession, given that alcohol reliably triggers cluster attacks)—also known as “Patient Zero”—made a remarkable post to the Internet in which he described his use of psilocybin to treat his cluster headache. He was vilified by the cluster headache community, which was generally unwilling to hear about the new treatment,⁴ but he persisted. The 38th person he persuaded to try psilocybin for cluster headache was a Midwesterner named Bob Wold.³

Mr. Wold (Figure 2) was a tough case. His cluster headaches had started as episodic, but his cluster periods had grown longer and longer until eventually they ran together, and nothing seemed to help. When I obtained copies of Mr. Wold’s medical records from his neurologist, Dr. Freitag, I counted no fewer than sixty-five medication trials, all of which had failed (except for two of his four week-long inpatient admissions to the Diamond Headache Clinic). Faced with a choice of trying psilocybin or undergoing gamma-knife brain surgery, he figured that it was likely to be brain damage either way, so he took the psilocybin. And it worked! The first dose gave him only 24 hours of relief, but subsequent doses broke the cluster headache cycle altogether. Livid that none of the neurologists he had seen had shared with him this simple, effective treatment for his terrible malady, he founded a group called the Clusterbusters (www.clusterbusters.com) in 2001. Clusterbusters is dedicated to bringing the attention of the medical establishment to this new medicine, promoting clinical trials, and turning psilocybin into a prescribable drug.

After the Clusterbusters’ membership topped 100, Bob Wold approached MAPS, and MAPS approached Harvard Medical School, where I was conducting research, with a proposal—were we inter-

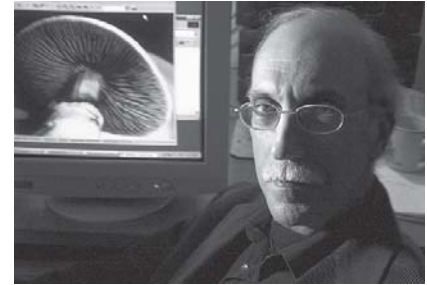


FIGURE TWO:

Bob Wold, unauthorized researcher on visionary drugs and cluster headache; founder of the Clusterbusters.

ested in a potential new treatment for a terrible disease? For a young neurologist who was new to research, it seemed like a gift from heaven. With the help of Earth and Fire Erowid, who graciously agreed to develop and host it, we put a “dummy questionnaire” on the Internet that asked a number of innocuous questions about quality of life with cluster headache, followed by a “money” question asking permission to contact the respondent to ask more questions about cluster headache. Those who checked the box, I phoned, e-mailed, and quizzed about their use of psychedelic drugs. This gave me 242 cases; I combined these with the 120 provided by the Clusterbusters and 21 cluster headache patients who—having heard that I was researching cluster headache—e-mailed me out of the blue, to yield a large database that I was able to search for evidence of therapeutic effect from psychedelic drugs. The final step was to require medical records documenting the diagnosis (since Internet identities are notoriously unreliable).





What is LSA?

LSA, also known as “ergine,” is an ergoline alkaloid that—unlike LSD—occurs in nature in a number of plants, two of which can be found in the United States (*Argyreia nervosa*, or Hawaiian baby woodrose, and *Ipomoea violacea*, morning glory), and one of which grows in Mexico (*Turbina* [= *Rivea*] *corymbosa*, or *ololiuhqui*).

Hawaiian baby woodrose is a perennial climbing vine that was native to the Indian subcontinent but now is present worldwide. Knowledge of its psychedelic properties started to spread in the 1960s, after a paper detailing its chemistry was published (Hylin & Watson 1965), and after it was noticed that poor people in Hawaii would consume the seeds for a cheap buzz (Emboden 1972). Seven or eight seeds will cause a four- to twelve-hour trip similar to LSD but with fewer visual effects, and with occasional nausea, flatulence, and vomiting. Morning glory is another climbing vine whose seeds contain LSA, and was originally used by Aztec shamans in Mexico to commune with their gods.

Ololiuhqui was likewise used by South American healers in shamanic healing ceremonies, and is thought to have been the most common visionary plant consumed by indigenous people throughout the continent. It is still used by the Mazatecs, who live in the southern mountains of Mexico. The constituent LSA was identified in 1960 by Albert Hofmann.

Because LSA is generally an unpleasant trip, few recreational users take it twice, and perhaps because of its low “abuse” potential, it is categorized in Schedule III, the same class as buprenorphine and anabolic steroids, not in Schedule I as are most other psychedelics.

How many people would send documentation of illegal activity to a faceless authority figure over the Internet? So many, in fact, that I cut the study off at 50, reasoning that more cases than that would not necessarily be more convincing; three more medical records arrived after the cutoff point. The results were extraordinary! (Figure 3) Psilocybin and LSD appeared to be at least as effective as the conventional medication at aborting an acute attack, and appeared to be able to terminate cluster periods and even prevent them from reoccurring, a characteristic not shared by any conventional medication. I published the results in the journal *Neurology* with my colleague Harrison Pope, Jr., a renowned professor of psychiatry at McLean Hospital, and my former colleague John Halpern (Sewell et al. 2006).

The study suffered from several methodological flaws, unfortunately. First—what was the dose? “One big one and two small ones,” would be a typical answer. “Three stems and two caps.” Not too useful for constructing a dose–response curve. Second, what about selection bias? Unfortunately, it’s probably possible to find fifty people on the Internet who would swear that rubbing cow manure in their hair cures cluster headache; cyberspace is a big place.

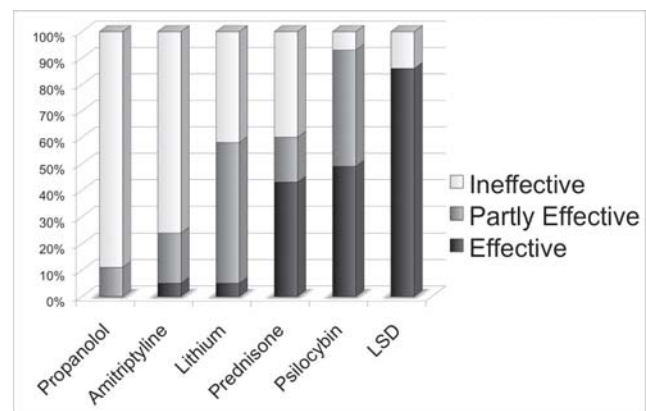


FIGURE THREE:

Authorized Research on Visionary Plants and Drugs: Efficacy of LSD and psilocybin indicated here is likely higher than would be seen in a clinical population for two reasons: 1) the population of cluster headache patients willing to resort to taking psychedelic drugs is by definition one for which conventional medications are not that effective, and 2) patients are more willing to share success stories than failures. Still, holey moleley!





The solution came from England. A group called the Organization for Understanding Cluster Headache (OUCH-UK) had noticed that seeds of the Hawaiian baby woodrose and morning glory plants, when ground up, seemed to be just as effective as LSD or psilocybin in treating their cluster headache. Even better, morning glory seeds can be ordered over the Internet, overnight-delivered, and consumed immediately without the need for a six-week delay while spores germinate and mushrooms grow. Better still, lysergic acid amide (LSA), the active ingredient in the seeds, is only Schedule III, so being caught with it is unlikely to result even in prosecution, much less a stiff prison sentence.

News of the discovery spread like wildfire and quickly jumped the pond, presenting me with a unique opportunity. Given that I had a database of 383 cluster headache patients, none of whom had taken LSA at the time they had enrolled in the study,⁵ how many—two years later—had taken it? Sixty-eight, it turned out. This was no longer a retrospective case series, which is scientifically unconvincing, but rather a prospective cohort study (which, while considerably more compelling, is still not up to the level of a randomized clinical trial). Not only that; since seeds come as discrete units, it occurred to me that all I had to do to arrive at a dose was 1) analyze a seed, 2) ask each subject how many seeds they had taken, and 3) multiply the two values to arrive at the dose.

This idea proved to be a dead end, unfortunately. Preliminary analysis of the seeds revealed that there was an over ten-fold variation in alkaloid content from batch to batch—some seeds being complete duds, containing no LSA whatsoever (Figure 4). The only solution was to have patients mail me whatever seeds they had left over after they treated themselves, so I could see exactly what they had taken (Figure 6, next page). Disclosure of the results will have to await peer review, but a preliminary poster presented at the 2008 annual meeting of the American Headache Society can be viewed on the Erowid web site (erowid.org/chemicals/lsa/lsa_article2.pdf). As one might expect, sub-hallucinogenic doses of LSA appear to be effective in treating cluster attacks, terminating cluster periods, and extending remission periods in cluster headache.

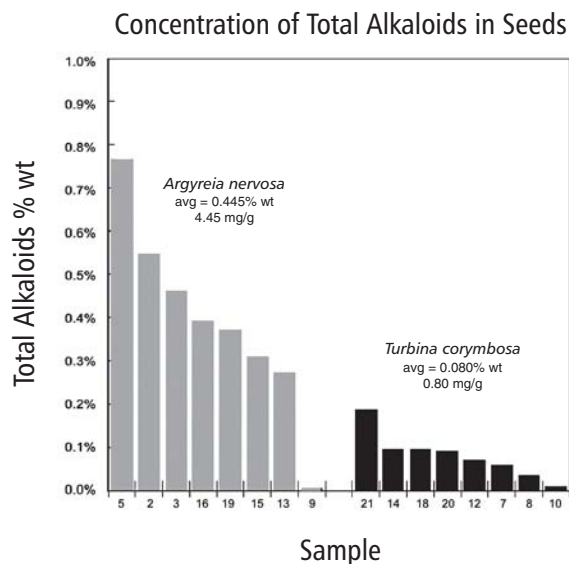


FIGURE FOUR:

Authorized research into visionary plants and drugs: alkaloid content of *Argyrea nervosa* and *Turbina (= Rivea) corymbosa*.

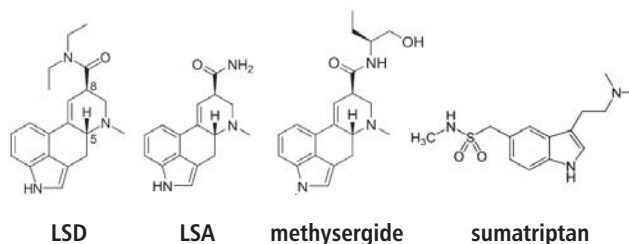


FIGURE FIVE:

Structural homologies between authorized and unauthorized treatments for cluster headache. Changing an ethyl group on LSD to a methoxy yields methysergide (Sansert™). Sumatriptan (Imitrex™) is dimethyltryptamine (DMT) with a methanesulfonamide in the 5-position, and is therefore potentially illegal under the Controlled Substances Analogue Enforcement Act.

And so it came to pass that modern science could have stumbled upon this discovery several times, but unfortunately asked the wrong questions, drew the wrong conclusions, or simply looked the other way. It was not a cadre of smart Ivy League doctors drawing chemical diagrams on chalkboards or running complicated structural computer simulations who discovered that psychotropic indoles treat clus-





FIGURE SEVEN:
Kyle Reed, authorized researcher.

ter headache. Rather, it was a dedicated patient group, testing different psychedelic compounds through trial and error, much as the shamans of old honed their healing techniques through observation and iteration. Unauthorized research made the discovery, leaving authorized research merely to confirm it and refine it.

Which brings us back to Jim DeKorne, former editor of *The Entheogen Review*. Compulsive about documentation, he recorded the date of every one of the fifteen-or-so occasions (October 25, 1964; February 21, 1965; February 18, 1979, etc.) that he took LSD over three decades (DeKorne 1994). It should be a simple matter, I thought, to cross-reference these occasions with the timing of his cluster periods—which he also recorded in excruciating detail—and show that his infrequent use of LSD corresponded with a skipping of each subsequent cluster period. I was dismayed to receive the following e-mail:

Alas, I doubt if I could provide any scientifically useful data. [... My diaries were] shredded when I left New Mexico in 2003. (I'd accumulated 16 tons of stuff during my 37 year residence there, but when we moved to Hawaii everything had to fit into a shipping container—triage time.) I now regret all that ruthless shredding because I'm writing a sequel to *Psychedelic Shamanism* and wish I had access to some of the old diaries.

There you have it. Even as Jim DeKorne cranked out the first photocopies of *The Entheogen Review*, irrefutable scientific evidence of the therapeutic efficacy of psychedelic drugs lay buried in his files, not ten feet away, unexamined, only to be thrown out a decade later. Any number of conclusions can be drawn from this. I prefer to surmise the following: First, the truth wins out eventually; and second, the universe has a sense of humor.

And with that thought in mind, on behalf of Jim DeKorne, David Aardvark, and the cast and crew of *The Entheogen Review*, I bid you all good night, and good luck. ☉

ACKNOWLEDGMENTS

Thanks go to Ethan Russo, M.D. and Nicola Schilling, L.C.S.W. for their comments on an earlier draft of this manuscript. Special appreciation goes to Kyle Reed (Figure 7), the analytic chemist who performed all the seed analyses in the study mentioned above in his laboratory at Harvard. When I calculated how much I would have had to pay to extract the alkaloids from all those seed samples using a commercial laboratory, the figure exceeded \$30,000. However, Kyle refused to allow me to even reimburse him for the cost of the raw materials used in the analysis. Thanks also to MAPS and Seth Hollub, for sponsoring and funding the above-ground LSA research.

FOOTNOTES

1. *Anhalonium lewinii* (= *Lophophora williamsii*) was standardized to a 10% tincture by a process described in the *U.S. Pharmacopeia* and given at a dose of 4–8 grams.
2. Dr. Arthur Heffter was the first Chairman of the German Society of Pharmacologists, wrote the first *Handbook of Experimental Pharmacology*, and was the first to isolate mescaline from peyote. It is meaningless to ask whether Heffter's or Havelock Ellis' self-experimentation was authorized or unauthorized; a century ago scientists were free to "authorize" themselves.
3. Real name used with permission.
4. It is my observation that cluster headache patients appear to be unusually law-abiding. The existence of a particular personality type that accompanies cluster headache has been commented upon many times but never formally verified.
5. And yes, that was one of the things I had checked. They may not have heard of LSA, but I had!

