

Project Number 43-DVG-2384

DISSEMINATION OF INTERNET DRUG INFORMATION BY INNOVATIVE
DRUG USERS

An Interqualifying Project

Submitted to the faculty

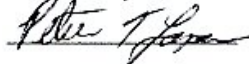
Of the

WORCESTER POLYTECHNIC INSTITUTE

In partial fulfillment of the requirements for the

Degree of Bachelors of Science

by



Peter T. Lapen

Date: April 27, 2006



Daniel Gibson III

Major Advisor

1. (Health Care and Technology)

Table of Contents

Abstract.....	2
Prologue.....	2
Methods.....	10
Results.....	12
Epilogue.....	20
Acknowledgments.....	24
Substances Cited.....	25
Works Cited.....	27

Edward W Boyer MD PhD*, Peter T Lapen‡, Patricia L Hibberd MD§

*Division of Medical Toxicology, University of Massachusetts Medical School,
‡Worcester Polytechnic Institute, Worcester, MA, and Clinical Research Institute,
§Tufts-New England Medical Center

Abstract

Objective. Internet-based drug information may be relayed through innovative drug users, a small population of individuals who use the web to learn about a new drug, experiment with that substance, and then disseminate their knowledge and experiences to others. We investigated the mechanisms adopted by innovative drug-using adolescents to disseminate Internet drug information and experiences to peers, the size and geographic distribution of the receiving group, and the age at which innovative drug users begin to disseminate drug information.

Prologue

In recent years, the information age brought upon us by the Internet has changed the way we live. The Internet has altered the way we as a society conduct business, the way we work and the way we play. However, the wealth of information on the Internet is not always accurate. While this is relatively inconsequential if it involves every day gossip or whatever leisurely pursuits may be found on the Internet, the nature of the information that can be found on-line is quite important if it involves health issues. The importance of such information regarding prescription drug interactions for example, is fairly easy to imagine.

As a corollary, what about illicit drug information? The answer is that it is no less important. The fact that such drug use behaviors are not condoned by law in most states does not mean such behaviors do not occur. In fact, the Internet has been suspected to play a role in such illicit recreational drug practices by innovative drug users, or “psychonauts”. There have indeed been studies conducted lately to acquire demographical information regarding who actually does change their drug use behavior dependent upon Internet based drug-related information. Such questions have been raised in recent years when drug usage information first met the “psychonauts” on the Information Super-highway.

Case records show an incident, where a twenty-one year old man was brought to the Emergency Room of Massachusetts General Hospital due to a sudden change in “mental status”. The young man had been consuming alcohol with friends, and they had noticed he began to act strangely when he became unable to hold his stool and urine, while remaining uncommunicative. After regaining consciousness, he became agitated to the point of presenting a threat to the medical staff, even with restraints upon him. Emergency Medical Service personnel reported that the fellow's friends claimed that he had consumed the cleaning fluid for laser-printer-toner cartridges in order to augment the affect of alcohol. Boston poison control confirmed that the said chemical is metabolized into gamma-hydroxybutyrate (also known as GHB, a substance used in nightclubs).

While some drug trends remain the same, like use of alcohol and marijuana, there are significant changes in recent years, such as the use of opioid pharmaceuticals and “club drugs” such as ketamine (special K), MDMA (ecstasy) and GHB (which is also known as a date-rape drug) thanks to the growth and introduction of the Internet in everyday life has prompted the start of many websites that encourage psychoactive drug use (Tancredi and Shannon 2003).

The last case was no isolated event. Records on the pubmed archive show that investigation into nine incidents of recreational ingestion of toxic

amounts of 1,4-butanediol, the GHB precursor usually found in cleaning solutions, for purposes including enhancement of body-building, treatment of depression, or insomnia in eight people according to one study (Zvosec et al. 2001).

So what is the link between such innovative drug behavior and the Internet? Then answer is www.Erowid.org. Erowid.org is a website that is operated by a couple living in California, named Fire and Earth Erowid. The website contains a wealth of information regarding the acquisition, manufacture, consumption, legal and health issues associated with both illegal and legal drug use. The site is also continuously updated by website's readers, sending their own firsthand experiences with drug use, as well as by the website staff. Erowid.org caught the attention of researchers like Dr. Edward Boyer after they found that Erowid.org was selling manufacturing kits for GHB on-line. Upon further investigation into the site, Boyer found that there was a wealth of information that was largely unknown up to that point on topics such as, GHB withdrawal, and would remain fairly uncommon knowledge, or at least, not "well-described", for another one and a half years (Sherman 2001). Upon looking further into the Erowid research, Edward Boyer concluded that:

"(We) found that the drug sites that promoted drug use invariably made recommendations that were potentially dangerous" and, "They provide 'plausible descriptions of the preparation, dose and administration and psychoactive effects of drugs. A site like Erowid has more than 4,000 pages of information on drugs, and it's not only believable, but it's credible in the eyes of young users. And the federal government is not keeping anybody off these sites, and they do not have an effective alternative to these sources of information'" (Sherman 2001).

Clearly, researchers such as Boyer started to see, “The issue here is that the Internet is more and more the communication vehicle of choice for adolescents and young adults”, and while the Federal Government was making billion-dollar, multi-media efforts to spread their anti-drug message to the public, it simply wasn't reaching out on the Internet (Sherman 2001).

However, the role the Internet plays in the communication of drug related information continued to display itself. According to Fire and Earth Erowid, A CBS evening news presentation during January, 2003:

“Featured an interview with a young man being treated at the University of Massachusetts hospital. They described that he had overdosed on an 'exotic combination of chemicals and plants', the recipe for which he had found on Erowid. The young man was quoted as saying that he thought 'hallucinogens were fun things to do on a Friday night'.

No specifics were given about what he had ingested, but through a number of other sources we learned that he had purchased Syrian rue seeds from which he made an extract. He ingested the extract orally (for its MAOI property) and then smoked 5-MeO-DMT.

Dr. Boyer believes that the young man experienced serotonin syndrome leading to severe overheating and subsequent rhabdomyolysis (toxic muscle damage). A case report documenting this incident is expected in 2003.* Since there is a history of traditional use of South American brews that contain both an MAOI (harmala) and 5-MeO-DMT, this incident helps raise important questions about potential health risks. We look forward to future research on this topic.

The young man said that he had read about the combination on “Erowid dot org”, to which the interviewer replied questioningly “Erowid dot org?” And then the commentator stated the URL again flatly: “Erowid dot org.” It seemed as if the editorial intent was to advertise the location of the site as clearly as possible” (Erowid 2003).

* The anticipated case study was published and is cited in this report: Tancredi et al, 2003

Boyer also commented on camera that he was “stunned” by the amount of information on Erowid.org and that he thought some of the information on the site

was not appropriate for children. He went on, however, to say how he himself found the site to be a useful resource (Erowid 2003). The Erowid website further quoted Boyer as saying, "Every physician I know, every law enforcement person I know who wants to find out the very latest in drugs goes to Erowid" (Erowid 2003).

Perhaps the CBS special had the opposite of the intended effect. For three days after CBS presentation, Erowid.org's website received over 40,000 visitors per day, which is about twice as much as the average daily traffic (Erowid 2003).

This prompted Dr. Boyer to do some more research on the the topic of the Internet's impact on drug use habits. He knew that it played some role, but the Boyer still questioned exactly who is being influenced by such information. In spring of 2004, I was recruited by Dr. Boyer and his colleagues to conduct volunteer clinical research at the University of Massachusetts Emergency Department in order to determine such demographical information. My task was to administer surveys in the Emergency Room to discern who uses the Internet to access web-based drug usage information, amongst those whom use the Internet and have history of using drugs.

This research sparked an interesting question. Dr. Boyer and I thought about what information we were gathering via the surveys. We formulated a logical question, "We are finding that certain demographics use the Internet to find Drug related information more than others. What do these people do with the drug information after they find it on the Internet? If they share it, how do

they share it and whom do they share it with?" The task of my IQP was to find the answers to such questions.

Dr. Boyer and I decided that the best way to acquire such information was via semi-structured, interviews. We then formulated a series of questions to serve as guidelines for the interview, regarding their socioeconomic status, age, and modalities by which they have communicated about drug related information found on-line. However, such questions presented ethical issues. Special steps needed to be taken in order to protect the individuals which were interviewed. The questions that were asked rendered answers that could be incriminating or at least, defaming.

Because the data collection in my IQP involved humans, I needed to acquire Investigational Review Board (IRB) approval. The IRB is a group of faculty members that ensure that all scientific ventures are conducted in an ethical manner, and that the risks presented by data collection, in any fashion, do not outweigh the benefit of research. Furthermore, the IRB makes certain that all risks involved with any studies are thoroughly minimized.

The IRB was concerned that our study, which necessitated voice recordings for the interviews, placed the interviewees at a certain level of risk because they would have effectively been confessing to committing criminal acts involving consumption or distribution or illicit substances, along with giving us the data we aimed to acquire in the interview.

After an initial IRB rejection, I re-sent my project proposal, with the assistance of Dr. Boyer and Assistant Professor Dan Gibson (WPI BB Dept.),

with certain revisions and special attention paid to a few points. We ensured that nobody would be placed at any risk by the voice recordings for a few reasons. First, if the voice recordings fell into possession of unauthorized persons, interviewee could be identified. Names were never recorded, and there is no way to associate a voice signature to any identification. All data recordings were kept under lock and key at all times. Voice recordings were to be transcribed to text shortly after recording for inter-rater agreement and data analysis. Upon transcription to text, all voice recordings were destroyed. Finally, the IRB was concerned about the overall confidentiality of the data collection. The concern was addressed by informing the IRB that I, the data collector would abide by HIPAA regulations. Since I was involved with direct patient interaction when I volunteered to help Dr. Boyer with his study, I needed to be trained to meet standards of HIPAA compliance. HIPAA (Health Insurance Portability and Accountability Act) is a regulation used in the health-care industry to ensure that all information regarding medical history, or any other personal information that could be considered sensitive by any means, is never tied to, or released to anyone for any purpose other than the delivery of health-care. Simply put, HIPAA establishes the highest standard of confidentiality. So, by adhering to the HIPAA standards that I have been trained to, while conducting my research for IQP purposes, any and all identifying information regarding the interactions between myself and the interviewees remained in the utmost confidentiality and no identifying information could ever be tied to the data I collected. Under HIPAA, penalties for breaking such promises could include \$25,000 in fines.

After presenting my solutions to such concerns, the IRB approved our proposal for IQP research.

While attaining IRB proposal did present its difficulties, the efforts to maintain confidentiality showed. This ended up helping the collection of data. The demographic that met the inclusion criteria of first uses the Internet, and second, has accessed on-line drug information, tends to be easily scared away when approached for such an interview. However, the presentation of a document explaining the measures taken to ensure confidentiality helped ease their concerns.

Conventional theories of drug use focus on the "gateway" phenomenon. This is the concept that a person starts using a drug that is present in his social environment, then, through exposure to other drugs on the fringe of his social community, he tries additional drugs. For example, a youth who grows up around social drinkers will first begin experimenting with alcohol. While using alcohol, he or she may be exposed to marijuana users amongst his or her drinking peers. Upon adapting marijuana habits, one may be further exposed to harder drugs such as cocaine, LSD (acid), opiates such as heroin, or MDMA (ecstasy) and start using one or more of them as well. However, as the Internet plays a greater role in our everyday lives, troves of information are available to anyone with Internet access. The Internet provides a wide array of information regarding substances of abuse and their use.

The Internet provides conditions that could potentially bypass the "gateway." When someone interested in drugs accesses the Internet,

information on nearly every drug is available instantly. Sources on drug use range from the highly educated to anyone who has used a particular drug and would like to share his experiences with the world. This in effect creates a world-wide drug-using community. This allows Internet users to make decisions on drug use that they believe are “informed”. Instead of particular social interactions, which depend upon geographical location, socioeconomic status, and so forth, an Internet user can learn about drugs and choose to use any drug based upon reading Internet information. This phenomenon strongly opposes the gateway theory, which relies heavily on peer to peer relations.

Newly developed theories of drug use emphasize highly experienced drug users who possess a significant grasp of psychoactive substance use. Known as “innovative” drug users, these individuals may function as vectors through which drug knowledge is disseminated to peers. The pivotal role that these adept drug users may play in the spread of emerging drug trends have made them an important prevention target. Although Internet-based information appears to affect drug use decisions made by innovative drug users, the subsequent responses of this population to on-line drug data remain poorly understood. The purpose of our study was to examine the mechanisms used by a group of innovative drug users to disseminate drug information to peers.

Methods (Note: this section was written largely by Dr. Boyer)

This study was conducted in a community-recruited sample of innovative drug users between March 2005 and April 2005. Inclusion criteria were: 1)

greater than 18 years of age; 2) had used the Internet to obtain information about psychoactive substances; 3) had used a new psychoactive substance based upon information obtained from the web; and 4) had disseminated Internet-based drug information to another person. The study protocol was approved by the Institutional Review Boards of participating institutions.

To obtain a sample of innovative drug users we employed a snowball sampling methodology. Snowball sampling methodology is particularly useful in identifying hidden populations, including those who might not respond to advertisements or other traditional study recruiting methods. We identified, through a community level recruiting effort, an individual highly familiar with the local drug using population who was willing to assist in the recruitment of potential respondents in this study (known as a “seed” in snowball sampling methodology). The seed approached a number of drug using individuals and asked if they were interested in participation in the study. This second tier of respondents agreed to recruit two additional potential respondents who were, in turn, assessed for inclusion criteria.

Using a 26 item, open-ended instrument, we performed a cross-sectional interview of young adults who self-reported the behavior of using a new psychoactive substance after reviewing drug information from the Internet. Domains of the instrument included gender/ethnicity, socioeconomic status, frequency of Internet use, types of information—both drug and nondrug—obtained on-line, drugs whose use had been changed after reviewing on-line information, mechanisms (e.g., word-of-mouth, cell phone, instant messaging,

text messaging) used by respondents to distribute Internet-based information, including that related psychoactive substances, age of first drug use, age at which respondent first distributed drug information that originated from the Internet, number of individuals who received drug information that originated from the Internet, age at which respondents ceased distributing Internet-based drug information, geographic distribution of individuals to whom respondents distributed Internet drug information. Interviews were audio-taped, placed in random order and transcribed in a single batch to preserve the anonymity of respondents.

The sample size for this study was empiric and intended to provide preliminary data on the mechanisms used by innovative drug users to disseminate Internet-based drug information to peers. We analyzed the study variables using kappa and descriptive statistics. We used an abstraction form to collect information about respondents' dissemination of drug information. The abstraction form comprised 27 items; by means of simple, dichotomous answers ("agree/disagree"), examiners assessed the study objectives. Masked versions were coded independently by two examiners trained in the use of the form, working according to an instruction manual, and blinded to the results until all data collection was complete. We determined, using the kappa statistic, the degree of inter-observer agreement between coders.

Results-(Tables written by Peter Lapen and Dr. Edward Boyer, M.D.)

We recruited 18 respondents whose demographic data (sex, race), is presented in Table 1, along with their preferred methods of disseminating drug information electronically. and age when they first did it.

Table 2. concentrates on the use of instant messaging by these 18 respondents.

Tables 3 and 4 are charts that present the relative amounts of use of each of the electronic modalities and how far the messages were transmitted (local, interstate, national, international)

Table 1. Respondent Demographic Profile and Methods of Disseminating Internet Drug Information to Peers

Respondent	Gender	Ethnicity	Age at which respondents first used electronic methods to disseminate Internet-based drug (nondrug) information to peers	Primary electronic method for disseminating drug information to peers	Secondary electronic method for disseminating drug information to peers
1	Male	Causian	15 (10)	Instant Messaging	Email
2	Male	Causian	16 (16)	Instant Messaging	None
3	Male	Causian	16 (16)	Instant Messaging	None
4	Male	Causian	17 (15)	Instant Messaging	None
5	Male	Causian	16 (16)	Instant Messaging	Email
6	Male	Causian	15 (14)	Instant Messaging	None
7	Male	Causian	15 (14)	Cellular telephone	Instant Messaging
8	Male	Causian	14 (14)	Instant Messaging	Cellular Telephone
9	Male	Causian	18 (17)	Cellular telephone	Instant Messaging
10	Male	Causian	18 (16)	Cellular telephone	Instant Messaging
11	Male	Causian	17 (17)	Cellular telephone	None
12	Male	Causian	17 (17)	Cellular telephone	Instant Messaging
13	Male	Causian	16 (15)	Instant Messaging	None
14	Male	Causian	18 (18)	Instant Messaging	None
15	Male	Causian	18 (18)	Landline telephone	Instant Messaging
16	Male	Causian	16 (16)	Instant Messaging	None
17	Female	Causian	14 (14)	Cellular telephone	Instant Messaging
18	Male	Causian	13 (12)	Cellular telephone	Instant Messaging

Table 2. Instant Messaging and the Dissemination of Internet-based Drug Information

Respondent	Use of a drug-specific buddy list?	Number of individuals to whom respondents instant-messaged Internet-based drug information	Attached links to Internet drug websites' content?	Widest geographical distribution of Internet-based drug information
1	Yes	150	Yes, from erowid.org	Regional
2	No	1	No	National
3	Yes	10	Yes, from erowid.org	Regional
4	Yes	10	No	Local
5	Yes	200	Yes, from erowid.org	International
6	Yes	4	Yes	National
7	Yes	10	Yes, from erowid.org	International
8	Yes	20	Yes	International
9	Yes	30	No	National
10	Yes	5	Yes, from erowid.org	Local
11	No	NA	NA	NA
12	Yes	150	No	National
13	Yes	20	No	Regional
14	Yes	40	Yes	Regional
15	Yes	60	Yes	National
16	No	3	No	Regional
17	Yes	20	No	National
18	Yes	15	No	National

"Local" distribution = dissemination of information to individuals 20 mile distant or less; "Regional" distribution = dissemination to persons less than 250 miles away; "National" distribution involves dissemination of information to persons more than 25 miles distant but within the United States; and "International" distribution involves dissemination of Internet-based drug information to persons in another country.

Table 3.

Primary Electronic Modalities

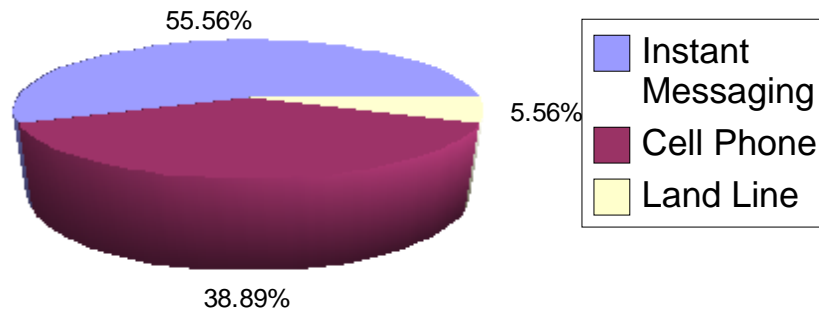
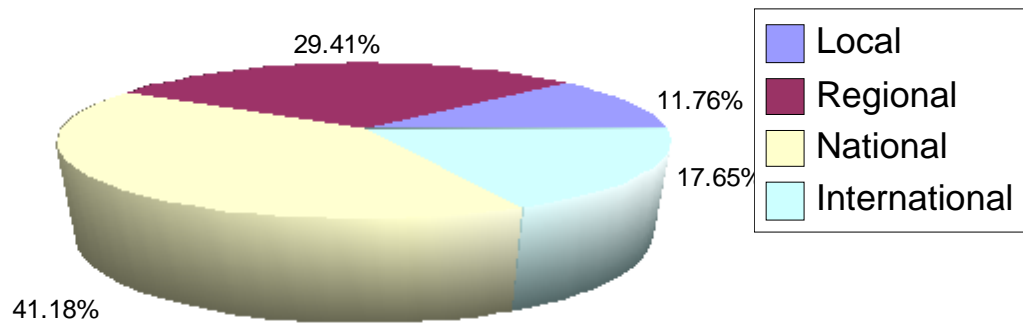


Table 4.

Maximum Range of Distribution



Our data demonstrated that of all the potential mechanisms by which drug information could be disseminated from the Internet, only three were frequently mentioned. These mechanisms were: word of mouth in person or via electronic proxy such as telephones; email; and instant messaging. We were quite surprised to see the ratios of relative usage.

Email was not used nearly as much as expected. Although email is widely used today, and the transfer of files from one computer to another is quite easy, only four respondents transferred “drug” information from the Internet to other people via email. Even then, the responses were far from strong in conviction. Respondent 1 and Respondent 10 replied when asked if they used email to share drug information found on-line, they replied “not usually”, meaning, they have, but seldom. When asked the same question, Respondent 12 replied, “(I) probably have...maybe under five times”. And Respondent 5 said he did send drug information found on-line by email, but it was only “legalization information”.

To our surprise, telephones were not the primary, electronic modality for drug information transfer. Only eight out of eighteen respondents replied that telephones were their preferred electronic modality of drug information communication. While the reason for this unexpected distribution is not known, we suspect that it is due to paranoid tendencies. These “innovative” drug users can sometimes be easily “spooked”. One individual who was approached for an interview and met inclusion criteria said “[I] don’t feel like contributing to this data”. Then, later explained that the “government” does not need to know his

communication methods. The final respondent, Respondent 18, also made a comment about the “U.S. Patriot Act” and how it made him a little more cautious in the manner in which he communicated amongst his peers about drugs. He continued later, “The government could be listening to you”. Respondent 9 commented, “You try to keep that stuff (drug related conversations) off cell phones”.

The most widely used electronic modality was, by far, America Online Instant Messaging (AIM). AIM is a computer program that allows the user to create an electronic account and a “screen name”. The user then logs onto their AIM account, and can converse with other AIM account holders, identifiable by their unique “screen name”, via real-time text, instantaneously sent via the Internet. Ten out of eighteen respondents confirmed that their preferred electronic modality was indeed, AIM. Of the remaining eight respondents, seven used instant messaging as their secondary modality of drug information dissemination. This is particularly noteworthy. The fact that AIM has become such a mainstream means of communication, at least in this surveyed community, is quite amazing. AIM has not been in use for long, compared to email and phones. However AIM enables the use of “hyperlinks” (entering text to serve as a links to desired websites, thereby referring a peer to a specific URL), file sharing, and direct connections. Five respondents confirmed attaching information to AIM conversations via any one or more of the methods cited above. Two of the respondents specifically noted that they posted hyperlinks to Erowid.org. Respondent 5 commented further, “hyperlinks are worth a thousand

words...and (sometimes I post links) to pics of my 'head stash'". The maximum geographical distance of drug info dissemination varied from a "less than a mile" on a college campus to as far as the opposite side of the world, "Australia and Malaysia" as noted by Respondent 10. Also, instant messaging was used to some extent, if not primarily, by those respondents that distributed drug information the furthest (refer to Table 2).

Epilogue

Word of mouth communication is still a frequently used modality, because, it is the oldest and most natural means of human communication. However, it is surprising to see such a new method of communication, such as AIM, rank second only to verbal (face to face, non-electronic) interaction (see Table 1).

According to Forrester Research, instant messaging is only going to get bigger. As of 2001, 28 percent of all on-line users utilize instant messaging (Kolko and Bermont 2001). Although instant messaging may already be popular with the 16-34 age group, Google's entrance into the IM market will drive double digit growth of instant messaging internationally (Cremers et al. 2004).

The effectiveness of AIM is also growing. With every upgrade, which come out quite frequently, users have a greater ability to communicate via text, pictures, "hyperlinks", direct connection, audio/visual links, and file sharing.

AIM presents certain new facets to real-time communication. Hyperlinks to sites yield very limited, if any, data corruption from person to person since the very website's URL address is cited in a window, which the recipient can simply

click on, and open a web page with the PC's default web browser. This allows any individual with AIM and a web browser to see a web site containing drug content referred by his peers with his own eyes, thereby allowing him to make his own conclusions and forward the site address to other peers that use instant messaging. AIM is also very fast; as fast as a user can type a phrase and tap the enter key. AIM conversations can also span great distances. Of the eight respondents that commented they have transmitted drug information acquired on-line a distance greater than or equal to that between Massachusetts and Ohio, AIM is the primary electronic modality for half of them. In addition to that, Respondent 5 commented that he conveyed drug information from Massachusetts to Spain by methods including, but not limited to, AIM. Two such respondents used primarily cell phones, and one used no electronic methods to convey drug information (see Table 1). The predominance of AIM usage in the practice of communicating about web-based drug information shows that geographical boundaries and limitations are far less impeding than they once were. In this case, when most communication is via AIM, the limiting factor of how fast drug content can be transferred is the degrees of separation between individuals in different communities, because up to this point, information regarding "innovative" drug usage was believed to be conducted by face-to-face interaction, by word-of-mouth. Furthermore, AIM may also be used more willingly for long-distance communication, because it is free of charge, thus, there are no financial issues in the case of national or international communication.

Another interesting association that our data shows is between AIM and tryptamines and salvia. Seven respondents commented they researched and used salvia. Of those seven people, five used AIM as their primary electronic modality of Internet drug information transfer. Four respondents researched and used tryptamines, and of those respondents, half used AIM as their primary electronic modality and the other two used cell phones (refer to figures 1 and 2). While initial observation would be that such statistics are not very striking, consideration must be given to the different nature of the drugs; salvia and tryptamines are a far less common topic of discussion in the social groups that were observed, compared to drugs such as psychedelic mushrooms, alcohol and marijuana which were indeed widely discussed via all modalities.

Perhaps the most alarming of our findings involve the age distributions. Of the eleven respondents that said their primary electronic modality is AIM, their ages ranged from fourteen to eighteen years. Seven of them were under the age of eighteen when they first sought out drug information from the Internet. Three respondents were fourteen, one was sixteen, and three were seventeen years of age. The other four were eighteen years of age. This shows that age of individuals that distribute information sought on-line via AIM is very low (see Tables 1 and 2) Because the AIM interface is easy to use but not employed by older subscribers as often, it appears that the growing computer literacy of young adolescents is a factor in their facility with AIM. The sharing function of AIM is also more likely to appeal to younger users than to older, more cautious, users of the Internet.

In terms of further research, there are some points that should be addressed. One, a study should be conducted to determine by urinalysis if subjects whom claim to use illicit substances, particularly tryptamines and salvia, are sincere and actually have used said substances. Two, another study should be conducted to create a prototype bot that can scour the Internet for “innovative” drug use. Such a program would use syntax recognition to find weblog/web bulletins on the Internet that manifest new, innovative drug usage behaviors posted after a given date. Third, another bot program could be created to make warnings about certain psychoactive substances available via AIM conversations, similar to AIM “smarterchild”. “Smarterchild” is an automatic computer program, a “bot”, that operates through AIM, and uses human syntax recognition algorithms to recognize certain keywords and therefore, allows AIM users to “converse”, or “chat” with a computer. AIM users could enter a name of a substance, or a variation thereof into the instant message window, and receive a response from the bot in the form of dosage warnings, et cetera. The feasibility of these projects are currently under investigation.

Since the conclusion of research, a paper based on this IQP was written and submitted for publication in *Pediatrics*.

Acknowledgments

I would like to extend my deepest, most sincere gratitude to Dr. Edward Boyer. Without his guidance, encouragement, and patience, I would never have had this opportunity for excellence. I cannot forget Dr. Dan Gibson III, either. His advice was quite an asset to my project. Finally, I would like to also thank Dr. Patricia Hibberd for her input. Again, thank you.

Substances Cited (All following information accessed from the Erowid.org website: www.erowid.org)

MAOI: Monamine oxidase inhibitors are used to inhibit the metabolism of dopamine and serotonin.

Salvia divinorum: *Salvia divinorum* is a perennial herb native to Mexico. when consumed, it is known to act as an atypical psychedelic.



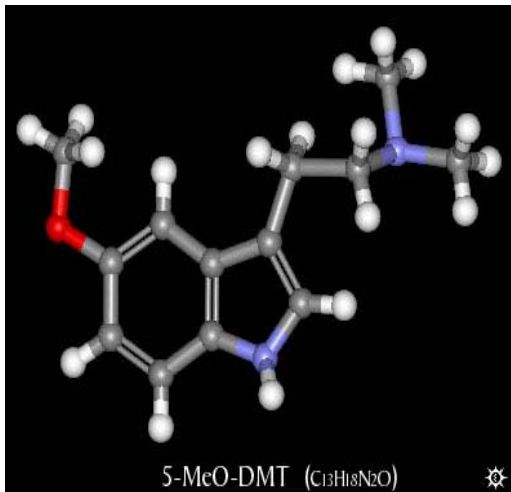
Syrian Rue: Seeds from the Syrian rue plant, native to Persia, are consumed for a MAOI effect. The seeds also contain certain alkaloids and harmine.



Peganum harmala (Syrian Rue)
from "Psychedelic Shamanism"
by Jim DeKorne



Tryptamines: Synthetic psychedelic chemicals of a similar conformation, such as 5-MeO-DMT or 5-MeO-DIPT.



Works Cited

- Cremers, Iris, Omwando, H.K., Favier, J., Jackson, P. (2004). Google will take IM to a higher plane. Retrieved February 19th, 2006, from <http://www.forrester.com/Research/Document/Excerpt/0,7211,35473,00.html>.
- Erowid, Fire and Earth (2003). Erowid articles eye on the media: CBS news "eye on America" reports on Erowid. Retrieved February 19th 2006, from http://www.erowid.org/general/mentions/mentions_cbsnews1.shtml
- Erowid, Fire and Earth (2006). <http://www.erowid.org>. Accessed on February 20th, 2006.
- Kolko, Jed and Bermont, Becky (2001). Intense Imers seek entertainment above all. *Business View Brief*, December 27, 2001. Retrieved February 19th, 2006, from <http://www.forrester.com/ER/Research/Brief/Excerpt/0,1317,14127,00.html>
- Sherman, Neil (2001). Sherman Study: "Partisan" sites winning web war on drugs. Retrieved February 19th, 2006, from http://www.erowid.org/general/mentions/2001_health-scout_web.shtml
- Tancredi, David N., M.D. and Shannon, Michael W., M.D. (2003). A 21-year-old man with sudden alteration of mental status. Case records of the Massachusetts General Hospital, Volume 349:1267-1275. Retrieved February 19th, 2006, from http://content.nejm.org.ezp2.harvard.edu/cgi/content/full/349/13/1267?andorexacttitleabs=and&search_tab=authors&tmonth=Feb&searchtitle=Authors&sortspec=Score+desc+PUBDATE_SORTDATE+desc&excludeflag=TWEEK_element&hits=20&year=2006&author1=Tancredi%2C+D&andorexactfulltext=and&fyear=1996&fmonth=Feb&sendit=GO&searchid=1&FIRSTINDEX=0&resourcetype=HWCIT
- Zvosec, Deborah L. PhD., Smith, S. W., M.D., McCutcheon, R.J., B.S., Spillane, J., Pharm.D., Hall, B.J., PhD., Peacock, E.A., M.D. (2001). Adverse events, including death associated with the use of 1,4-butanediol. *New England Journal of Medicine*, 344:87-94. Retrieved February 19th, 2006, from http://content.nejm.org.ezp2.harvard.edu/cgi/content/abstract/344/2/87?andorexacttitleabs=and&search_tab=authors&tmonth=Feb&searchtitle=Authors&sortspec=Score+desc+PUBDATE_SORTDATE+desc&excludeflag=TWEEK_element&hits=20&year=2006&author1=Zvosec%2C+D&andorexactfulltext=and&fyear=1996&fmonth=Feb&sendit=GO&searchid=1&FIRSTINDEX=0&resourcetype=HWCIT