

“Researching Salvias: An Interview with Jack E. Hurd” and the accompanying article: “A Quick Overview of Salvias and *Salvia divinorum*” appeared in the Fall, 2008, edition of the *Pennyroyal Papers*, newsletter of The New England Unit of The Herb Society of America. The articles are posted on The New England Unit’s website (www.neuhsa.org), with the express permission of Riekie Sluder and Jack E. Hurd. All rights reserved.

Researching Salvias: An Interview with Jack E. Hurd by Riekie Sluder

Imagine what Thanksgiving would be like without turkey stuffing made with common garden sage, *Salvia officinalis*. According to a *New York Times* article on September 8th, 2008, many state legislatures are trying to regulate salvias. It is all because of a rogue salvia, *Salvia divinorum*. Apparently this variety is regarded as the world’s most potent hallucinogenic herb. Some states have already banned salvias because of it and others are considering doing so.

Jack E. Hurd, a Forensic Scientist with the Department of Public Safety Alaska Scientific Crime Detection Laboratory, is doing research on salvias to identify if any other salvias besides *S. divinorum* have similar psychogenic properties. He contacted the New England Unit via our website to request samples of several specimens of salvia from our collection in the Teaching Herb Garden at Elm Bank. Rhonda Haavisto forwarded the request to me as captain of the salvia bed and we began a correspondence via email. I was able to assist him in his research by sending him specimens of *S. viridis*, *S. verticillata* and *S. transylvanica* which he did not have.

The following is an interview that I conducted with Jack E. Hurd:

Why did you become interested in doing research on salvias?

In the United States, salvia is not regulated under the Controlled Substances Act but some states, including Delaware, Louisiana, Missouri, Florida and others, have passed their own laws. Several other states have proposed legislation against salvia, including Alabama, Alaska, California, Iowa, Michigan, New Jersey, New York, Ohio, Oregon, Pennsylvania, and Texas. At this time, many of these proposals have not made it into law, with motions having failed, stalled or otherwise died, for example at committee review stages.

Most of my colleagues in the forensic community are not experts in botany. Consequently, forensic labs throughout the nation are ill equipped to botanically identify *Salvia divinorum* to the exclusion of the other 900-1200 species of *Salvia* that exist in the world.

What is the goal of the research? My initial goal was answering the question, “what is involved in the botanical identification of *Salvia* species?” In other words, what morphological structures do botanists look at in order to identify individual species of *Salvia*? Ultimately, I learned that *Salvia* species identification is all about the flowers (color of calyx & corolla, shape of calyx & corolla, shape of stamen, etc). Leaves, stems, and stalks can not be used reliably to identify species. Since *Salvia divinorum* rarely flowers, I realized that morphological identification would not be a practical means to identify the plant.

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If controlling the “drug” is the goal of law makers, my suggestion is to control the active ingredient in the plant, Salvinorin A, not the plant itself. The question then becomes, “Are there any other species of *Salvia* that contain the active ingredient, Salvinorin A?” Therefore, the ultimate goal of my research is to answer that question.

Who, if anyone, is funding the research? I was given permission and am receiving funding to begin researching *Salvias* from the Alaska Crime Lab's budget.

How did you go about finding samples? The internet has been an invaluable tool in helping me find organizations/people willing to help me obtain *Salvia* leaf samples from their collection. I have emailed/phoned thousands of people “begging” for help. Of those thousands, only a relative few have been willing to help. The following is a sampling of those who have provided me with *Salvias*: *The San Francisco Botanical Garden Society at Strybing Arboretum, Organic chemist Richard Dufresne (one of the leading North American authorities on Salvias), Desert Botanical Garden - Phoenix, AZ., Las Pilitas Nursery, U.B.C. Botanical Garden and Centre for Plant Research, Denver Botanic Gardens, Peckerwood Gardens Conservation Foundation, Cabrillo College, Atlanta Botanical Garden, UNM Biology Department Herbarium, Sandy Mush Herb Nursery, Robbin Middleton (England), The New England Unit of the Herb Society of America, and Yoji Saito (Japanese expert on Salvias).*

What is your methodology? The instrument that I am using to analyze the chemical makeup of the leaves is called a GC/MS (gas chromatograph/mass spectrometer).

What are some of your preliminary findings? So far, of the ~300 species/varieties of *Salvia* that I have examined, only *Salvia divinorum* contains the active ingredient Salvinorin A.

That is very encouraging. Hopefully, your findings will prevent the wholesale banning of gardeners growing salvias in the future. Thank you for your article, *A Quick Overview of Salvias and Salvia divinorum*. We wish you luck and hope that you can keep us updated on your progress.

Please note, for more information or if you are interested in donating plant material, contact Jack Hurd at:

DPS - Alaska Scientific Crime Detection Laboratory
5500 East Tudor Road Anchorage, AK 99507
Phone: (907) 269-5670 Fax: (907) 338-6614
E-mail: jack.hurd@alaska.gov

A Quick Overview of Salvias and *Salvia divinorum* by Jack E. Hurd

History and Properties of Salvias

Roman naturalist Caius Plinius Secundus (Pliny the Elder), is purported to be the first to use the name *Salvia*. The name is a derivative of the Latin verb *salvere*, meaning to heal or save, and originally referred to the medicinal qualities of some of the species. Salvias are members of the mint family, *Lamiaceae* (or *Labiatae*), and comprise one of the largest of all plant genera. Among the few species that are more prolific are *Acacia* with about 1200 species, *Solanum* with about 1400, and *Euphorbia* with around 2000. The *Lamiaceae* family is in part characterized by flowers in which all the petals are fused into a 2-lipped corolla. The flowers exhibit bilateral symmetry, meaning that it is only possible to cut them into precisely identical halves by making the cut in one particular position. Although other plant families also have bilaterally symmetrical flowers, such as *Leguminosae*, *Lamiaceae* are distinguished from them by several other features, such as quadrangular (square) stems, opposing pairs of leaves at each stem joint, and the ovary being positioned above the corolla and calyx. The square cross section of the stem is a plant feature shared with only a few other families such as *Scrophulariaceae*, the foxglove family. While most plants in the *Lamiaceae* family have four stamens, *Salvia* happens to be one of the few genera in this family with only two stamens.

Salvia divinorum

Salvia divinorum (*S. divinorum*) is one of the perennial herbs in the *Lamiaceae* family. It may be closely related to *S. concolor* found in central Mexico. *S. divinorum* is used for ceremonial and medicinal purposes by the Mazatec Indians of Oaxaca, Mexico. In recent years, it has become widely available throughout the world, especially via e-commerce. Typically, the leaves or leaf extracts are smoked. The leaves can also be masticated with the active ingredient being absorbed via the oral mucosa. Alternatively, the extracted juices from crushed leaves are made into a tea and ingested. Absorption of the active ingredient via the gastrointestinal system appears to be inefficient and has little to no effect.

Its psychoactive effects have been compared to other hallucinogens such as psilocybin, ketamine, mescaline, and lysergic acid diethylamide (LSD). Like *Artemisia absinthium* (wormwood) and *Cannabis sativa*, *Salvia divinorum* contains terpenoid essential oils. *Salvinorin A* is the active ingredient responsible for the hallucinogenic effects of *Salvia divinorum*. Chemically, it is classified as a trans-neoclerodane diterpene. Neoclerodane diterpenes have been isolated from other *Salvia* species. However, *Salvinorin A* is the first diterpene to be identified as a hallucinogen in humans. *Salvinorin A* is not an alkaloid, does not contain nitrogen, and does not interact with the serotonin receptor. Rather, studies show that *salvinorin A* is a potent non-nitrogenous selective kappa opioid receptor agonist. There are three main types of opioid receptors; mu-receptors (μ), delta-receptors (δ), and kappa-receptors (κ). All three receptors have subtypes. When these subtypes are stimulated, they produce analgesic effects. The κ subtype also alters perception, cognition, and the neurobiology of mood. However, unlike mu-opioid agonists such as morphine and heroin, kappa-receptors do not produce respiratory depression or addiction.

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In the United States, *Salvia divinorum* (*S. divinorum*) is not regulated under the Controlled Substances Act. However, crime laboratories throughout the United States are anticipating that *S. divinorum* will be federally controlled within a few years. At the time of this study, there are approximately 30 states that have current or proposed laws controlling *S. divinorum* and/or its active component *salvinorin A*. Although the main components of many *Salvia* species are flavonoids and terpenoids, there is uncertainty as to whether other species of *Salvia* contain *salvinorin A*, a diterpenoid. This pilot study addresses the questions as to whether *salvinorin A* is unique to *S. divinorum*. In order to determine if *salvinorin A* is unique to *S. divinorum*, extracts from other species of *Salvia* are being collected, extracted, and analyzed.

Jack E. Hurd, Forensic Scientist
DPS - Alaska Scientific Crime Detection Laboratory
5500 East Tudor Road Anchorage, AK 99507
Phone: (907) 269-5670 Fax: (907) 338-6614
E-mail: jack.hurd@alaska.gov