Description of document:	Drug Enforcement Administration (DEA) Report on Usage of Khat In the United States, 2002-2003
Requested date:	12-March-2014
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Source of document:	Freedom of Information & Privacy Act Unit (SARF) Drug Enforcement Administration 8701 Morrissette Drive Springfield, VA 22152 Fax: (202) 307-8556 Email: DEA.FOIA@usdoj.gov

U.S. Department of Justice
Drug Enforcement Administration
FOI/Records Management Section
8701 Morrissette Drive
Springfield, Virginia 22152

DEA Case Number: 14-00118-F

FEB 29 2016

DEA Appeal Number: 14-00071-AP

OIP Appeal Number AP-2014-01946

Subject: INFORMATION REGARDING THE MOST RECENT DEA REPORT ON USAGE OF KHAT IN THE UNITED STATES

This letter responds to your Administrative Appeal that has been remanded by the U.S. Department of Justice, Office of Information and Policy (OIP) for further processing of your Freedom of Information/Privacy Act (FOI/PA) request dated March 12, 2014, addressed to the Drug Enforcement Administration (DEA), Freedom of Information/Privacy Act Unit (SARF), seeking access to information regarding the above subject.

The processing of your request identified additional information that will be released to you. Portions not released are being withheld pursuant to the Freedom of Information Act, 5 U.S.C. § 552, and/or the Privacy Act, 5 U.S.C. § 552a. Please refer to the list enclosed with this letter that identifies the authority for withholding the deleted material, which is indicated by a mark appearing in the block next to the exemption. An additional enclosure with this letter explains these exemptions in more detail. The documents are being forwarded to you with this letter.

For your information, Congress excluded three discrete categories of law enforcement and national security records from the requirements of the FOIA. *See* 5 U.S.C. § 552(c). This response is limited to those records that are subject to the requirements of the FOIA. This is a standard notification that is given to all our requesters and should not be taken as an indication that excluded records do, or do not, exist.

If you are not satisfied with my response to this request, you may administratively appeal by writing to the Director, Office of Information Policy (OIP), United States Department of Justice, Suite 11050, 1425 New York Avenue, NW, Washington, DC 20530-0001, or you may submit an appeal through OIP's FOIAonline portal by creating an account on the following web site: https://foiaonline.regulations.gov/foia/action/public/home. Your appeal must be postmarked or electronically transmitted within 60 days of the date of my response to your request. If you submit your appeal by mail, both the letter and the envelope should be clearly marked "Freedom of Information Act Appeal."

If you have any questions regarding this letter, you may contact Government Information Specialist J. Kewley on 202-307-7728.

Sincerely,

Katherine Myrick

Katherine L. Myrick, Chief
Freedom of Information/Privacy Act Unit
FOI/Records Management Section

Number of pages withheld: 0

Number of pages released: 73

APPLICABLE SECTIONS OF THE FREEDOM OF INFORMATION AND/OR PRIVACY ACT:

Freedom of Information Act 5 U.S.C. 552			**Privacy Act 5 U.S.C. 552a**	
[ ] (b)(1)	[ ] (b)(5)	[ ] (b)(7)(C)	[ ] (d)(5)	[ ] (k)(2)
[ ] (b)(2)	[X] (b)(6)	[ ] (b)(7)(D)	[X] (j)(2)	[ ] (k)(5)
[ ] (b)(3)	[ ] (b)(7)(A)	[ ] (b)(7)(E)	[ ] (k)(1)	[ ] (k)(6)
[ ] (b)(4)	[ ] (b)(7)(B)	[ ] (b)(7)(F)		

Enclosures

EXPLANATION OF EXEMPTIONS
SUBSECTIONS OF TITLE 5, UNITED STATES CODE, SECTION 552

(b)(1) (A) specifically authorized under criteria established by an Executive order to be kept secret in the interest of national defense or foreign policy and (B) are in fact properly classified pursuant to such Executive order;
(b)(2) related solely to the internal personnel rules and practices of an agency;
(b)(3) specifically exempted from disclosure by statute (other than section 552b of this title), if that statute-
(A)(i) requires that the matters be withheld from the public in such a manner as to leave no discretion on the issue; or (ii) establishes particular criteria for withholding or refers to particular types of matters to be withheld; and (B) if enacted after the date of enactment of the OPEN FOIA Act of 2009, specifically cites to this paragraph.
(b)(4) trade secrets and commercial or financial information obtained from a person and privileged or confidential;
(b)(5) inter-agency or intra-agency memorandums or letters which would not be available by law to a party other than an agency in litigation with the agency;
(b)(6) personnel and medical files and similar files the disclosure of which would constitute a clearly unwarranted invasion of personal privacy;
(b)(7) records or information compiled for law enforcement purposes, but only to the extent that the production of such law enforcement records or information (A) could reasonably be expected to interfere with enforcement proceedings, (B) would deprive a person of a right to a fair trial or an impartial adjudication, (C) could reasonably be expected to constitute an unwarranted invasion of personal privacy, (D) could reasonably be expected to disclose the identity of a confidential source, including a State, local, or foreign agency or authority or any private institution which furnished information on a confidential basis, and, in the case of a record or information compiled by criminal law enforcement authority in the course of a criminal investigation or by an agency conducting a lawful national security intelligence investigation, information furnished by a confidential source, (E) would disclose techniques and procedures for law enforcement investigations or prosecutions, or would disclose guidelines for law enforcement investigations or prosecutions if such disclosure could reasonably be expected to risk circumvention of the law, or (F) could reasonably be expected to endanger the life or physical safety of any individual;
(b)(8) contained in or related to examination, operating, or condition reports prepared by, on behalf of, or for the use of an agency responsible for the regulation or supervision of financial institutions; or
(b)(9) geological and geophysical information and data, including maps, concerning wells.

SUBSECTIONS OF TITLE 5, UNITED STATES CODE, SECTION 552a

(d)(5) information compiled in reasonable anticipation of a civil action proceeding;
(j)(2) material reporting investigative efforts pertaining to the enforcement of criminal law including efforts to prevent, control, or reduce crime or apprehend criminals;
(k)(1) information which is currently and properly classified pursuant to an Executive order in the interest of the national defense or foreign policy, for example, information involving intelligence sources or methods;
(k)(2) investigatory material compiled for law enforcement purposes, other than criminal, which did not result in loss of a right, benefit or privilege under Federal programs, or which would identify a source who furnished information pursuant to a promise that his/her identity would be held in confidence;
(k)(3) material maintained in connection with providing protective services to the President of the United States or any other individual pursuant to the authority of Title 18, United States Code, Section 3056;
(k)(4) required by statute to be maintained and used solely as statistical records;
(k)(5) investigatory material compiled solely for the purpose of determining suitability, eligibility, or qualifications for Federal civilian employment or for access to classified information, the disclosure of which would reveal the identity of the person who furnished information pursuant to a promise that his/her identity would be held in confidence;
(k)(6) testing or examination material used to determine individual qualifications for appointment or promotion in Federal Government service the release of which would compromise the testing or examination process;
(k)(7) material used to determine potential for promotion in the armed services, the disclosure of which would reveal the identity of the person who furnished the material pursuant to a promise that his/her identity would be held in confidence.

COPY

VF Khat
1989

UNITED STATES DEPARTMENT OF AGRICULTURE
Agricultural Research Administration
Bureau of Plant Industry, Soils,
and Agricultural Engineering

Division of Tobacco
Medicinal, and Special Crops

Beltsville, Maryland

June 26, 1952

Mr. G. W. Cunningham
Deputy Commissioner of Narcotics
Bureau of Narcotics
Treasury Department
Washington 25, D. C.

Dear Mr. Cunningham:

I have your letter of June 5th concerning information on the drug plant, Catha edulis. This plant is not well-known in the United States although it has been introduced. Records in the Division of Plant Exploration and Introduction of this Bureau show that Catha edulis has been introduced four times, the first introduction being in 1910. Also, it is noted that the Royal Palm Nurseries, Oneco, Florida, offer the shrub for sale as indicated by the 1950 edition of Plant Buyers' Guide. Evidently there are some plants of Catha edulis scattered in southern United States; however, Dr. Blake, Botanist of this Bureau, expressed the opinion that distribution was probably limited to the south and only rare plants could be found.

A botanical description is given of Catha edulis in Bailey's Cyclopedia of Horticulture, and a copy of this description is attached for your reference.

The United States Dispensatory for 1950 gives considerable information and some citations to investigations with the plant. We have attached a copy of this report for your information.

Economic Botany by Hill, McGraw-Hill Book Company, has a short paragraph on "khat" which we have copied and enclosed for your reference.

J. M. Nichols, Botanical Ready Reference, published by the Murray and Nickell Manufacturing Company, Chicago, for the S. B. Penick & Company, 132 Nassau Street, New York, lists under item number 543 "Catha Edulis. Cafta Leaves. Khat Kat. Abyssinian Tea. Arabian Tea. Kat. Leaves. exc. sti. As Coca Leaves." We do not know whether or not the S. B. Penick Company offer the leaves for sale as a crude botanical as there are probably many things listed in this reference that are not carried in stock by the company.

If there are any further developments regarding the misuse of this plant, we would like to be informed. Anything we can do in the way of information or assistance will be made available to you upon request.

Very truly yours,

D. M. Crooks
Head Horticulturist in Charge

Enclosure

Catha Edulis

The Standard Cyclopedia of Horticulture. L. H. Bailey, Vol. I--A-E. The Macmillan Company, 1943.

"CATHA (Arabian name). Celastraceae. One evergreen spineless shrub of Arabia and Afr., and cult. in warm countries for the lvs., which are said to possess sustaining and recuperative properties and which are eaten by the Arabs or used in the preparation of a beverage. C. edulis, Forsk. (Celastrus edulis, Vahl). Khat. Cafta. Glabrous, to 10 ft.: lvs. opposite, or on the leafy shoots alternate, thick, narrowly elliptic or oval-oblanceolate, serrate, narrowed to the short petiole, 4 in. or less long: fls. small, white, in short axillary clusters; calyx 5-lobed; petals 5; stamens 5, borne on a disk: fr. an oblong or clavate caps., 3-valved, 1-3-seeded, 1/3 in. long.--Recently offered in this country. The twigs and lvs. are an object of commerce in Arabia."

The Dispensatory of the United States of America, Volumes 1 and 2. J. B. Lippincott Company, 1950.

"Catha. Catha edulis.--Under various Arabic names, such as Kat, Khat, Chaat, Kus es Salahin, Tchaad, Tschut, Tohat, Tohai, Gat, the leaves of Catha edulis Forsk. (Fam. Celastraceae) (Abyssinian or African tea) are very largely used as a stimulant in northern Africa, the plant being extensively cultivated.

"The plant is a shrub, reaching the height of nine to twelve feet, with thin coriaceous leaves whose margins are bluntly serrate. The leaves are chewed both in the green and fresh condition, and are in some places made into a tea. The taste is sweetish and astringent, somewhat suggesting licorice. They are asserted to act as stimulants, overcoming the sense of fatigue in the same way as cocaine, or caffeine. Fluckiger and Gerrock found in it an alkaloid, katine, $C_{10}H_{18}ON_2$, which has been studied by Chevalier (Bull. gen. therap., 1912, 18), who found that it is a stimulant to the central nervous system. Stockman (Pharm. J., 1912, 88) found three alkaloids, cathine, cathinine, and cathidine, and also a fourth alkaloid in too small quantities for study. He found (J. Pharmacol., 1913, 4) that these alkaloids were stimulating to both the brain and spinal cord, and in large doses produced paralysis through a direct action upon the muscle. Wolfes (Arch. Pharm., 1930, 268, 81) has shown cathine to be identical with d-nor- -ephedrine."

Economic Botany. Albert F. Hill, 1st ed. McGraw-Hill Book Co.,Inc.,1937.

"Khat: The dark-green leaves of Catha edulis are used in Arabia to yield khat, the principal beverage of the natives. This shrub, which resembles tea, was grown in terraced gardens in Arabia long before coffee was introduced, and may even antedate tea. It grows wild in Abyssinia, and is cultivated in other parts of Northeastern Africa. The leaves and buds contain an alkaloid similar to caffeine, and are used dried or are chewed in the fresh condition for the stimulating effect. Khat is an excellent beverage plant and is worthy of exploitation."

VF Khat - 2000-2005

Focus on Illegal Drugs

Khat
A Potential Concern for Law Enforcement

By M. Justin Crenshaw, M.S., and Tod Burke, Ph.D.

© Drug Enforcement Administration

The word *khat* (pronounced *cot*) may not evoke much response from most of American society, but it could herald a significant problem for law enforcement in the near future.[1] Khat is a plant that originates in eastern Africa and the southern Middle East; people of these regions know it well and, reportedly, for centuries have chewed its leaves for their narcotic properties. Users in these areas may spend up to half of their income on the drug.[2] Khat is known by other names throughout the world; people in eastern Africa most commonly call it miraa, but it also is referred to as chat, jat, oat, kat, African salad, and Abyssinian tea. Many countries consider it a legitimate (and profitable) export.

The United States considers khat dangerous and classifies it as a controlled substance. Undoubtedly, a passion for this drug in America's fast-paced society would present a crisis. Armed with an understanding of this natural narcotic, including its origins, chemical and medical concerns, and cultural status, law enforcement will be better equipped to combat it if it expands into the larger U.S. population.

Composition and Cultivation

The main psychoactive ingredients in khat are cathinone (chemically similar to amphetamine) and cathine. In addition, khat plants contain chemicals called alkaloids, which long have served as narcotics and hallucinogens.

DEA classifies cathinone as a Schedule I narcotic.[3] The amounts of cathinone that exist in khat and, thus, the drug's mind-altering effects may vary based on the area where it was harvested. For instance, the amount of cathinone in khat plants from Kenya may reach 14 percent, while levels in plants from Yemen may be as low as 3.3 percent.[4] Once khat leaves dry and the cathinone evaporates, only cathine remains, and the plant drops to a Schedule IV narcotic.[5]

Current interest in cathinone exists because recent discoveries confirm that illegal laboratories produce a chemical called methcathinone, a synthetic form of cathinone. Ephedrine, a compound found in over-the-counter cold medicines, and pseudoephedrine represent the main precursor chemicals. Methcathinone, which sells as a methamphetamine alternative, commonly is called cat and often mistaken for khat.[6]

The khat tree grows 3,000 to 6,000 feet above sea level and can reach a height of 20 feet. The leaves of the plant are reddish-brown while on the tree, but quickly become a leathery yellow-green once picked. Although people may use all of the stems and leaves, they appear to prefer the young shoots at the top of the plant because they find them softer and easier to chew than the older ones toward the bottom. While most leaves are harvested for chewing, some are deliberately dried and crushed into a powder form for additional

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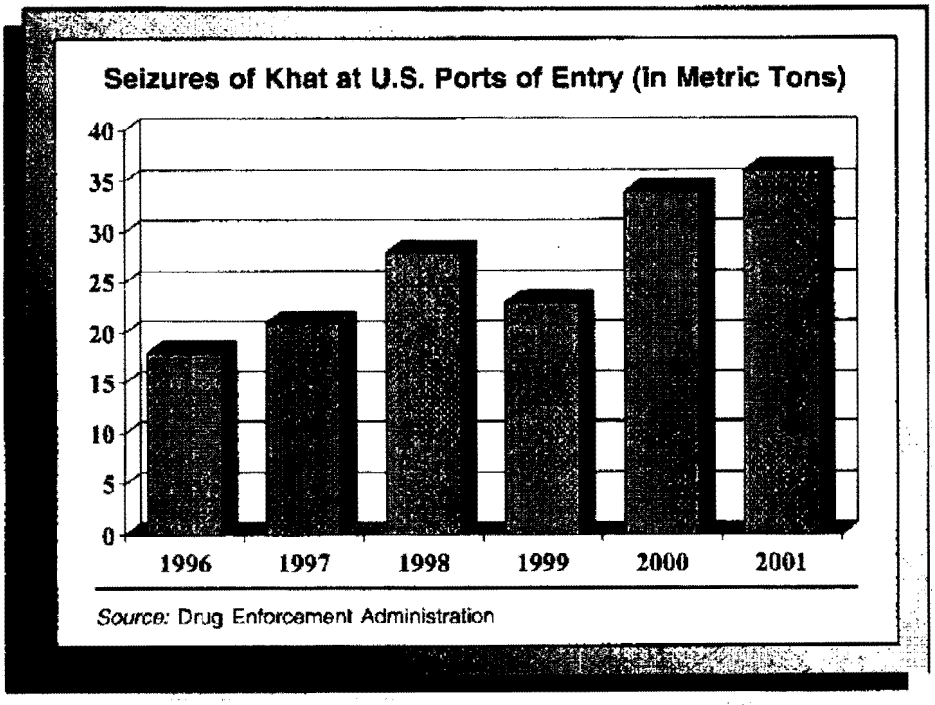
start chewing large amounts of khat; therefore, they build up a tolerance for the drug slowly. Some users even have supplemented alcohol or other depressants to counteract the effect that khat has on sleep. Due to the small quantity often consumed, overdose is unlikely.

While khat does have a strong psychological addiction for most users, the withdrawal symptoms are relatively minor when compared with other illegal drugs, such as heroin and cocaine. Withdrawal signs may include laziness, depression, nightmares, and slight tremors.[15] The duration of these symptoms may differ by user. Furthermore, the severity of the depression can vary and may lead to agitation or sleeping difficulties.

The rise of khat use in the United States seems to coincide with the increase in the number of immigrants arriving from eastern Africa and the Arabian Peninsula.[16] In 2000, the U.S Customs Service seized 70,008 pounds of khat, an increase of 21,070 pounds from the previous year. In Columbus, Ohio, which has the second largest Somali population in the United States, police seized 860 pounds in 2002, an increase over the previous 2 years' seizures of 633 pounds and 8.5 pounds, respectively.[17] New York City, Detroit, Minneapolis, Seattle, and San Diego may see an increase in khat arrests due to growing eastern African communities.[18]

Many immigrants are unaware that khat is illegal in the United States. As a result, they often use the drug in public and later face arrest. Some cities even have seen khat advertised and sold openly in grocery stores and restaurants. Many sellers, in an attempt to keep sales of the drug quiet, only deal with users of eastern African descent and turn away everyone else.

On the street, khat currently sells for $28 to $50 a bundle (100 to 200g) and $300 to $440 a kilogram;[19] these prices currently compare with those of some other drugs, such as ecstasy and oxycodone, but are considerably lower than prices of other narcotics, such as marijuana, cocaine, and heroin. Khat's low cost makes it appealing to many drug users, especially youths.



Most of the khat enters the United States from eastern Africa via overnight shipping, although there have been some instances of cultivation in the United States. A majority of khat arrives through

[5] A Schedule IV narcotic presents a lower potential for abuse and dependence than some other controlled substances. Examples include benzodiazepines, darvon, and phenobarbital. For additional information, see *http://www.usdoj.gov/dea/agency/csa.htm*.

[6] U.S. Department of Justice, Drug Enforcement Administration, "Khat," *Drug Intelligence Brief*, June 2002; retrieved on January 23, 2004, from *http://www.usdoj.gov/dea/pubs/intel/02032/02032.html*.

[7] Supra note 4.

[8] Jonathan Stevenson, "Krazy Khat: Somalia's Deadly Drug War," *The New Republic* 207 (November 23, 1992): 17-19.

[9] Supra note 4.

[10] Supra notes 2 and 8.

[11] Richard B. Seymour, "Khat Has U.S. Presence," *Psychopharmacology Update* 10 (June 1999): 5.

[12] Ibid.; and Mohamed Al-Kamel, "Khat Plant"; retrieved on January 24, 2004, from *http://www.geocities.com/forceps1974/khat.html*.

[13] Supra note 12 (Al-Kamel).

[14] Supra note 12 (Al-Kamel).

[15] Supra note 4.

[16] "Khat Use Increases in Some U.S. Cities," *Alcoholism and Drug Abuse Weekly* 14 (September 16, 2002): 7-9.

[17] Ibid.

[18] Frank Bures, "From Civil War to the Drug War: Immigrants Are Risking Prison for a Taste of Home," *Mother Jones* 26 (November/December 2001): 23-24.

[19] Supra notes 6 and 12 (Al-Kamel).

[20] T.Trent Gegax, "Meet the Khat Heads," *Newsweek*, September 30, 2002, 35.

Lt. Crenshaw serves in the U.S. Air Force.
Dr. Burke, a former police officer, is a professor of criminal justice at Radford University in Radford, Virginia.

The Bulletin Honors

Christos G. Rouses Memorial

The Lowell, Massachusetts, Police Department presents the Christos G. Rouses Memorial. This monument, dedicated in 1980, is named for Officer Rouses, who was shot to death by an armed robber while responding to a silent alarm at a local pharmacy. The memorial, located in the plaza directly in front of Lowell Police Department Headquarters, depicts an officer with his hand on the shoulder of a young child and features the names of Officer Rouses and other fallen Lowell officers. The memorial sits, surrounded by landscaping, in the center of an unused fountain. ✦

Nominations for *The Bulletin Honors* should include at least one color 5x7 or 8x10 photograph (slides also are accepted) of a law enforcement memorial along with a short description (maximum of 200 words). Contributors should send submissions to the Editor, *FBI Law Enforcement Bulletin*, FBI Academy, Madison Building, Room 201, Quantico, VA 22135.

VF Khat -2000 - 2005

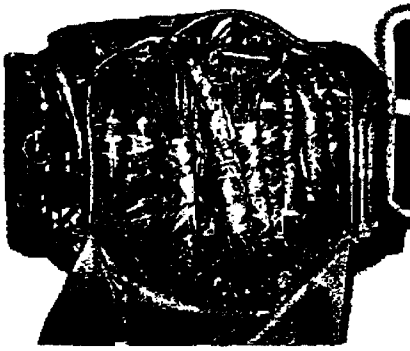
Product No. 2003-L0424-002

INTELLIGENCE BULLETIN

MAY 2003

U.S. DEPARTMENT OF JUSTICE

KHAT (Catha edulis)



NDIC

The availability of khat, a plant containing stimulants regulated under the Controlled Substances Act, is increasing in the United States. The amount of khat seized by federal law enforcement officers increased dramatically from 14 metric tons in 1995 to 37 metric tons in 2001. Moreover, in the first 6 months of 2002 federal officers seized nearly 30 metric tons of the drug. Individuals of Somali, Ethiopian, and Yemeni descent are the principal transporters and distributors of khat.

Background

Khat (Catha edulis)—also known as African salad, bushman's tea, gat, kat, miraa, qat, chat, tohai, and tschat—is a flowering shrub native to northeast Africa and the Arabian Peninsula. The plant usually grows from 2 to 12 feet high; however, it can reach 20 feet. Khat plants typically are grown among crops such as coffee, legumes, peaches, or papayas. Fresh khat leaves contain cathinone—a Schedule I drug under the Controlled Substances Act; however, the leaves typically begin to deteriorate after 48 hours, causing the chemical composition of the plant to break down. Once this occurs, the leaves contain cathine, a Schedule IV drug. Fresh khat leaves are glossy and crimson-brown in color, resembling withered basil. Deteriorating khat leaves are leathery and turn yellow-green in color.

Schedule I and Schedule IV Drugs

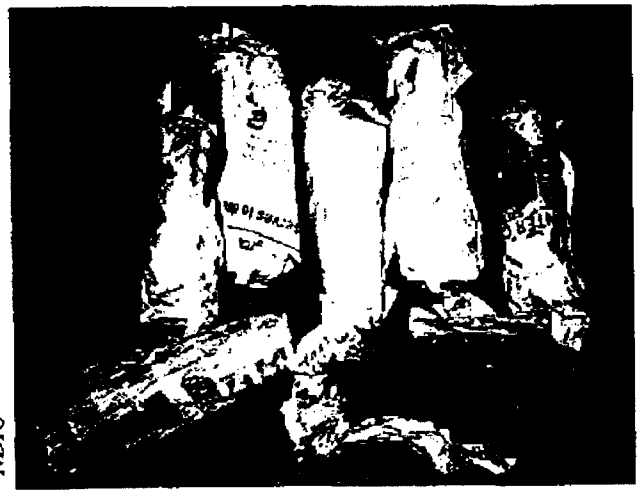
Drugs classified as Schedule I under the Controlled Substances Act are those deemed to have a high potential for abuse, no currently accepted medical use in treatment in the United States, and a lack of accepted safety for use of the drug under medical supervision. Schedule IV drugs are classified as having a low potential for abuse and a currently accepted medical use in treatment in the United States; abuse of Schedule IV drugs may lead to limited physical or psychological dependence.

Abuse

In the United States khat use is most prevalent among immigrants from Somalia, Ethiopia, and Yemen. These individuals use the drug in casual settings or as part of religious ceremonies. Abuse levels are highest in cities with sizable populations of such immigrants including Boston, Columbus, Dallas, Detroit, Kansas City, Los Angeles, Minneapolis, Nashville, New York, and Washington, D.C. Law enforcement reporting indicates that some other groups in these areas have begun abusing the drug.

Khat typically is ingested by chewing the leaves—as is done with loose tobacco. Dried khat leaves can be brewed in tea or cooked and added to food. After ingesting khat, the user experiences an immediate increase in blood pressure and heart rate. Abusers claim that the drug lifts spirits, sharpens thinking, and increases energy—effects similar to but less intense than those caused by abusing cocaine or methamphetamine. The effects of the drug generally begin to subside between 90 minutes and 3 hours after ingestion; however, they can last up to 24 hours. A state of mild depression can follow periods of prolonged use. Taken in excess, khat causes extreme thirst, a sense of exhilaration, talkativeness, hyperactivity, wakefulness, and loss of appetite. Repeated use can cause manic behavior with grandiose delusions, paranoia, and hallucinations. It also can cause damage to the nervous, respiratory, circulatory, and digestive systems.

Many Muslims, including Somalis, use khat during the religious month of Ramadan. Law enforcement officials in the United States indicate that a large number of khat seizures occur during Ramadan. In 2002 Ramadan occurred from November 5 through December 4. During November and December, U.S. Customs Service (USCS) officials seized nearly 3,000 kilograms of khat from airports in California, Illinois, Kentucky, Minnesota, New York, and Tennessee. [Note: the USCS is now part of the Bureau of Immigration and Customs Enforcement Service under the Department of Homeland Security.]



NDIC

Khat rolled in newspaper for transport.

Availability

Seizure data indicate that the availability of khat is increasing in the United States. According to Federal-wide Drug Seizure System (FDSS) data, federal law enforcement officials seized 14 metric tons in 1995, over 37 metric tons of khat in 2001, and nearly 30 metric tons in the first 6 months of 2002. State and local law enforcement officials also frequently seize kilogram quantities of khat. For example, in October 2002 local law enforcement officials in Merriam, Kansas, seized nine boxes of khat, each weighing over 13 kilograms, and arrested two Somali nationals.

The use of khat is accepted within the Somali, Ethiopian, and Yemeni cultures. In these countries khat is not a controlled substance and is openly sold at markets. Many immigrants from these countries continue to use khat in the United States. As such, khat frequently is advertised openly on signs in ethnic restaurants, bars, grocery stores, and smoke shops. Signs often are printed in the native language of the store owner. Common names for khat that may appear on such signs include kat, qat chat, gat, tohai, tschat, and mirraa. Khat generally sells for $300 to $400 per kilogram or $28 to $50 per bundle (40 leafed twigs measuring 12 to 15 inches in length).

Transportation

Khat must be transported quickly to its intended market because of its limited shelf life. Thus, the drug often is transported into the United States, typically through Great Britain and Canada, primarily via package delivery services and, to a lesser extent, by couriers aboard commercial aircraft. Khat also is transported into the United States from Canada by private vehicle. To maintain freshness during transport, khat frequently is wrapped in plastic bags, banana leaves, or newspapers and sprinkled with water.

Khat smugglers use various tactics to avoid law enforcement scrutiny when shipping the drug via package delivery services. For example, khat usually is listed on manifests (cargo invoices) as Abyssinian or African tea, African salad, molokheya (an Egyptian vegetable), perishable lettuce or fresh vegetables, tobacco leaves, and herbs. It also has been listed as auto parts on at least one occasion.

The amount of khat seized from packages arriving from foreign destinations, as well as the frequency with which these seizures occur, illustrates the extent to which package delivery services are used to transport khat into the

NDIC

Khat wrapped in banana leaves and smuggled in a suitcase.

United States. According to USCS, kilogram quantities of khat were seized daily between January and September 2002 from packages arriving at the package delivery facility located at the Memphis International Airport. USCS officials seized 3,916 kilograms of khat during that period.

The following examples demonstrate that seizures involving package delivery services are common in other parts of the country as well.

Minneapolis-St. Paul, Minnesota: On December 31, 2002, USCS officials seized over 146 kilograms of khat concealed in seven boxes shipped from the United Kingdom and arrested a 29-year-old Minneapolis resident as he accepted receipt of the boxes.

New York, New York: In August 2002 USCS officials seized 22 packages containing more than 59 kilograms of khat that had arrived in New York from London. The packages were addressed to individuals in several U.S. cities. During a subsequent controlled delivery, the Kansas City, Kansas, Police Department Interdiction Unit arrested four male Somali nationals and one male Ethiopian national. The Omaha Commercial Interdiction Unit also conducted a controlled delivery and arrested two Somali nationals. Other controlled deliveries have been made in Minneapolis; Norfolk, Nebraska; Seattle; and Sioux City, Iowa.

Kansas City, Missouri: In March 2002 USCS officials seized over 68 kilograms of khat concealed in five boxes shipped from London and arrested two Somali nationals who accepted receipt of the boxes in Kansas City.

Kansas City, Kansas: On October 18, 2002, officers with the Merriam Police Department arrested two Somali men from Minneapolis who were attempting to retrieve several packages containing khat that had been shipped from London, England, to various locations throughout the Kansas City area. The packages were addressed to various individuals with Middle Eastern names and delivered to 10 different hotels via package delivery services. The khat was to be distributed in Minneapolis. At the time of their arrest, the men had retrieved seven of the packages; the police collected the other three.

Khat also is transported into the United States by couriers aboard commercial aircraft. Khat smugglers in Great Britain frequently attempt to recruit couriers who are not of African or Middle Eastern origin, believing such individuals are subject to less scrutiny when entering the United States.

The following example illustrates the use of this smuggling method.

Detroit, Michigan: On January 13, 2003, USCS officials seized approximately 80 kilograms of khat concealed in the luggage of two British women arriving from London. Law enforcement officials executed a controlled delivery of the khat to a hotel near the airport and arrested two Somali men from Nashville, Tennessee, who attempted to receive the drug. The two Somali men were to transport the khat by private vehicle back to Tennessee for distribution among the Somali community in Nashville.

Outlook

Khat likely will become increasingly available in the United States. Abuse of the drug will remain most prevalent in communities with large Somali, Ethiopian, and Yemeni populations. Recent law enforcement reporting indicates that some Caucasian individuals have begun abusing khat; however, the drug likely will not become widely popular due to its limited shelf life and because stimulant abusers commonly seek more intense physiological effects, such as those produced by cocaine and methamphetamine. Although the drug's popularity likely will remain limited to Somali, Ethiopian, and Yemeni populations, khat will remain a growing concern among law enforcement agencies in the United States because of its increasing availability.

Sources

Falkowski, Carol. *Dangerous Drugs: An Easy-to-Use Reference for Parents and Professionals.* Center City, Minnesota: Hazelden, 2003

New York State Office of Alcoholism and Substance Abuse Services

Northwestern Ontario (Canada) Tri-Force/Kenora Joint Forces Drug Unit

Street Drugs, Publishers Group, Plymouth, Minnesota, www.streetdrugs.org

U.S. Department of Homeland Security

Directorate of Border and Transportation Security

Bureau of Immigration and Customs Enforcement Service

U.S. Department of Justice

Drug Enforcement Administration

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VF Khat -2000 - 2005

Drugs and Chemicals of Concern

Khat, Quat, Tschat, Miraa (Cathinone, Cathine,)

Introduction

Catha edulis Forsk, popularly known as khat, is a plant used in parts of Africa and the Arab Peninsula. Its fresh leaves and tops are chewed or, less frequently, dried and consumed as tea, in order to achieve a state of euphoria and stimulation. Due to the rapid air transportation, the drug has been reported in London, Rome, Amsterdam, Canada, and the U.S. The public has become more aware of this exotic drug through media reports pertaining to the United Nations mission in Somalia, where khat use is endemic, and its role in the Persian Gulf. The khat plant is known by a variety of names, such as ***qat*** in Yemen; ***tschat*** in Ethiopia, and ***miraa*** in Kenya.

In 1980 the World Health Organization classified khat as a drug of abuse that can produce mild to moderate psychic dependence.

Licit Uses

Khat has not been approved for medical use in the U.S. Khat use has traditionally been confined to the regions where khat is grown, because only the fresh leaves have the desired stimulating effects. In recent years improved roads and the availability off-road vehicles in or close to areas of cultivation and the possibility of air transportation has increased the global distribution of this non-storable commodity. Traditionally, khat has been used as a socializing drug and this is still very much the case in Yemen where it is a predominantly male habit. In other countries khat is consumed largely by single individuals and at parties. It is mainly a recreational drug in the countries which grow khat, even though it may also be used by farmers and laborers for reducing physical fatigue, and by drivers and students for improving attention.

Chemistry/Pharmacology

The stimulant effect of the plant was originally attributed to norpseudoephedrine or cathine, a phenylalkylamine-type substance isolated from the plant. However, the attribution was disputed by reports showing the plant extracts from fresh leaves contained another substance more behaviorally active than cathine. In 1975, the alkaloid cathinone (L(S)-(-)-alpha-aminopropiophenone) was isolated and its absolute configuration was established in 1978. Cathine and cathinone are phenylisopropylamine derivatives which resemble the amphetamines. Khat consumption induces mild euphoria and excitement. Individuals become very talkative (loquacity or even logorrhea) under the influence of the drug and may appear to be unrealistic and emotionally unstable. Khat can induce manic behaviors and hyperactivity. Several cases of khat-induced psychosis have been reported in the literature. Khat is an effective anorectic and its use also results in constipation.

Dilated pupils (mydriasis), which is prominent during khat consumption, reflects the sympathomimetic effects of the drug, which are also reflected in increased heart rate and blood pressure. A state of drowsy hallucinations may result coming down from khat use as well (hypnogogic hallucinations). Withdrawal symptoms that may follow prolonged khat use include lethargy, mild depression, nightmares, and slight tremor.

Illicit Uses

Khat is used for its mild euphoric and stimulating effects. Because of its anorectic effects, khat is used by some members of the Islamic faith during Ramadan, the ninth month of the Moslem year, which is spent in fasting from sunrise to sunset. Emigrants have now brought the khat habit to the U.S. Even though khat may help these religious and cultural groups preserve their ethnic identity in their new environments, the dependence on its use must be seen in the same light as those of the other psychomotor stimulants, amphetamine, methamphetamine, and cocaine.

User Population

It is estimated that several million people are frequent users of khat. Many of the users originate from countries between Sudan and Madagascar and in the southwestern part of the Arabian Peninsula, especially Yemen. In Yemen, 60% of the males and 35% of the females were found to be khat users who had chewed daily for long periods of their life. The traditional form of khat chewing in Yemen involves only male users; khat chewing by females is less formal and less frequent. In Saudi Arabia, the cultivation and consumption of khat are forbidden, and the ban is strictly enforced. The ban on khat is further supported by the clergy on the grounds that the Qur=an forbids anything that is harmful to the body. This is in sharp contrast to the church in Yemen. In Somalia, 61% of the population reported that they do not use khat, 18% report habitual use, and 21% are occasional users. The drug has increasingly entered the U.S. by these emerging cultural enclaves. Once imported and found on the streets of the U.S., khat is being used by other populations.

Illicit Distribution

Khat leaves are illicitly bundled and shipped into the U.S. Seizures have occurred at all ports of entry and at courier services like FEDEX and UPS. According to the FDIN data base, over 57,000 pounds of khat leaves were seized in 1998 and over 24 **metric tons** of khat seized in 1999. There were over 1 kilogram of cathine and over 44 kilograms of cathinone analyzed in the DEA laboratory system during 1999.

Control Status

Cathine is in **Schedule IV** and cathinone is in **Schedule** I of the Controlled Substance Act.

Comments and additional information are welcomed by the Drug and Chemical Evaluation Section, FAX 202-307-8570 or telephone 202-307-7183.

August, 2001

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Drug Enforcement Administration
Office of Diversion Control
Drug & Chemical Evaluation Section

KHAT
(Street Names: Khat, Qat, Kat, Chat, Miraa, Quaadka)

August 2013
DEA/OD/ODE

Introduction:

Khat, *Catha edulis*, is a flowering shrub native to East Africa and the Arabian-Peninsula. Khat often refers to the leaves and young shoot of *Catha edulis*. It has been widely used since the thirteenth century as a recreational drug by the indigenous people of East Africa, the Arabian Peninsula and throughout the Middle East.

Licit Uses:

There is no accepted medical use in treatment for khat in the United States.

Chemistry and Pharmacology:

Khat contains two central nervous system (CNS) stimulants, namely cathinone and cathine. Cathinone (alpha-aminopriopiophenone), which is considered to be the principal active stimulant, is structurally similar to d-amphetamine and as potent as a CNS stimulant. Cathine, also called d-norpseudoephedrine, is about 10 times less potent than cathinone as a CNS stimulant. Cathinone levels are highest in the freshly cut khat plant. Once cut, levels of cathinone start declining. Cooling the plant material will reduce the rate of decline in cathinone levels such that detectable levels may be found at least out to 10 days post cutting. In addition, encountered drug seizures of dried or dehydrated khat have shown that cathinone may be detected for many months or even years post cutting. Cathine remains stable in khat after the plant has been cut regardless of storage.

Khat produces amphetamine-like effects. These effects include: euphoria, a feeling of increased alertness and energy, hyperactivity, anorexia, and lack of fatigue. The users also feel relaxed and talkative. Sympathomimetic effects may include elevated blood pressure, dilated pupils, hyperthermia, arrhythmias, and increased respiration. The effects of khat usually last between 90 minutes and 3 hours. After-effects of khat use have been reported as lack of concentration, numbness and insomnia.

Khat abuse leads to psychological dependence. Chronic abuse of khat can lead to behavioral changes and impairment of mental health. Clinical manifestations include manic behavior with grandiose delusions, violence, suicidal depression, or schizophreniform psychosis characterized by paranoid delusions. Chronic abuse can also produce physical exhaustion, anorexia, periodontal disease and disturbances of the gastrointestinal system.

Illicit Uses:

Khat is abused for its stimulant and euphoric effects. Most often the fresh leaves and shoots of the khat shrub are chewed, and then retained in the cheek and chewed intermittently until all the juices are extracted. To counter the bitter taste of the plant, copious amounts of water or sweet soda are drank. Dried khat can be made into tea or a chewable paste. Rarely other modes of self-administration include smoking or sprinkling on food.

User Population:

Abuse of khat in the United States is most prevalent among immigrants from Somalia, Ethiopia, and Yemen. Abuse of khat is highest in cities with a substantial population of these immigrants. These cities include Boston (MA), Columbus (OH), Dallas (TX), Detroit (MI), Kansas City (MO), Los Angeles (CA), Minneapolis (MN), Nashville (TN), New York (NY), and Washington D.C.

Illicit Distribution:

Individuals of Somali, Ethiopian, and Yemeni descent are the primary transporters and distributors of khat in the United States. The khat is transported from Somali into the United States and distributed in the Midwest, West and Southeast (Nashville, Tennessee) regions of the United States. According to the National Drug Intelligence Center, Somali and Yemen independent dealers are distributing khat in Ann Arbor , Detroit, Lansing and Ypsilanti, Michigan; Columbus, Ohio; Kansas City, Missouri; and Minneapolis/St. Paul, Minnesota. Due to a limited shelf life, the khat needs to be transported quickly to the intended market. Thus shipment by air is the most common method of transport. The khat is often transported through the United Kingdom and Canada primarily via package delivery services and to a lesser extent by couriers aboard commercial aircraft. Khat is typically shipped package into bundles that are wrapped in plastic bags or banana leaves to retain moisture and freshness.

Khat has been widely available in the United States since 1995. According to recent Federal-wide Drug Seizure System (FDSS) data, law enforcement seized 89,669 kilograms of khat in 2010.

The National Forensic Laboratory Information System (NFLIS) and the System to Retrieve Information from Drug Evidence (STRIDE) indicate that 552 drug exhibits submitted to federal, state and local forensic laboratories in 2011 were identified as khat, cathine and/or cathinone and 718 exhibits identified in 2012. In the first quarter of 2013, there were 118 exhibits identified as khat, cathine and/or cathinone.

In 2004, Kansas City Police Department (KCPD) reported the emergence of a new form of khat within the Somali community. Graba, a dried form of khat that is similar in appearance to marijuana, has been seized by KCPD. Graba is produced in Ethiopia and is commonly dried before it is transported into the United States. In two separate incidents in January 2004, KCPD officers seized 13.2 pounds of graba from an Ethiopian national and 38 grams from a Somali national.

Control Status:

Cathinone and cathine are in Schedules I and IV, respectively, of the Controlled Substances Act.

Comments and additional information are welcomed by the Office of Diversion Control, Drug and Chemical Evaluation Section
Fax 202-353-1263, telephone 202-307-7183, or Email ODE@usdoj.gov.

UF Khat - 2000 - 2005

Drug Enforcement Administration
Office of International Intelligence
Europe, Asia, & Africa Strategic Unit (NIBE)

April 2002

Catha Edulis (a.k.a. Khat)

Status in International Drug Trafficking

Khat is a naturally occurring stimulant derived from the Catha Edulis shrub. This shrub is primarily cultivated in East Africa and the Arabian Peninsula. The use of khat is an established cultural tradition for many social situations in this region of the world. Individuals of East African and Middle Eastern descent are most often responsible for the importation, distribution, possession, and use of khat in the United States, even though khat is illegal in the United States.

Background Information

Khat is also known as Abyssinian tea, African salad, oat, kat, chat, and catha. Khat has 2 active ingredients, which are cathinone and cathine.

- Cathinone is a Schedule I substance that produces an euphoric effect similar to amphetamines in its ability to stimulate the central nervous system. The cathinone in khat begins to lose potency, as the plant material dies 48 hours after it is cut. Khat that has been refrigerated or frozen will retain its cathinone for a longer period.

- Cathine is a Schedule IV substance that produces a much lower stimulant effect than cathinone. It does not lose its potency after the khat has been cut.

Analyst Note: Methcathinone, commonly called cat, is occasionally confused with khat. Methcathinone is a synthetic Schedule I substance that has similar chemical structure as the cathinone in the khat plant. Methcathinone is produced in clandestine laboratories and sold as an alternative to methamphetamine. Ephedrine and/or pseudoephedrine are the main precursor chemicals for methcathinone synthesis. The addictive properties and side effects of this synthetic are more intense than either of the naturally occurring khat substances.

Recent History

Several million people may currently be using khat worldwide, with largest concentrations being in the regions surrounding the Middle East. Seizures of khat have risen from around 800 kilograms annually in 1992 to over 37.2 metric tons in 2001. The price of khat was in the range of US $30 - $60 per kilogram in 1992. Although current kilogram prices for khat are not available, the price, per bundle, for khat was in the range of US $15 - $50 in 1998.

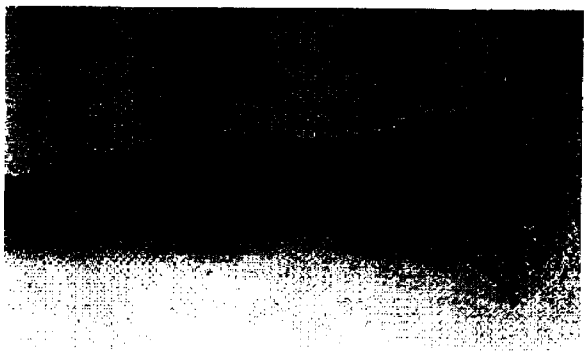
Analyst Note: A bundle of khat can contain anywhere from 20 to 40 stems.

Cultivation

Khat is an important part of the economy of many producer countries, particularly Somalia and Yemen. Recent press reports from Yemen claim that more than US $2 billion are spent annually by Yemenis to purchase khat, and states that khat is often grown on land that is unsuitable for other crops. Khat is grown in export quantities in countries such as Kenya and Ethiopia. Khat is Ethiopia's fourth largest export according to U.S. embassy reporting, and the recreational use of khat is widely accepted there. The World Health Organization reports that the cultivation and use of khat has profound socioeconomic consequences on associated countries and individuals. Included among the consequences, cultivation of khat requires scarce land and water resources that could be put to other uses. Khat use is costly and potentially addictive. Widespread use of khat impacts on productivity, as frequent use tends to reduce the motivation to work.

The only known case of khat cultivation in the United States occurred in September 1998 when 1,076 khat plants were seized in a raid in Salinas, California. Sophisticated irrigation techniques were used in this outdoor grow operation. The suspect was a legal alien from Yemen who allegedly cleared approximately US $10,000 per month in khat sales.

Trafficking



Because the cathinone content of khat is reduced as the plant material dries, shipment by air is the most common method of transport. Khat is usually shipped already packaged into bundles and is wrapped in plastic bags or banana leaves to retain moisture and freshness. According to the Food and Drug Administration, khat is sometimes falsely labeled and shipped to the United States as "Molokheya", an Egyptian vegetable. Khat is generally smuggled in passenger luggage, overnight express mail (USPS, UPS, DHL, etc) or shipped as air cargo and falsely labeled as "vegetables".

Most khat seized in the United States has been seized from a number of immigrants from Somalia, Ethiopia, Yemen and Eritrea and other countries where khat use is common. The United States Customs Service (USCS) makes most of its khat seizures at the JFK International Airport in New York from arriving passengers, overnight express mail, and air cargo. Of the over 27 metric tons seized by the USCS in FY 1998, almost 18 metric tons were seized from flights arriving from Great Britain. Most of the prosecutions in the United States for the trafficking of khat is done at the state level rather than in the federal court system.

Use/Abuse of Khat

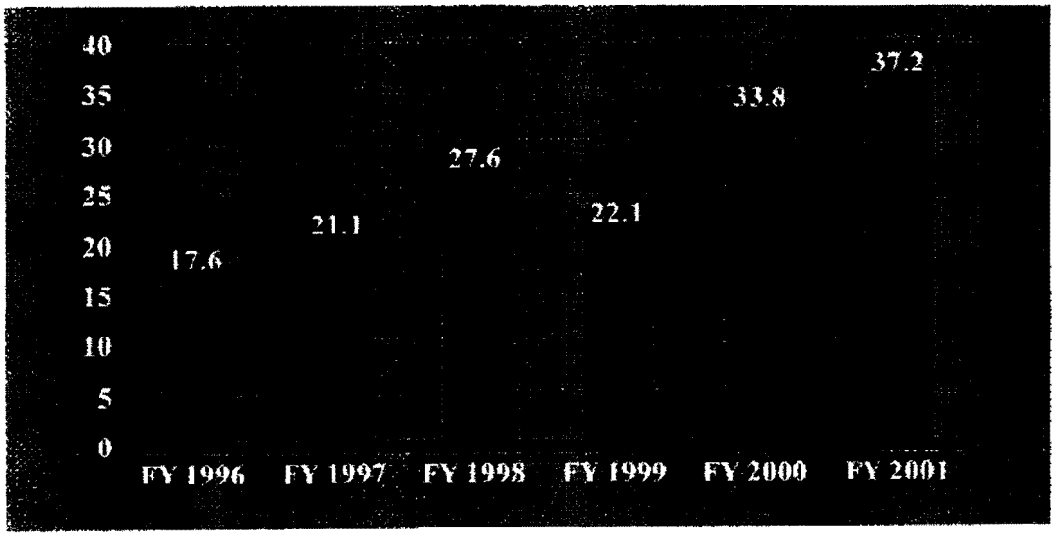
Khat has been used since antiquity as a recreational and religious drug by natives of Eastern Africa, the Arabian Peninsula, and the Middle East. Khat is legal in many countries, including Great Britain where khat can be legally imported, distributed, used, and/or exported. Khat has long been an acceptable substitute for alcohol among Muslims. During the period of Ramadan, the use of khat is popular to alleviate fatigue and reduce the effects of hunger. Although khat can be abused, it is often used in a social context in a similar manner to coffee consumption in other parts of the world.

Khat is typically chewed like tobacco. The fresh leaves, twigs, and shoots of the khat shrub are chewed, and then retained in the cheek and chewed intermittently to release the active drug. Dried plant material can be made into tea or a chewable paste, but dried khat is not as potent as the fresh plant product. Khat can also be smoked.

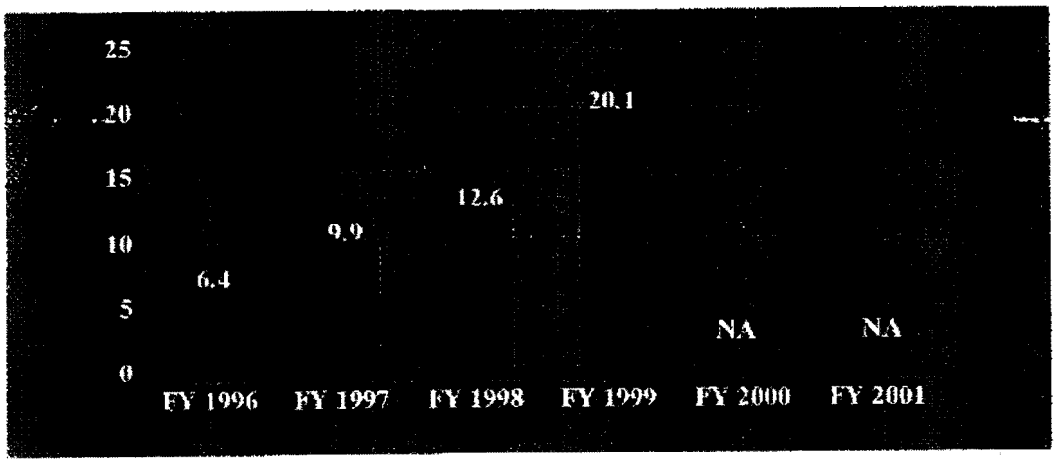
Chronic khat abuse can result in symptoms similar to amphetamine addiction, such as physical exhaustion, violence, and suicidal depression. Common side effects include anorexia, tachycardia, hypertension, insomnia, and gastric disorders. Khat abuse can also result in irritability and violence.

Statistics

Seizures (at US ports of entry)(in metric tons)



*Seizures (Non-US)(in metric tons)**



*Provided by Interpol

Key Judgements

- The amount of khat seized in the United States has been steadily increasing and appears to be related to the number of immigrants from Somalia, Ethiopia, Yemen and Eritrea and other countries where khat use is common. Although it is hard to predict future immigration trends, it seems likely that the importation of khat will continue to increase to meet the demand of those ethnic groups who are accustomed to using it.

- It does not seem likely at this point that khat use will expand beyond the ethnic Somalian, Ethiopian, Yemeni and Eritrean communities. There is no indication that khat is marketed outside these ethnic communities, even though it appears to be readily available.

Prepared by:

Europe, Asia, Africa Strategic Unit (NIBE)
Intelligence Division
Drug Enforcement Administration
April 2002
Questions/Comments: 202-307-8410

VF Khat - 1990 - 1999

U.S. Department of Justice
Drug Enforcement Administration
Intelligence Division

KHAT *Factsheet*

December 1992

History:

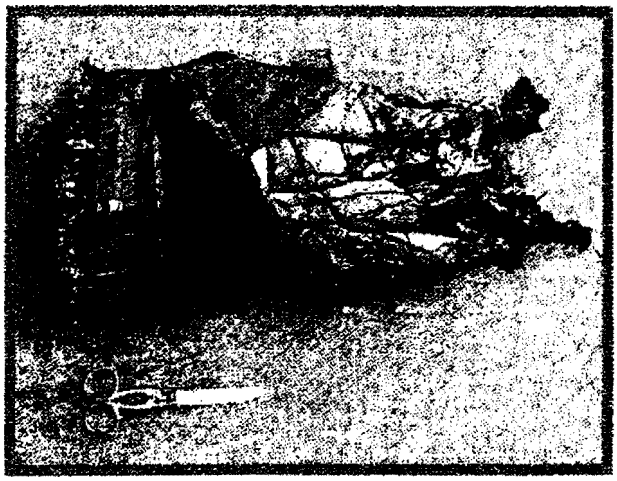
Catha edulis, known by over forty different names including khat, kat, qat, or miraa, is a flowering, evergreen shrub or small tree, 10 to 20 feet tall, native to East Africa and southern Arabia. The plant is prized for its stimulant properties. Khat (pronounced "cot") has been cultivated throughout East Africa in areas with sufficient moisture at elevations up to 6,500 feet. For centuries, khat has been used for social and medicinal purposes in this region, where its use as a stimulant probably predates that of coffee.

The alkaloids, cathinone and cathine, have been identified as the primary and secondary active ingredients in khat, and produce central nervous system stimulation. Cathinone is approximately ten times more potent than cathine. Cathinone is most potent in leaves less than 48 hours old; cathine does not lose its potency with age. Because cathinone is only present in fresh khat leaves, its early use was restricted to areas of indigenous growth. With the advent of international air travel, the perishable nature of khat presents less of an obstacle to would-be users.

Today, several million people throughout East Africa, southern Arabia, and the Middle East habitually use khat. In those regions, young shoots of the khat plant are harvested year-round and sold daily in the market place. Khat is commonly sold in bundles of 40 twigs, approximately 16 inches long. Harvested material may be wrapped in banana leaves or plastic bags to preserve freshness. (See photographs at right.)

Trafficking:

Khat is transported in East Africa by trucks and planes. Some reporting indicates that it is also smuggled by small sailing vessels. Although most khat trafficking occurs within East Africa and the Middle East, khat has been seized in several European countries including Finland, Italy, Norway, Sweden, and Switzerland.



Khat consists of young tender shoots collected daily in the morning. To keep fresh, it is wrapped in banana leaves or plastic bags; in some areas it is sold unwrapped.

AMP/QCC

Khat has been smuggled into the United States via Canada by cars and air freight. The majority of khat, however, has been found at airports concealed in luggage. Seizures of khat have been reported in Champlain, New York; Chicago, Illinois; Dallas, Texas; Newark, New Jersey; New York, New York; and St. Louis, Missouri. Approximately 800 kilograms of khat were seized in the United States by the U.S. Customs Service between August 1991 and October 1992. Very limited reporting indicates that the price of a kilogram of khat in the United States ranges from $30 to $60. Khat use in the United States is typically limited to East African and Arab ethnic groups.

***Catha edulis* Forskal, family Celastraceae**

Methods of Consumption:
Individual leaves and tender stems are detached from the twigs and chewed. The plant material is then retained in the cheek as a ball; liquids are consumed to counteract the dry-mouth that results from chewing khat. Dried leaves and twigs are crushed for tea or made into a chewable paste. In some areas of the Middle East, leaves and the ends of the twigs are crushed and smoked like tobacco.

Effects of Use:
Isolated in the khat plant only recently, the alkaloid cathinone is described as a "naturally-occurring amphetamine." Use of khat produces a euphoric effect that compares to amphetamine in its ability to stimulate the central nervous system. Khat use results in a temporary sense of exhilaration, energy, talkativeness, hyperactivity, wakefulness, and loss of appetite. According to khat chewers, the stimulant delays fatigue. Chronic idleness has been cited as one of the major social problems associated with khat use. Taken in excess, khat produces extreme thirst and symptoms that approximate alcohol intoxication. The effects of khat may last up to 24 hours. Although habitual users may experience a psychological dependency, there is little evidence of physical dependency.

Controlled Substances:
Both cathinone and cathine are on the United Nations' List of Psychotropic Substances. Cathinone has been proposed for inclusion in Schedule I of the United States Controlled Substances Act (CSA). Cathine is currently listed as a controlled substance under Schedule IV of the CSA. Substances containing cathine, such as khat, are therefore controlled under Schedule IV.

Common Names or Terms:
Abyssinian tea, African tea, Arabian tea, Bushman's tea, *chat, crafta,* Flower of Paradise, *ikwa, ischott, kaad, kafta, kat, la salade, liss, liruti, mairongi, mandoma, mbungula, mabwe, meongi, mfeike, mhulu, mira, mirungi, m'mke, msekera, muhulu, muirungi, muraa, mutsawhri, mzengo, ol neraa, gat, salahin, seri,* Somali tea, *tohai, and tumayot.*

Information:
Questions regarding the information contained in this fact sheet may be directed to the Drug Enforcement Administration, Intelligence Division, Strategic Intelligence Section: telephone (202) 307-8110.

DEA-92064

Photographs:
United Nations Publications
Illustration:
Richard. 1547 Atlas Plate 30

(VF Amphetamine - Methcathinone
for full-text see ↑)

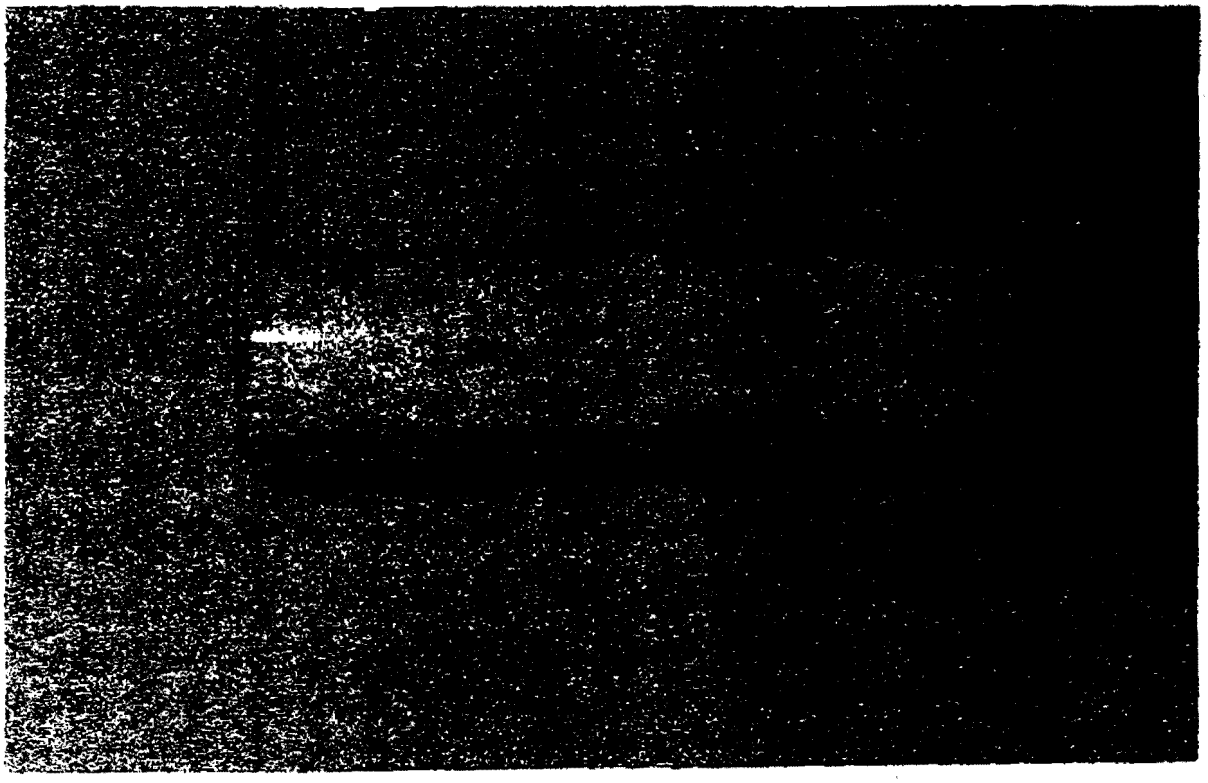
U.S. Department of Justice
Drug Enforcement Administration

Methcathinone (CAT)

Drug Intelligence Bulletin

DEA

Intelligence Division



February 1994
DEA-94007

VF Khat 1990-1999

METHCATHINONE (CAT)

Methcathinone, a potent and easily manufactured stimulant, is increasingly available in parts of the United States, primarily the Midwest. Sold under the street name CAT, methcathinone is known also as GOOB, SNIFF, STAR, or WONDER STAR. Less often it is sold as methamphetamine under such names as CRANK, SPEED, BATHTUB SPEED, or GO FAST and, in Indiana, as SLICK SUPERSPEED and CADILLAC EXPRESS. Outside the United States, methcathinone is known synonymously as ephedrone and is a significant drug of abuse in Russia and some of the Baltic Republics. In these regions, methcathinone (ephedrone) is sold under such street names as JEFF, JEE COCKTAIL, MUL'KA, COSMOS, EFFENDI, and POMIMUTKA.

DISTRIBUTION AND PURITY

Methcathinone is distributed in the United States as a white to off-white, chunky powdered material. Methcathinone seized thus far has been uncut, with purity levels greater than 90 percent. It is usually sold in 1/4 gram, gram, 3.5 gram (1/8 ounce or eight-ball), or ounce quantities. The powdered material comes packaged in paper packets (called bindles), vials, or plastic bags.

Methcathinone is increasingly available in parts of the United States, primarily the Midwest.

CAT vs KHAT

Methcathinone is a structural analogue of methamphetamine and of cathinone. Cathinone is the principal psychoactive ingredient in young, freshly cut material of the khat plant, *Catha edulis*. The similarity in pronunciation between CAT (a common street name for methcathinone) and khat (pronounced "cot") has prompted some confusion regarding identification of these very dissimilar materials.

	CAT:	KHAT:
DESCRIPTION:	White chunky powder	Leaves and shoots
SOURCE OF SUPPLY:	Clandestine manufacture	*Catha edulis* plant
ROUTE OF INGESTION:	Snorted, Injected, Smoked	Chewed
CSA SCHEDULE:	Methcathinone: I	Cathinone: I; Cathine: IV

Khat, consisting of the young leaves and tender shoots of the *Catha edulis* plant, is a vegetative material that is chewed for its stimulant properties. Native to East Africa and southern Arabia, the khat plant has been used for social and medicinal purposes in this region, where its use as a stimulant probably predates that of coffee. Cathinone, a Schedule I substance most potent in leaves less than 48 hours old, is quite unstable and is converted into cathine as the plant material ages. Cathine, a Schedule IV substance, is a less potent central nervous system stimulant. Most Americans first heard about khat from press reports covering U.S. humanitarian action in Somalia. Khat is chewed routinely by large segments of the Somali population, including followers of Somali warlords.

Methcathinone, by contrast, is a clandestinely manufactured, synthetic compound with an abuse potential equivalent to methamphetamine. In the United States, methcathinone is sold almost exclusively in the hydrochloride salt form, which is very stable and highly water soluble.

VF Khat – 2000 – 2005

Drug Intelligence Brief

June 2002

KHAT

Status in International Drug Trafficking

Although khat is illegal in the United States, it is legal throughout much of Europe, East Africa, and the Arabian Peninsula. Individuals of East African and Middle Eastern descent are most often responsible for the importation, distribution, possession, and use of khat in the United States.

A khat shrub

Background

Khat is a naturally occurring stimulant derived from the *Catha edulis* shrub. This shrub is primarily cultivated in East Africa and the Arabian Peninsula. The use of khat is an established cultural tradition for many social situations in those regions. Khat is also known as *Abyssinian tea, African salad, oat, kat, chat, and catha*. Khat has two active ingredients, cathinone and cathine.

- Cathinone is a Schedule I substance that produces a euphoric effect similar to amphetamine in that it stimulates the central nervous system. The cathinone in khat begins to degrade 48 hours after the plant has been cut. Khat that has been refrigerated or frozen will retain its cathinone potency for a longer period.

- Cathine is a Schedule IV substance that produces a much less intense stimulant effect than cathinone; however, it does not lose its potency after harvesting.

Methcathinone

Methcathinone, commonly called cat, is occasionally confused with khat. Methcathinone is a synthetic, Schedule I substance that has a similar chemical structure to the cathinone in the khat plant. Methcathinone is produced in clandestine laboratories and sold as a methamphetamine alternative. Ephedrine and/or pseudoephedrine are the main precursor chemicals used in methcathinone synthesis. The addictive properties and side effects of this synthetic are more intense than either of the naturally occurring khat substances.

Recent History

Several million people may currently be using khat worldwide; the largest concentrations of users are in the regions surrounding the Middle East. U.S. Customs Service (USCS) seizures of khat have risen from around 800 kilograms annually in 1992 to over 37.2 metric tons in 2001. The price of khat ranged from US$30 to US$60 per kilogram in 1992. Although current kilogram prices for khat are not available, the price of khat ranged from US$15 to US$50 per bundle in 1998. [Note: There is no method of converting bundles to kilograms, because the weights of the bundles vary—some bundles can weigh almost nothing while others can weigh much more. In addition, a bundle of khat can contain between 20 and 40 stems; the variance of weight and number of stems accounts for the wide range of prices per bundle. Seizures of khat, however, can be measured and are measured in kilograms.]

At a khat cultivation area

Cultivation

Khat is an important part of the economy of many producer countries, particularly Somalia and Yemen. Press reports from Yemen state that more than US$2 billion are spent annually by Yemenis to purchase khat, which is often grown on land that is unsuitable for other crops. [Note: Although khat is cultivated on land that is currently unsuitable for other crops, the cultivation of khat precludes the land's development for other purposes.]

Khat is grown in export quantities in countries such as Kenya and Ethiopia; it is Ethiopia's fourth largest export according to U.S. embassy reporting, and the recreational use of khat is widely accepted there. Over 33 percent of Yemen's gross national product is associated with the cultivation, consumption, and exportation of khat. The World Health Organization reports that the cultivation and use of khat has profound socioeconomic consequences on countries and individuals. The cultivation of khat requires scarce land and water resources that could be put to other uses. Khat use is costly and potentially addictive. Widespread frequent use of khat impacts productivity because it tends to reduce worker motivation.

The only known case of khat cultivation in the United States occurred in September 1998, when 1,076 khat plants were seized in a raid in Salinas, California. Sophisticated irrigation techniques were used in this outdoor-grow operation. The individual involved was of Middle Eastern origin; he earned approximately US$10,000 per month in khat sales.

Because the potency of the cathinone in the khat is reduced as the plant material dries, shipment by air is the most common method of transport.

Trafficking

A bundle of khat

Khat is usually shipped already packaged into bundles, and wrapped in plastic bags or banana leaves to retain moisture and freshness. Khat is generally smuggled in passenger luggage, overnight express mail (USPS, UPS, DHL, etc.), or shipped as air cargo and falsely labeled as "vegetables." According to the U.S. Food and Drug Administration, khat is sometimes falsely labeled and shipped to the United States as *molokheya*, an Egyptian vegetable.

Most khat seized in the United States has been seized from immigrants of Somalia, Ethiopia, Yemen, Eritrea, and other countries where khat use is common. The USCS makes most of its khat seizures at the JFK International Airport in New York from arriving passengers, overnight express mail, and air cargo. Of the over 27 metric tons seized by the USCS in FY 1998, almost 18 metric tons were seized from flights arriving from Great Britain. Most cases of khat trafficking in the United States are prosecuted at the state level rather than in the federal court system.

Use/Abuse of Khat

Two men chewing khat

Khat has been used since antiquity as a recreational and religious drug by natives of Eastern Africa, the Arabian Peninsula, and the Middle East. Khat is legal in many countries, including Great Britain where khat can be legally imported, distributed, used, and/or exported. Khat has long been an acceptable substitute for alcohol among Muslims. During the period of Ramadan, the use of khat is popular to alleviate fatigue and reduce hunger. Although khat can be abused, it is often used in a social context similar to the manner in which coffee is consumed in other parts of the world. Reports from Yemen indicate that khat is consumed by 3 out of every 4 Yemenis, and accounts for more than 40 percent of the average family budget.

Khat is typically chewed like tobacco. The fresh leaves, twigs, and shoots of the khat shrub are chewed, and then retained in the cheek and chewed intermittently to release the active drug. Dried plant material can be made into tea or a chewable paste, but dried khat is not as potent as the fresh plant product. Khat can also be smoked and even sprinkled on food.

Chronic khat abuse can result in symptoms such as physical exhaustion, violence, and suicidal depression, which are similar to amphetamine addiction. Common side effects include anorexia, tachycardia, hypertension, insomnia, and gastric disorders.

Statistics

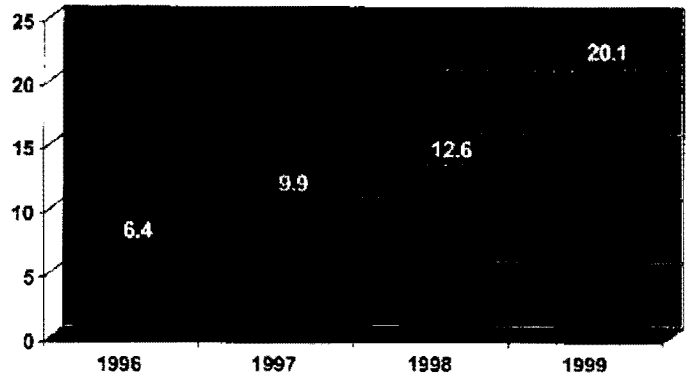
Seizures of Khat at U.S. Ports of Entry
Metric Tons

SOURCE: El Paso Intelligence Center (EPIC) from USCS data

Seizures of Khat (Non-U.S.)
Metric Tons

SOURCE: INTERPOL

Statistics for the years 2000 and 2001 are unavailable.



Key Judgments

The amount of khat seized in the United States has been steadily increasing; it appears to be related to the increasing number of immigrants from Somalia, Ethiopia, Yemen, Eritrea, and other countries where khat use is common. Although it is hard to predict future immigration trends, it seems likely that the importation of khat will continue to increase to meet the demand of those ethnic groups who are accustomed to using it.

It does not seem likely at this point that khat use will expand beyond the ethnic Somalian, Ethiopian, Yemeni, and Eritrean communities. There is no indication that khat is marketed outside these ethnic communities although it appears to be readily available.

This report was prepared by the DEA Intelligence Division, International Strategic Support Section, Europe, Asia, Africa Strategic Unit. This report reflects information received prior to April 1, 2002. Comments and requests for copies are welcome and may be faxed to the Intelligence Production Unit, Intelligence Division, DEA Headquarters, at (202) 307-8726.

Drug Fact Sheet

Khat

Overview

Khat is a flowering evergreen shrub that is abused for its stimulant-like effect. Khat has two active ingredients, cathine and cathinone.

Street names

Abyssinian Tea, African Salad, Catha, Chat, Kat, Oat

Looks like

Khat is a flowering evergreen shrub. Khat that is sold and abused is usually just the leaves, twigs, and shoots of the Khat shrub.

Methods of abuse

Khat is typically chewed like tobacco, then retained in the cheek and chewed intermittently to release the active drug, which produces a stimulant-like effect. Dried Khat leaves can be made into tea or a chewable paste, and Khat can also be smoked and even sprinkled on food.

Affect on mind

Khat can induce manic behavior with grandiose delusions, paranoia, nightmares, hallucinations, and hyperactivity. Chronic Khat abuse can result in violence and suicidal depression.

Affect on body

Khat causes an immediate increase in blood pressure and heart rate. Khat can also cause a brown staining of the teeth, insomnia, and gastric disorders. Chronic abuse of Khat can cause physical exhaustion.

Drugs causing similar effects

Khat's effects are similar to other stimulants, such as cocaine and methamphetamine.

Overdose effects

The dose needed to constitute an overdose is not known, however it has historically been associated with those who have been long-term chewers of the leaves. Symptoms of toxicity include delusions, loss of appetite, difficulty with breathing, and increases in both blood pressure and heart rate. Additionally, there are reports of liver damage (chemical hepatitis) and of cardiac complications, specifically myocardial infarctions. This mostly occurs among long-term chewers of khat or those who have chewed too large a dose.

Legal status in the United States

The chemicals found in khat are controlled under the Controlled Substances Act. Cathine is a Schedule IV stimulant, and cathinone is a Schedule I stimulant under the Controlled Substances Act, meaning that it has a high potential for abuse, no currently accepted medical use in treatment in the United States, and a lack of accepted safety for use under medical supervision.

Common places of origin

Khat is native to East Africa and the Arabian Peninsula, where the use of it is an established cultural tradition for many social situations.

News From DEA

July 26, 2006

Fact Sheet
FOR IMMEDIATE RELEASE

KHAT
AKA: Catha Edulis

Street Names: Khat has over 40 street names to include Abyssinian Tea, African Salad, Bushman's Tea, Chat, Gat, Kat, Miraa, Oat, Qat, Somali Tea, Tohai, Tschat

Description: Catha Edulis is a shrub (6-12 feet in height) which is grown in southern Arabia and Eastern Africa, and primarily in the countries of Somolia, Yemen, Kenya and Ethiopia. Also known at khat, qat, and quat (pronounced cot). The leaves of this plant contain the alkaloids cathine and cathinone, and are chewed for the stimulant effects.

How is Khat abused? Khat is ingested by chewing the leaves-as is done with loose tobacco. Dried Khat leaves can be brewed in tea or added to food.

What are the licit uses of khat? There is no legitimate use for khat in the United States.

CATHINE: An alkaloid which is a Schedule IV drug under the CSA.

CATHINONE: An alkaloid which is a Schedule I drug under the CSA. Cathinone is 10 times more potent than Cathine but dissipates within 48 hours of harvest.

What is an alkaloid? Any of various physiologically active, nitrogen-containing organic bases obtained from plants such as nicotine, quinine, atropine, cocaine, and morphine.

Within 48 hours of harvest Khat's chemical composition breaks down and at that point Khat contains only Cathine, the schedule IV substance.

What effects does Khat have on a user? After ingestion the user experiences immediate increase in blood pressure and heart rate. It is a stimulant which effects begin to subside after about 90 minutes to 3 hours, but can last 24 hours.

Who uses Khat? Khat is accepted within the Somali, Kenyan, Ethiopian, and Yemeni cultures in the U.S. and is used by members of this immigrant community. Typically, only the males from these cultures use the drug.

What are the risks? Individuals who abuse khat typically experience a state of mild depression following periods of prolonged use. Taken in excess khat causes extreme thirst, hyperactivity, insomnia, and loss of appetite. Khat can reduce the user's motivation and can cause manic behavior with grandiose delusions, paranoia, and hallucinations. Khat can cause damage to the nervous, respiratory, circulatory, and digestive systems

How much is available in the United States? The availability of khat in the United States has been increasing since 1995. According to the Federal-wide Drug Seizure System (FDSS), law enforcement seizures of khat increased from 14 metric tons in 1995 to over 37 metric tons in 2001. During the first six

months of 2002, nearly 30 metric tons of khat was seized. El Paso Intelligence Center reported that law enforcement seized 32, 39, 37, 54, 47, and 32 metric tons of khat in 2000, 2001, 2002, 2003, 2004, and through September 2005, respectively.

How much does it cost to manufacture? Khat is purchased from farmers in the horn of Africa region for about $1 per kilogram. Warlords operating in this area use their planes to ship the khat to countries in Europe, where khat is still legal. The khat is sold to middlemen for $200/kg, a profit of $199 per kilogram. The drugs are then shipped to the United States and elsewhere.

How much does Khat sell for in the United States? Khat generally sells for $300-$600 per kilogram or $30 to $60 per bundle (which is 40 leafed twigs measuring 12-15 inches in length).

How is khat shipped to United States? Khat is either shipped using couriers who can put between 20 and 140 kilograms in their suitcases or sent via express mail in boxes containing 9-25 kilograms of khat.

Where do the profits go? Evidence suggests the money made from the sale of khat is moving back to Europe and the Middle East.

VF Khat - 2006

An Overview of Khat (Catha edulis): A Forensic and Scientific Perspective

[redacted] Senior Forensic Chemist
United States Department of Justice
Drug Enforcement Administration
Northeast Laboratory
New York, NY 10011

Psychoactive plants have been used for thousands of years by native peoples to hallucinate and expand consciousness during religious ceremonies and as general inebriants

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Indigenous Practices of Psychoactive Plants

- *Ganja (marijuana)*
  - *"Wisdom weed" by Rastafarians*
  - *Religious rite to get closer to inner spiritual self, Jah (God) and Creation*

Indigenous Practices of Psychoactive Plants

- *Coca (cocaine)*
  - *Cultivation consumption of leaves considered sacred by pre Columbian civilizations*
  - *Incas used coca for religious and medical purposes*
  - *Mate de coca*

Indigenous Practices of Psychoactive Plants

- *Peyote Cactus*
  - *Spineless cactus native to southwestern US through central Mexico*
  - *Phenethylamine alkaloids, principal being mescaline*
  - *Used by indigenous peoples such as Huichol and Navajo in traditional religious rites*

Indigenous Practices of Psychoactive Plants

- *Ayahuasca or hoasca "Vine of the Soul"*
  - *Concoction of 2 Amazonian plants Psychotria viridis and Banisteriopsis caapi*
  - *Indigenous to Amazon basin of South America*
  - *Tea used for religious purposes by Brazil based church UDV*
  - *Prepared brew contains DMT*

Indigenous Practices of Psychoactive Plants

- *Khat*

Indigenous plant of Africa

Chewing of leaves analogous to chewing of coca

Stimulatory effect ("natural amphetamine")

Remedy for number of medical ailments

Khat Perspective

What is Khat?

- Evergreen perennial tree or shrub
- Family: Celastraceae
- Genus: Catha
- Species:
  - edulis
  - Typically (Yemen) in wild state and lower elevations
- Yemen - 1-10 m
  Ethiopian highlands 15-20m
- Lancet shaped leaves are reddish green turning to yellow green as they age
- Young shoots near top of plant most favorable but leaves and stems at middle and lower sections used as well

Botanical Description of Khat leaf

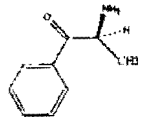
Source: The British Pharmaceutical Codex 1949, p. 902

- 9cm long x 4cm wide
- Lanceolate or oval-lanceolate
- Petiolate (having a stalk)
- Coriaceous (resembling leather)
- Crimson-brown
- Glossy upper surface, serrated margins
- Aromatic odor
- Taste aromatic, sweet, astringent

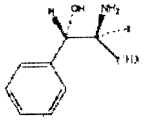
Street Terms for Khat (pronounced "cot")

- Khat is the most common name in English and Arabic
- Jimaa in Oromiffaa (language of Oromo people in Ethiopia)
- Phonetic transcriptions of Arabic khat:
  - Chat (Amharic)
  - Qat (Yemen)
  - Tschat (Ethiopia)
  - Miraa (Kenya)
  - Kat
  - Cat, cat, quat
  - Catha
  - Kus-es-Sakalin
  - Tohai
  - Abyssinian Tea
  - African Tea
  - African Salad

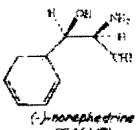
Principal Khat Constituents of Forensic Interest



S-(-)-α- aminopropiophenone
Cathinone(CA)



(+)-norpseudoephedrine
Cathine(NPE)



(-)-norephedrine
PPA(NE)

International Control

The international status of the Catha edulis plant and it's principal psychoactive substances is complex.

In certain countries including USA, Canada, Denmark, Sweden, Finland, Norway, Switzerland, Italy, Greece, Saudi Arabia and Morocco the plant itself is controlled.

In many other countries the constituent psychoactive substances are controlled.

Khat Control Status

- February 1993 -cathinone placed in Schedule I of CSA*
- When cathinone present, khat is Schedule I substance
- Older leaf samples no longer containing detectable levels of cathinone , but cathine present, khat is Schedule IV substance
- Cathine does not lose its potency with age
- Well preserved samples needed for analysis

* Federal Register, Vo 58, No. 9 , January 14 1993, pp 4316-4318

Khat Origins

- *Chewing of khat leaves predates the use of coffee*
- *History as a crop is neither clear nor certain*
- *Lore of khat passed on orally from generation to generation*
- *Theory suggests khat was known to ancient Egyptians*
- *Arabic sources – medicinal plant 15th century in Turkestan and Afghanistan*
- *Yemen or Ethiopian origin?*
- *Khat mentioned in chronicles of Ethiopian king Amda Seyon (1314-1344)*
- *Discovered by herder who noticed effect of plant on his goats*
- *Tried it and experienced wakefulness and added strength*

Major Khat Cultivation Areas

- Ethiopia (Hararghe district)*
- Arabian Peninsula: Yemen
- Northern provinces of Kenya along slopes of Mount Kenya
- Mountainous regions of East Africa including Eritrea, Tanzania, Burundi, Rwanda
- Somalian coastline
- Congo, Uganda, Rwanda, Zambia, Zimbabwe, South Africa
- Island of Madagascar
- Afghanistan, Turkestan, India, Sri Lanka

Khat Cultivation

Wide range of ecological adaptability, growing under a variety of climatic conditions including droughts when other crops fail

Grows best at altitudes from 3000-8500 ft and in coastal regions

Often interspersed among coffee trees and other crops

Harvesting of Khat

- Planting to regular harvesting takes 2-3 years
- Harvested year round (2-3 times a yr)
- Harvesting usually occurs in early morning or late afternoon -harvested by breaking off young branches from main branches
- Each harvested product is locally given name
- Khat has short shelf life and cannot be kept for longer than 2-3 days
- Leaves need to be transported quickly to market
- Khat bundles wrapped in banana leaves to avoid drying, wilting which results in decrease of cathinone content

Khat Markets(Yemen)

Young fresh shoots are harvested in early morning . 4-8 leaves are made into small bundles and sold in fresh state to khat chewers or traders in late morning

Khat Consumption

- The practice of chewing khat is an ancient tradition throughout the Horn of Africa
- The leaves, twigs and young shoots are chewed like tobacco, retained in the cheek and the juice swallowed with the resinous material in the side of the mouth until the cheek bulges
- Dried material can be smoked, made into a tea or a chewable paste of leaves, water, sugar or honey, flavoured with herbs
- Users often drink tea or soft drinks at same time or smoke cigarettes
- People unable to chew leaves, khat can be ground and taken as juice (custom in Ethiopia)

Varieties of Marketable Khat Products Ethiopia

- Oromo people in Hararghe recognize 3 traditional varieties
- Classified based on color of young shoots and farmers grade quality based on narcotic effect, physical appearance, demand and market value
- 3 varieties rated according to farmers and khat users

  Dimaa (red)- red tinge (1)
  Withstands harsh conditions, superior quality, highest market value

  Hamarcat (intermediate)(2)
  Broad leaves , less branches

  Goleta/dalacha white or light in color (3)
  Narrow leaves , more branches compared to hamarcat

Harvested Khat- Ethiopia

- Consumable and non-consumable portions
- Chewable portion is succulent and tender
- Leathery part unfit for consumption

  4 major grades based on growth stage of shoots and proportion of chewable parts identified by local farmers, traders, consumers

Uraba *Qudaa* *Qortii* *Fuoqa*

Varieties of Marketable Khat Products Yemen

- Prices vary with soil and climate in which khat grown
- South Yemen 2 common varieties

  Dhali and Yaffaa have low appeal
- North Yemen has larger agricultural areas and numerous varieties of khat(over 40)

  Taizi, Sharqi, Sawti, Khat al wadi, Sharqi

  RED TYPE ("DIMMA") CONSIDERED THE BEST
- Varieties have different effects based on personal preferences

  South Yemen varieties produce more extensive, occasional hallucinations

  North Yemen variety- elicit more or less euphoria, depression, ephedrine

Khatamine(phenylalkylamines) content in Khat

Beckhuster S and Brennessen, R. Journal of Ethnopharmacology, 19, p 269-277 (1987)

Studied variation of khatamines in khat depending on origin and type
Analyzed samples from 4 markets of Ethiopia, Kenya, North Yemen and Madagascar
Different khat types , origin and quality vary considerably

- Kenyan khat: Red Type
  CA(1.6-3.6%), NPE(1.2-1.5%), NE(0.2-0.8%)
  48% mean CA relative to total khatamine content
- Ethiopian khat: All types
  CA(0.8-1.9%), NPE(2.2-7.5%), NE(0.12-0.44%)
  18% mean CA
- Yemeni khat: White Type
  CA(0.086-0.34%), NPE(1.9-2.5%), NE(0.10-0.18%)
  6% mean CA

Typical Dose of Fresh Khat Leaves

100 g fresh khat leaves contain[1]

36 mg cathinone
120 mg cathine
8 mg norephedrine

Higher content in young leaves still growing

1. Schorno, H.X et al. Pharm Acta Helv, 57 pp. 168-176 (1982)

African Khat Consuming Countries

- Indigenous people of Ethiopia and surrounding countries of Somalia, Kenya, Eritrea, Yemen, Djibouti
- Consumption and trading of khat is legal except in Eritrea and Tanzania
- Socially and culturally important in some Muslim countries
- 5-10 million use khat on a daily basis
- Somalia 75% of 8 million chew khat
- Originally confined to natural habitats
- Motorized and air transport spread custom of khat chewing

Yemeni Tradition of Khat Consumption

- More than psychoactive plant
- Social setting of khat chewing analogous to coffee houses and pubs
- 90% male, 30% female chew khat on regular basis
- Dominant role in celebrations (birth, circumcision, marriages), political meetings
- Daily khat sessions (mafrish al 'qat meaning "the council of khat")
- 50-200 g leaves consumed
- People confirm their Yemeni identity and self esteem as segments in class society
- Withdrawal from khat results in social isolation

Khat Effects

- "Natural" amphetamine (CNS stimulant)
- Euphoric state accompanied by talkativeness
- Diminished clarity and concentration sometimes accompanied by nervousness and agitation
- Schizophrenia
- Depression

Psychic Dependence on Khat

" pleasurable effects afforded by khat are a strong inducement for many to procure by any means the necessary supplies at least once a day or to repeat or prolong the periods of chewing, often at expense of vital needs such as food"

Eddy et al. Bulletin of World Health Organization, 32, 721 (1965)

Abuse of Khat

- *Djibouti City, Djibouti (www.irinnews.org) 6 July 2005*

95% male population consume khat based on government estimates

Cheapest bundle costs DF200(US $1.12), good quality khat costs DF3000, ten times laborers salary

Economic activity comes to standstill as men hurry to street stalls selling khat, retire for afternoon of chewing

Leaves you totally exhausted the next day, people don't show up at office

One-fifth household income goes to buying khat

Main reasons for low productivity and efficiency among workers

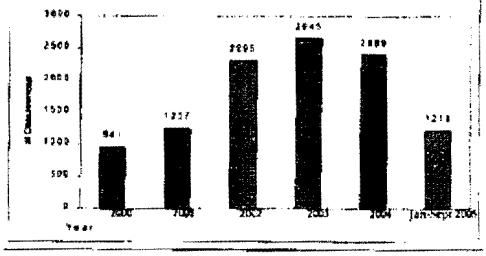
UNDP estimates that Djibouti loses $70 million in foreign currency every year to khat

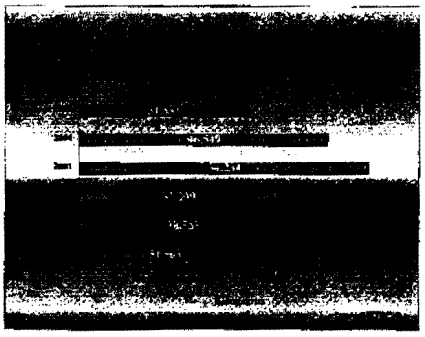
Smuggling of Khat

- Immigrants of East African and Middle East most often responsible for importation, distribution, possession and use of khat
- Shipped packaged in plastic bags or wrapped in banana leaves to retain moisture & freshness

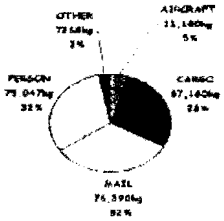
- Smuggled in passenger luggage, overnight express mail, shipped as air cargo and falsely labeled as "vegetables"

Reported Khat Occurrences USA 2000-2005
Source: EPIC





Khat Smuggling Concealment Distribution 2000-2005



OTHER: Vehicles, Residences, Business/Hotels

Source: EPIC

Khat Economics $

- World International Khat Trade: $8C million
- Kenya largest supplier of khat to Somalia and Europe followed by Ethiopia and Yemen
- Lucrative cash crop in Ethiopia(4th largest export). 85-90% exported
- Ethiopian government licenses number of shipments for khat exports and collects taxes
- Taxes on khat important revenue source to governments
- 38% of Yemen's gross national product is associated with the cultivation and export of khat
- 1/2-2/3 arable land cultivated for khat

Value of Khat Smuggled through NYC in 2003

If the DEA estimates are correct and only 5% - 10% of smuggled khat is actually seized then between 315 and 630 ton escaped seizure and entered the USA through New York in 2003. This means that khat traffickers potentially smuggled between **US$126 million and US$378 million** of the substance through New York's two airports alone in one year!

Profits from Khat Trafficking to the USA

- Khat can be purchased in Kenya for about US$1 per kilo.

- Once smuggled to the USA, the price can vary from US$40.00 to US$60.00 per bundle that equates to . . .

US$400 to US$600 per kilo

NYPD / DEA 2005 Operation

Tackling the Khat Traffickers

In August 2005, NY DEA and NYPD began working a case on a KHAT smuggling organization operated from Queens NY.

Surveillance was conducted and five (5) subjects arrested on 18th August 2005, with 87 pounds (39kgs) of khat seized.

The ongoing investigation identifies the suspects as being linked to London, the Netherlands, Somalia, New York, Boston and Minneapolis.

NYPD / DEA 2005 Operation

Trafficking Operation

A phone call is made from the US to the UK and khat is ordered or there is a schedule of deliveries that occur on a regular basis. The shipment is either moved by human courier or by package.

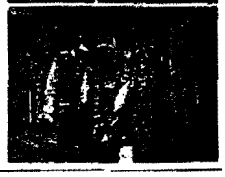
In this operation alone about 80 suitcases a week are being carried by passengers (two per courier) and about 200 packages are shipped via major small parcels companies.

NYPD / DEA 2005 Operation

Each courier stays for several days and is paid about $1000.00.

Once at the hotel the khat is separated into smaller quantities.

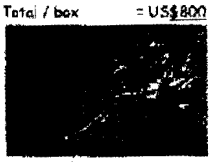
The courier is met at the hotel by the "owner" of the khat who is responsible for distribution to "runners" who transport the khat to various States that have a large Somali population.



NYPD / DEA 2005 Operation

Estimated Weekly Costs

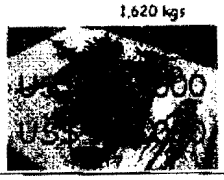
Couriers Costs		Package Costs	
Fee	= US$1,000	Shipping (per box)	= US$300
Flight	= US$1,000	Bribe (per box)	= US$500
Hotel	= US$ 300	Total / box	= US$800
Recruitment	= US$ 200		
Total / courier	= US$2,500		



NYPD / DEA 2005 Operation

Potential Weekly Turnover

80 suitcases @ 10 kilos per case	= 800 kgs
200 packages @ 5 kilos per package	= 1,000 kgs
Estimated total weight	1,800 kgs
Less 10% (for seizures)	1,620 kgs
1620 kilos @ US$400/kg	=
1620 kilos @ US$600/kg	=



NYPD / DEA 2005 Operation

Estimated Potential Weekly Profit

40 Couriers @ US$2,500 = US$100,000
200 packages @ US$800 = US$160,000
1800 kilos of khat = US$ 3,600

Overall Cost = US$263,600

POTENTIAL WEEKLY PROFIT

1620 kilos @ US$400 per kilo less costs = US$385,000

1620 kilos @ US$600 per kilo less costs = US$709,000

Forensic Issues

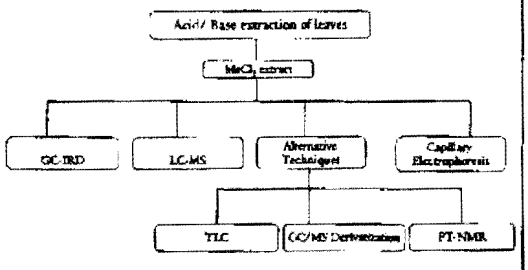
History of Khat Alkaloids

- Cathine was originally thought to be responsible for plant's activity
  - Other nitrogen containing compounds could not be adequately characterized due to lack of technology
  - Most experiments performed on dry plant material
  - Chemical instability of cathinone
- Cathinone highly unstable in presence of oxygen
  - Undergoes enzymatic reduction in plant to (+)-norpseudoephedrine (cathine) and (-)-norephedrine (PPA)
  - Cathine and norephedrine occurs mainly in older plants, as a result of reduction of cathinone during drying and storage
- 1978 UN lab determined cathinone and cathine to be primary and secondary active alkaloids
- Cathinone is one-third as potent as amphetamine & ten times that of cathine
- Cathinone most potent in leaves less than 48 hours old

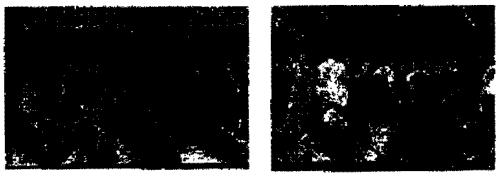
Issues to Consider for Forensic Drug Chemist

- Minimize reduction of cathinone to cathine
- Proper preservation of samples
- Most samples received in plastic bags but are stored in freezer at -10 ° F
  Samples therefore do not need to be analyzed immediately
  Submit khat bundles in paper bags if possible
  Plastic restricts air flow around plant bundles
- Large seizures: representative sample (5-10 bundles)
- Advance notification on of khat shipment to lab
- Rapid workup and analysis to minimize oxidative dimerization of cathinone during isolation step

Khat Analytical Scheme



Khat Exhibits Received at DEA-New York Laboratory

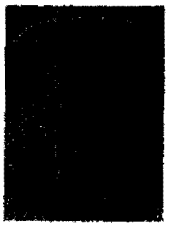


Khat Extraction Scheme

Remove leaves from plant material

Separate leaves from stems

Khat Extraction Scheme



Vacuum filter acidic solution thru 0.45micron fiberglass pad

Khat Extraction Scheme

Vacuum filter acidic solution thru 0.45micron fiberglass pad

Extract acidic layer with $CHCl_3$, three times. Discard $CHCl_3$ layers

Basify acid layer with 5% Na_2CO_3 followed by extracting 3 times with $MeCl_2$

3. Filter $MeCl_2$ extracts over $MgSO_4$

4. Separate extracts into 4 aliquots

Khat Extraction Fresh Leaves Color Changes

Step 1: H_2SO_4 extract

Step 2: Extract with $CHCl_3$

Step 3: Basifying step

LC/MS Sample Preparation

Acid/base extraction khat leaves

$MeCl_2$ portion from base extract

Evaporate to dryness

Reconstitute in LC-MS grade 50 mM / 2mM ammonium formate pH 6.7

LC-MS in-source CID

LC/MS In-Source Collision Induced Dissociation

- Occurs in mid- transport region between capillary exit and first skimmer
- Transfer of energy to an ion through collision with neutral gas
- Ion energies adjusted by varying fragmentor voltage
  - High ion energy: more collisions & more fragmentation
  - Low ion energy : little or no fragmentation (pseudomolecular ion)
  - Compound dependent - experimentally determined via FIA

Method Specifications

HPLC Conditions

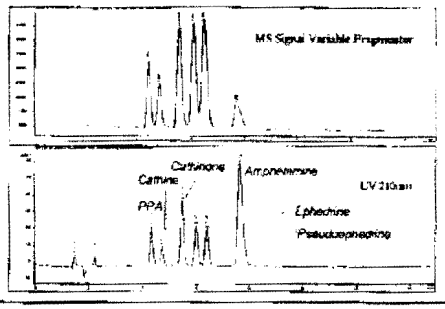
Agilent 1100 HPLC-DAD System
Column: Phenomenex Polar RP column (15 cm x 3.0 mm)

MobilePhase: 93% 10mM ammonium formate pH 3.7: 7% ACN

Flow: 0.5 mL min^{-1}
Injection Volume : 5 uL with methanol solvent wash
Temperature: 40° C
Run Time: 10 min

UV DAD: Signal#1: 250 nm, 20 nm
Signal#2: 210 nm, 10 nm
Reference: 450 nm, 100 nm

Selectivity LC/MS



Method Specifications

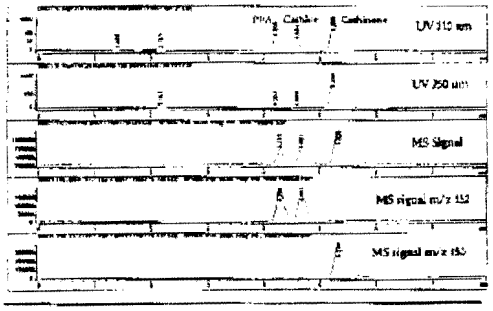
MS Conditions

Agilent 1100 LC/MS system
Mode: Scan Mass Range: 50-400 amu Step Size: 0.15 amu
Polarity: Positive

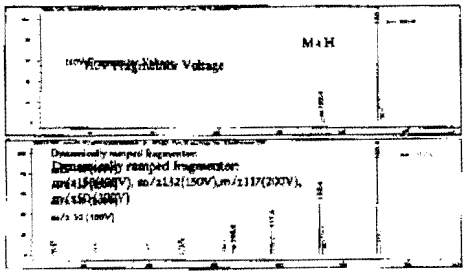
Fragmentor: dynamically ramped in-source CID
Cathinone:
m/z150 (100 V), m/z132 (150 V), m/z117 (200 V), m/z50 (300 V)
Cathine:
m/z152 (80 V), m/z134 (140 V), m/z91 (240 V)

ES Source Settings:
N_2 drying gas: 13 L /min at 350° C
Nebulizer pressure: 30 psig
Capillary Voltage: 3000 V

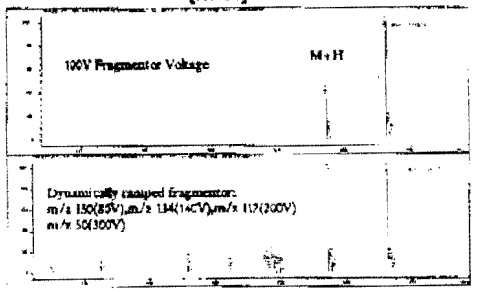
TIC of Khat Extract



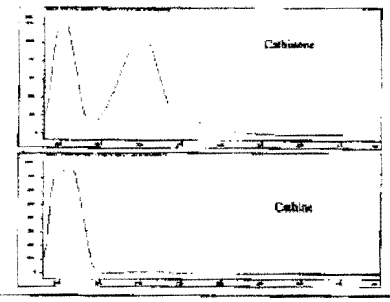
ESI Spectra Cathinone [M+H]$^+$ 150



ESI Spectra Cathine [M+H]$^+$ 152



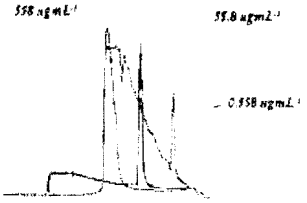
Spectral Discrimination



Cathinone Limits of Detection

Extracted Ion m/z 150

Conc. ugmL⁻¹	S/N	On Column (ng)
5.58	353.1	27.90
2.79	259	13.95
1.116	96	5.58
0.558	76	2.79
0.558	42	2.79
0.1116	11	0.558
0.0558	6	0.279



Cathine Limits of Detection

Extracted Ion m/z 152

Conc. ugmL⁻¹	S/N	On Column (ng)
526	518.1	2630
263	413	1315
105.2	355	526
52.6	304	263
5.26	58	26.3
1.052	17	5.26
0.526	6	2.63

LC-MS results

- Provides conclusive molecular weight confirmation for cathine and cathinone
- Sensitivity optimized for most abundant ions resulting in characteristic spectra
- Reproducible spectra and retention times
- Three dimensional technique (RT's , ESI MS and UV spectra)
- Method validated on 50 actual Khat seizures

GC-IRD

One of the primary methods of choice in identifying major khat components[1]

Sample preparation:

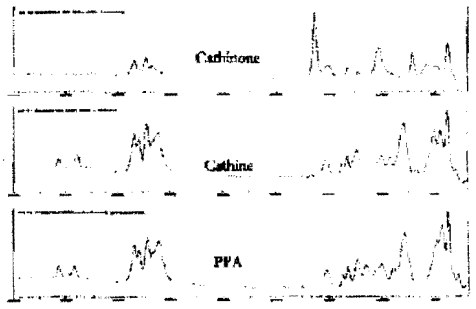
The $MeCl_2$ extract is evaporated to dryness (without heat) and reconstituted in minimal amount of chloroform.

Vapor phase IR of cathinone can be distinguished from norpseudoephedrine (cathine) and norephedrine(PPA) .

PPA produces a different IR , however, it has similar retention time as cathine

[1] Lee, M.M. "The Identification of Catharane in Khat (Catha edulis): A Time Study," Journal of Forensic Sciences, Vol 40, No 1, January 1995, pp 118-121

GC-IRD Vapor Phase Infrared Spectroscopy of Khat Alkaloids



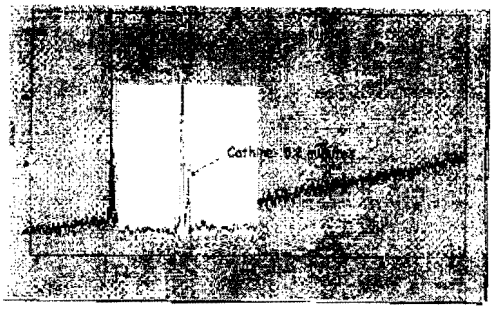
GC-IRD

- Agilent 6890 GC interfaced with a BioRad IRD detector
- Column: HP-5 25 m x 320 µm x 0.52 µm
- Oven: 100°C for 1.50 min , ramp 25° /min to 280 °C for 4 min
- Inlet: 270°C Injection Volume: 2 µl Mode: Splitless
- Column Flow: 2.0 ml min-1

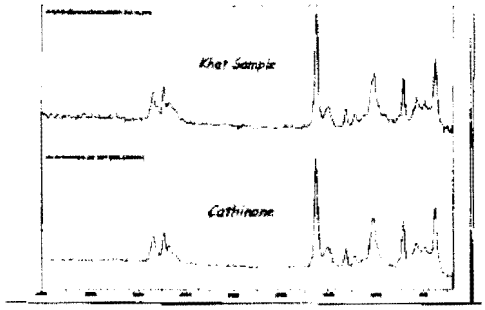
Detector: IRD

- Transfer Line: 280 °C Flow Cell Temperature: 280 °C KBR windows
- Chromatogram type: Gram-Schmidt Optical Resolution 8, 1.5scans/sec

GC-IRD Suspected Khat Seizure



Suspected Khat Seizure



GC-MS

Sample preparation:

The methylene chloride extract evaporated and reconstituted in methanol

Method parameters:

GC Column: HP-5MS 30m x 0.25 mm x 0.25 µm
Temperature program:
90 °C to 120 °C, @ 35 °C/min,
initial time 1.35 min
120 ° C to 290 ° C, @ 45 ° C,
initial time 0.55 min, final hold time 8.5 min
Injection port 255 ° C, transfer line 290° C

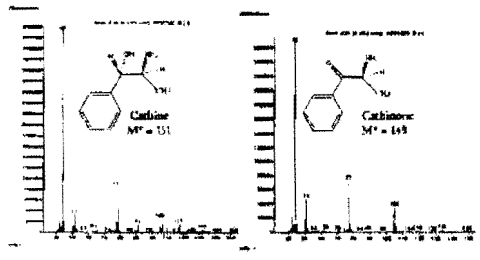
Results:

Cathinone , cathine, PPA all produce similar mass spectra

No conclusive molecular weight confirmation

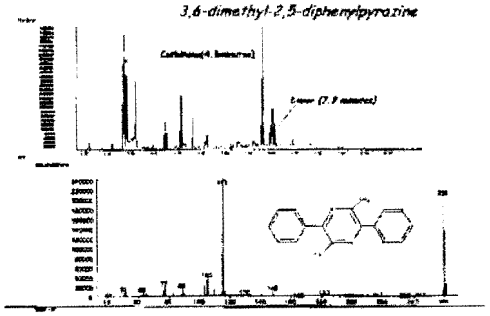
Derivatization needed for conclusive identification

GC/MS of Khat Alkaloids



Oxidative dimerization of cathinone

3,6-dimethyl-2,5-diphenylpyrazine



GC-MS Derivatization

Acylation with TFAA

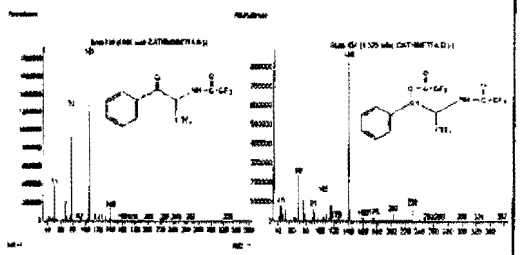
$MeCl_2$ extract + 100-200 µl TFAA , heat 30 minutes at 70 °C

Method parameters:

GC Column: HP-5MS 30m x 0.25 mm x 0.25 µm
Temperature program:
90 °C to 120 °C, @ 35 °C/min,
initial time 1.35 min
120 ° C to 290 ° C, @ 45 ° C,
initial time 0.55 min, final hold time 8.5 min
Injection port: 255 ° C, transfer line: 290° C

Results:
Cathinone can be distiguished from cathine and norephedrine
Cathinone RT: 4.9 minutes
Cathine and norephedrine(PPA) coelute at 4.5minutes

GC/MS Derivitization
Acylation with TFAA



GC-MS Derivatization

Derivatization with S)-(-)-N-Trifluoroacetylprolylchloride(TPC)

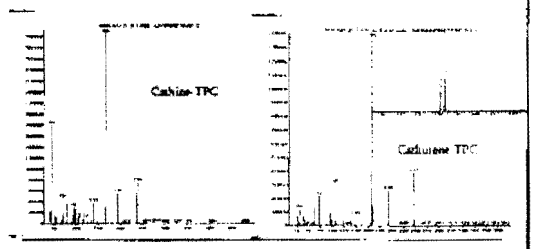
$MeCl_2$ extract + 100-200 µl TPC , heat 30 minutes at 70 °C

Method parameters:

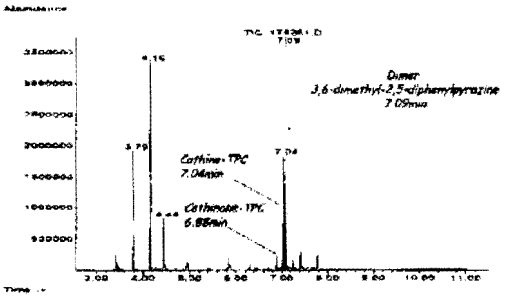
GC Column: HP-5MS 30m x 0.25 mm x 0.25 µm
Temperature program:
90 °C to 120 °C, @ 35 °C/min,
initial time 1.35 min
120 ° C to 290 ° C, @ 45 ° C,
initial time 0.55 min, final hold time 8.5 min
Injection port: 255 ° C, transfer line: 290° C

Results:
Cathinone can be distiguished from cathine and norephedrine
Cathine and norephedrine(PPA) coelute

GC/MS Derivatization with (S)-(-)-N-Trifluroacetylprolylchloride



Case Application- Khat Extract Derivatized with TPC



TLC

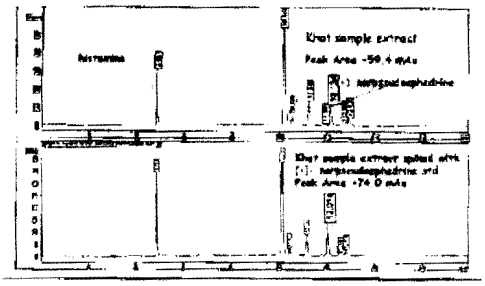
- System I
- Silica Gel 60 F_{254nm}
- MeOH: NH_4OH (100:1.5)
- Locator: short wave UV 254 nm
- Cathinone Rf: 0.25
- Cathine: 0.14 (weak response)
- Norephedrine: 0.14

- System II
- Silica Gel 60 F_{254nm}
- Ethyl acetate:MeOH: NH4OH (85:10:5)
- Locator: 0.5% ninhydrin followed by heating
- Cathinone Rf: 0.46(light purple)
- Cathine Rf: 0.23(pink)
- Norephedrine: 0.23

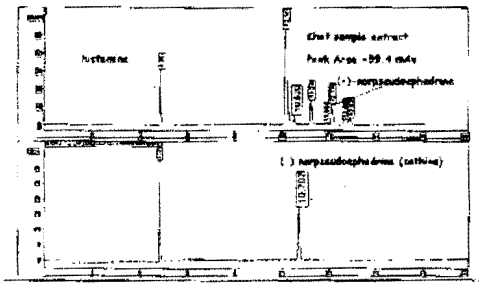
Capillary Electrophoresis

- Why?
- Must determine the optical rotation of (+)norpseudoephedrine in order to confirm cathine based on CFR 1308.14(V)(e)
- Confirmed via migration time matching and spiking with known standard of (+)-norpseudoephedrine
- Migration time matching done for cathinone and norephedrine if possible
  - Method Specifications
- Capillary: 48.5 cm fused silica capillary
- 30mM 2-Hydroxy Propyl B-Cyclodextrin, 175 mM Sodium Monobasic Phosphate, pH 3.5
- Injection Solvent: 35mM Sodium Monobasic Phosphate with 1mg/ml histamine diphosphate marker
- Hydrodynamic Injection: 50 mbar*2 sec
- Voltage: 16kv, 25 °C
- UV: 205 nm

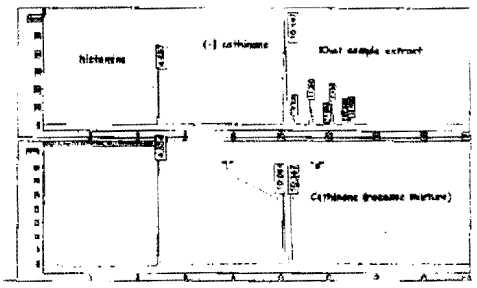
Capillary Electrophoresis Case Application



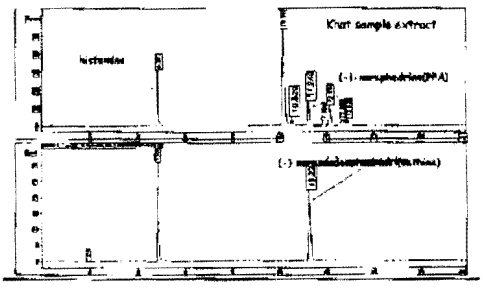
Capillary Electrophoresis Case Application



Capillary Electrophoresis Case Application



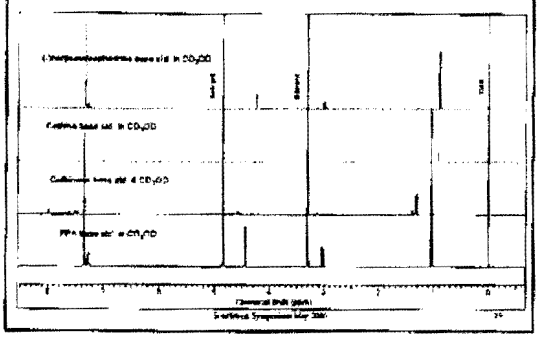
Capillary Electrophoresis Case Application



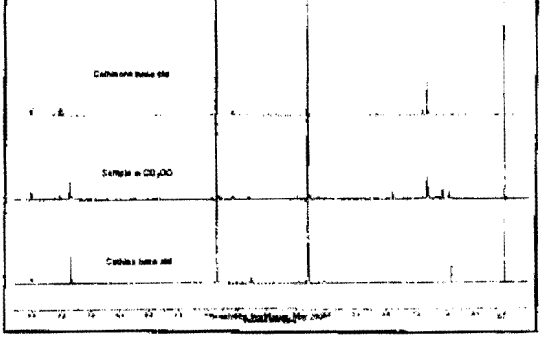
NMR Method Specifications

- Proton 1D NMR
- Varian Mercury 400 MHz NMR Spectrometer
- Number of transients=8, Acquisition time = 3 seconds
- 45 deg pulse, Relaxation delay (d1) = 1 sec
- Sample temperature: 25 deg C.
- Sample in deuterated methanol with 0.05% Tetramethylsilane (TMS) as the 0 ppm reference standard

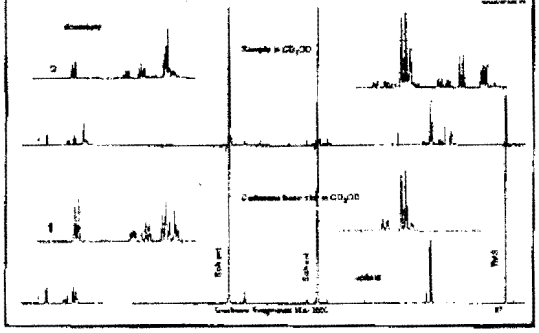
NMR Data in Deuterated Methanol



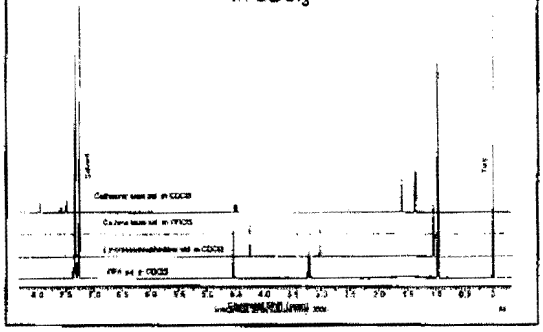
NMR case Application in CD_3OD



NMR Case Application



NMR Spectra of Khat Alkaloids of Interest in $CDCl_3$

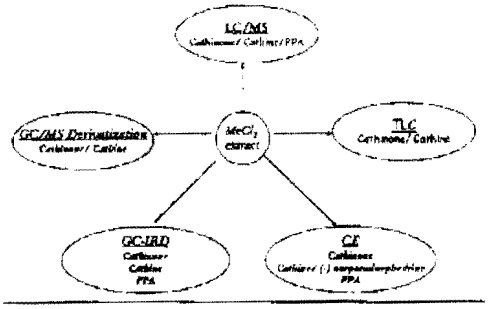


NMR Summary

- *Confirmation of cathinone base in case sample*
- *NMR can differentiate between cathinone, cathine and norephedrine*
- *Work preliminary on actual casework*
- *Use of chiral solvating agent (S)-(-)- 1,1'-bi-2-naphtol to differentiate enantiomers of khat alkaloids*

(JFSCA, 39, No. 4, July 1994, pp. 1026-1038)

Summary of Analytical Techniques



US vs. Hussein
US District of Maine
(230 F Suppl. 2nd 109)

Somali refugee from Portland picks up FedEx package containing khat

Cooperative, didn't know khat contained illegal drugs

Hussein's lawyer argued khat is used in Africa , the way coffee is used in USA

Sentenced to 0-6 months, 1 year probation

State of Ohio vs Samatar
787 NE 2nd 691, Ohio Appl 10 District

Somalian arranged to provide khat to friends getting married

Package seized

Chemist found cathinone but no cathine

Motion for appeal that chemist testimony is scientifically impossible

Defense chemist - "not chemically possible to have harvested khat which contains cathinone and no cathine"

NYPD / DEA 2005 Operation

Links to Terrorism?

Several of the suspects provided statements indicating the sale of khat in the US is extremely profitable, generating millions of dollars in revenue. The proceeds are sent overseas via wire transfers and using the Hawala network. Hawala is an alternative or parallel remittance system. It exists and operates outside traditional banking and financial channels.

The financing of Al Qa'ida has been linked with the Hawala network

In his recently published book, "Holy War on the Home Front," Harvey Kushner, director of the Criminal Justice Department at Long Island University, calls for a congressional investigation into why America's homeland security bureaucracy has not given top priority to an estimated

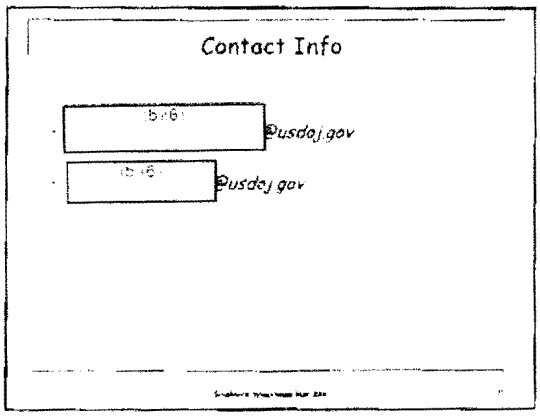
US$1.5 billion

khat smuggling industry into the U.S., which produces an illegal cash flow back to the UK, Somalia, Kenya and Yemen.

Khat Literature

Acknowledgments

- b;6 *Forensic Chemist*
  DEA Northeast Laboratory, NY
- b;6 *Laboratory Director*
  DEA Northeast Laboratory, NY
- b;6 *Intelligence Analyst*
  FBIC, El Paso, TX
- P/C b;6 *, SO18 Aviation Security,*
  London Metropolitan Police, Heathrow Airport


Contact Info
(b)(6)
@usdoj.gov
(b)(6)
@usdoj.gov

VF-Khat-1990-1995

DEPARTMENT OF HEALTH AND HUMAN SERVICES

Food and Drug Administration

21 CFR Parts 510 and 558

Animal Drugs, Feeds, and Related Products; Change of Sponsor

AGENCY: Food and Drug Administration, HHS.

ACTION: Final rule.

SUMMARY: The Food and Drug Administration (FDA) is amending the animal drug regulations to reflect a change of sponsor for a new animal drug application (NADA) from Agri Beef Co. to Elanco Animal Health, A Division of Eli Lilly and Co.

EFFECTIVE DATE: January 14, 1993.

FOR FURTHER INFORMATION CONTACT: Benjamin Puyot, Center for Veterinary Medicine (HFV-130), Food and Drug Administration, 7500 Standish Pl., Rockville, MD 20855, 301-295-8646.

SUPPLEMENTARY INFORMATION: Agri Beef Co., 2201 North 20th St., P. O. Box 47, Nampa, ID 83653, has informed FDA that it has transferred ownership of, and all rights and interests in, approved NADA 140-939 for Monensin/Tylosin liquid B feed to Elanco Animal Health, A Division of Eli Lilly and Co., Lilly Corporate Center, Indianapolis, IN 46285. Accordingly, the agency is amending the regulations in 21 CFR 558.355(f)(3)(ix) to reflect the change of sponsor. Also, FDA is amending the regulations in 21 CFR 510.600(c)(1) and (c)(2) by removing Agri Beef Co. because the firm is no longer the sponsor of any approved NADA's.

List of Subjects

21 CFR Part 510

Administrative practice and procedure, Animal drugs, Labeling, Reporting and recordkeeping requirements.

21 CFR Part 558

Animal drugs, Animal feeds.

Therefore, under the Federal Food, Drug, and Cosmetic Act and under authority delegated to the Commissioner of Food and Drugs and redelegated to the Center for Veterinary Medicine, 21 CFR parts 510 and 558 are amended as follows:

PART 510—NEW ANIMAL DRUGS

1. The authority citation for 21 CFR part 510 continues to read as follows:

Authority: Secs. 201, 301, 501, 502, 503, 512, 701, 706 of the Federal Food, Drug, and Cosmetic Act (21 U.S.C. 321, 331, 351, 352, 353, 360b, 371, 376).

§ 510.600 [Amended]

2. Section 510.600 *Names, addresses, and drug labeler codes of sponsors of approved applications* is amended in the table in paragraph (c)(1) by removing the entry "Agri Beef Co." and in the table in paragraph (c)(2) by removing the entry "022941".

PART 558—NEW ANIMAL DRUGS FOR USE IN ANIMAL FEEDS

3. The authority citation for 21 CFR part 558 continues to read as follows:

Authority: Secs. 512, 701 of the Federal Food, Drug, and Cosmetic Act (21 U.S.C. 360b, 371).

§ 558.355 [Amended]

4. Section 558.355 *Monensin* is amended in paragraph (f)(3)(ix) by removing the number "022941" and adding in its place "000986".

Dated: January 7, 1993.

Robert C. Livingston,

Director, Office of New Animal Drug Evaluation, Center for Veterinary Medicine.

[FR Doc. 93-603 Filed 1-13-93; 8:45 am]

BILLING CODE 4160-01-F

DEPARTMENT OF JUSTICE

Drug Enforcement Administration

21 CFR Part 1308

Schedules of Controlled Substances: Placement of Cathinone and 2,5-Dimethoxy-4-ethylamphetamine into Schedule I

AGENCY: Drug Enforcement Administration, Department of Justice.

ACTION: Final rule.

SUMMARY: With the issuance of this final rule, the Administrator of the Drug Enforcement Administration (DEA) places cathinone and 2,5-dimethoxy-4-ethylamphetamine (DOET) into Schedule I of the Controlled Substances Act (CSA) (21 U.S.C. 801 et seq.). As a result of this rule, the regulatory controls and criminal sanctions of a Schedule I substance under the CSA will be applicable to the manufacture, distribution, and possession of cathinone and DOET. This action is taken to enable the United States to meet its obligations under the Convention on Psychotropic Substances.

EFFECTIVE DATE: February 16, 1993.

FOR FURTHER INFORMATION CONTACT: Howard McClain, Jr., Chief, Drug and Chemical Evaluation Section, Drug Enforcement Administration, Washington, DC 20537, Telephone: (202) 307-7183.

SUPPLEMENTARY INFORMATION: Cathinone and DOET are psychoactive substances which are regulated under Schedule I of the United Nations Convention on Psychotropic Substances, 1971. The United States is a signatory to that Convention. The CSA requires the Secretary of the Department of Health and Human Services (DHHS), should he concur with the scheduling decision of the United Nations Commission on Narcotic Drugs and should he determine that control measures under the CSA are not adequate to meet the requirements of the Convention, to recommend to the Attorney General that he initiate proceedings for scheduling the substance [see 21 U.S.C. 811(d)(3)(B)]. By letter dated July 2, 1987, the Assistant Secretary for Health, acting on behalf of the Secretary, recommended to the Administrator of the DEA that he initiate scheduling actions under the CSA to assure compliance with the international requirements. The Administrator proposed placing cathinone and DOET into Schedule I of the CSA in a notice which was published in the **Federal Register** (52 FR 41736, October 30, 1987). In response to the proposal, an individual requested a hearing if the placement of cathinone and DOET into Schedule I would affect his religious use of a number of psychoactive substances. Because the comment was not filed in a timely manner and the request for a hearing was not made in accordance with the procedures set forth in 21 CFR 1308.45, the request was denied.

The Administrator, by letter of December 13, 1988, requested a scientific and medical evaluation of the Assistant Secretary for Health [see 21 U.S.C. 811(b)]. The Assistant Secretary responded by letter of November 5, 1992 and recommended that cathinone and DOET be placed into Schedule I. Enclosed with the letter were documents which were entitled "Basis for the Recommendation for Control of Cathinone into Schedule I of the Controlled Substances Act" and "Basis for the Recommendation for Control of 2,5-Dimethoxy-4-ethylamphetamine (DOET) into Schedule I of the Controlled Substances Act". Each document presented an evaluation and scheduling recommendation which were based on a review of the factors which the CSA requires the Attorney General and the Secretary to consider [see 21 U.S.C. 811(c)]. The Assistant Secretary found that because cathinone's abuse potential is similar to those of the stimulants, amphetamine and methamphetamine, both of which have high potentials for abuse and are

controlled in Schedule II of the CSA, and because cathinone has not been accepted for medical use in treatment in the United States, cathinone should be controlled in Schedule I. In relation to DOET, the Assistant Secretary found that because its abuse potential is similar to that of the hallucinogens, mescaline, 2,5-dimethoxy-4-methylamphetamine and 2,5-dimethoxyamphetamine all of which are controlled in Schedule I of the CSA, 2,5-dimethoxy-4-ethylamphetamine (DOET) should be controlled similarly in Schedule I.

Cathinone is the major psychoactive component of the plant *Catha edulis* (khat). The young leaves of khat are chewed for a stimulant effect. Enactment of this rule results in the placement of any material which contains cathinone into Schedule I. When khat contains cathinone, khat is a Schedule I substance. During either the maturation or the decomposition of the plant material, cathinone is converted to cathine, a Schedule IV substance. In a previously published final rule, the Administrator stated that khat will be subject to the same Schedule IV controls as cathine, (see 53 FR 17459, May 17, 1988). When khat does not contain cathinone, but does contain cathine, khat is a Schedule IV substance.

While the clandestine synthesis of cathinone has not been encountered by the DEA, the illicit synthesis of the methyl analog, methcathinone, has been encountered at twelve clandestine laboratories. Methcathinone was placed into Schedule I on May 1, 1992 pursuant to 21 U.S.C. 811(h) (see 57 FR 18825, May 1, 1992). In January 1992, the DEA encountered a clandestine laboratory which had manufactured DOET.

Based on the information gathered and reviewed by the DEA, DHHS and the recommendation of the Assistant Secretary for Health, the Administrator of the DEA, pursuant to the provisions of 21 U.S.C. 811(a), finds that:

(A) Cathinone and DOET each have a high potential for abuse.

(B) Cathinone and DOET have no currently accepted medical use in treatment in the United States.

(C) There is a lack of accepted safety for use of cathinone or DOET under medical supervision.

The above findings are consistent with placement of cathinone and DOET into Schedule I of the CSA.

Regulations that are effective on and after February 16, 1993, and imposed on cathinone and DOET are as follows:

1. *Registration.* Any person who manufactures, distributes, delivers, imports or exports cathinone or DOET or who engages in research or conducts instructional activities with respect to these substances, or who proposes to engage in such activities, must be registered to conduct such activities in accordance with parts 1301 and 1311 of title 21 of the Code of Federal Regulations.

2. *Security.* Cathinone and DOET must be manufactured, distributed and stored in accordance with §§ 1301.71–1301.76 of title 21 of the Code of Federal Regulations.

3 *Labeling and packaging.* All labels and labeling for commercial containers of cathinone and DOET must comply with the requirements of §§ 1302.03–1302.05, 1302.07 and 1302.08 of title 21 of the Code of Federal Regulations.

4. *Quotas.* All persons required to obtain quotas for cathinone or DOET shall submit applications pursuant to §§ 1303.12 and 1303.22 of title 21 of the Code of Federal Regulations.

5. *Inventory.* Every registrant required to keep records and who possesses any quantity of cathinone or DOET shall take an inventory pursuant to §§ 1304.11–1304.19 of title 21 of the Code of Federal Regulations of all stocks of these substances on hand.

6. *Records.* All registrants required to keep records pursuant to §§ 1304.21–1304.27 of title 21 of the Code of Federal Regulations shall maintain such records on cathinone and DOET.

7. *Reports.* All registrants required to submit reports pursuant to §§ 1304.34–1304.37 of title 21 of the Code of Federal Regulations shall do so regarding cathinone and DOET.

8. *Order Forms.* All registrants involved in the distribution of cathinone or DOET must comply with the order form requirements of §§ 1305.01–1305.16.

9. *Importation and Exportation.* All importation and exportation of cathinone or DOET shall be in compliance with part 1312 of title 21 of the Code of Federal Regulations.

10. *Criminal Liability.* Any activity with respect to cathinone or DOET not authorized by, or in violation of, the CSA or the Controlled Substances Import and Export Act shall be unlawful.

Pursuant to 5 U.S.C. 605(b), the Administrator certifies that the placement of cathinone and DOET into Schedule I will have no impact upon small businesses or other entities whose interests must be considered under the Regulatory Flexibility Act (Pub. L. 96–354). This drug control action relates to the control of substances that have no legitimate use or manufacturer in the United States.

This action has been analyzed in accordance with the principles and criteria contained in E.O. 12612, and it has been determined that this matter does not have sufficient federalism implications to require the preparation of a Federalism Assessment.

In accordance with the provisions of 21 U.S.C. 811(d), this scheduling action is a formal rulemaking that is required by United States obligations under an international convention, namely the Convention on Psychotropic Substances, 1971. Such formal proceedings are conducted pursuant to the provisions of 5 U.S.C. 556 and 557 and, as such, have been exempted from the consultation requirements of Executive Order 12291 (46 FR 13193). Accordingly, this action is not subject to those provisions of E.O. 12778 which are contingent upon review by OMB. Nevertheless, the Administrator has determined that this is not a "major rule," as that term is used in E.O. 12291, and that it would otherwise meet the applicable standards of sections 2(a) and 2(b)(2) of E.O. 12778.

List of Subjects in 21 CFR Part 1308

Administrative practice and procedure, Drug traffic control, Narcotics, Prescription drugs.

Based upon the notification of the Secretary-General of the United Nations and in accordance with the recommendations of the Assistant Secretary for Health of the Department of Health and Human Services and under the authority vested in the Attorney General by 21 U.S.C. 811(a) and delegated to the Administrator by the regulations of the Department of Justice (28 CFR 0.100), the Administrator hereby amends 21 CFR part 1308 as follows:

PART 1308—SCHEDULES OF CONTROLLED SUBSTANCES

1. The authority citation for 21 CFR part 1308 continues to read as follows:

Authority: 21 U.S.C. 811, 812, 871(b) unless otherwise noted.

2. Section 1308.11 is amended by redesignating existing paragraphs (d)(3) through (d)(28) as (d)(4) through (d)(29) and adding new paragraph (d)(3) to read as follows:

* * * * *

§ 1308.11 Schedule I.

(d) * * *

(3) 2,5-dimethoxy-4-ethylamphetamine.....7399

Some trade or other names: DOET

* * * * *

3. Section 1308.11 is amended by redesignating paragraphs (f)(1) through (f)(4) as (f)(2) through (f)(5) and adding paragraph (f)(1) to read as follows:

§ 1308.11 Schedule I.

* * * * *

(f) * * *

(1) cathinone 1235

Some trade or other names: 2-amino-1-phenyl-1-propanone, alpha-aminopropiophenone, 2-aminopropiophenone, and norephedrone.

* * * * *

Dated: January 7, 1993.

Robert C. Bonner,

Administrator of Drug Enforcement.

[FR Doc. 93-677 Filed 1-13-93; 8:45 am]

BILLING CODE 4410-09-M

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT

Office of the Assistant Secretary for Public and Indian Housing

24 CFR Part 990

[Docket No. N-93-3560; FR 3068-N-04]

Low-Income Public Housing—Project-Based Accounting

AGENCY: Office of the Assistant Secretary for Public and Indian Housing, HUD.

ACTION: Request for comment on estimated reporting and recordkeeping burden.

SUMMARY: This request for public comment is related to the final rule on project-based accounting for low-income public housing that was published on December 23, 1992. It deals with the subject of the burden of information collections contained in that rule. The Department has not changed the burden estimate, but it is inviting further comment from the public.

DATES: Comments are now being accepted by OMB and HUD.

ADDRESSES: Interested persons are invited to respond to this notice by sending comments on the reporting and recordkeeping burden of the project-based accounting requirement, in accordance with 24 CFR part 990, subpart C, to both of the following persons: HUD Rules Docket Clerk, room 10276, Office of General Counsel, Department of Housing and Development, 451 Seventh Street SW., Washington, DC 20410-0500; and HUD Desk Officer, Office of Information and Regulatory Affairs, Office of Management and Budget, 725 Seventeenth Street NW., Washington, DC 20503. Communications should refer to the above docket number and title. A copy of each communication submitted will be available for inspection and copying during regular business hours (7:30 a.m.-5:30 p.m. Eastern Time) at the Seventh Street address.

FOR FURTHER INFORMATION CONTACT: Mr. John T. Comerford, Director, Financial Management Division, Office of Management Operations, Public and Indian Housing, room 4212, U.S. Department of Housing and Urban Development, 451 Seventh Street SW., Washington, DC 20410, telephone (202) 708-1872 (voice) or (202) 708-0850 (TDD). (These telephone numbers are not toll-free.)

SUPPLEMENTARY INFORMATION: In the final rule, published on December 23, 1992 (57 FR 61226), adding a subpart C to 24 CFR part 990, the Department mentioned that the estimated reporting and recordkeeping burden had been challenged by commenters. This Notice explains why the Department has not changed the burden estimate, while inviting further comment from the public.

Numerous objections were raised by commenters in response to the estimated reporting and recordkeeping burden of 1¼ hours per PHA for providing year-end information by project. Commenters argued that project-based accounting (PBA) would increase staff hours tremendously, require computer hardware and software redesign, staff training time, additional staff for handling accounting and reporting detail, increase accounting and auditing fees, and require the hiring of consultants.

The respondents who raised objections to the estimate of burden hours, in HUD's view, have misinterpreted the extent of the intended impact of project-based accounting on the PHA accounting system. For example, respondents assumed that the PBA requirement imposed a mandatory framework of accounting or reporting that would require extensive revision of their existing accounting systems; that separate operating budgets and/or HUD reporting forms would have to be prepared and submitted by project; that separate General Ledgers would have to be maintained by project; that PBA meant the assignment of specific staff to individual projects which would either require the hiring of additional staff or result in idle time for existing staff; that operating subsidy and operating reserves would have to be calculated and maintained by project.

On the other hand, the estimate of burden hours was based on the assumption by the Department that many PHAs, particularly larger PHAs, have existing systems in place that provide for the accumulation and allocation of resources by management area; that little, if any, modification of existing systems would be required in order to further identify consolidated income/expense categories by project or cost center; that the only continuing additional time would be in the preparation of the required year-end information reports for the Board. The elimination in the final rule of the requirement to allocate indirect income/expense among projects/cost centers further ensures that the impact on existing accounting systems will be minimal, even for smaller PHAs. Therefore, the Department did not change the number of estimated burden hours because we believe that, on the average, the ongoing additional time required by the PHA will be limited to preparing the annual project/cost center reports for distribution to the Board.

The Office of Management and Budget is currently reviewing the reporting and recordkeeping burden imposed by the rule and would welcome additional comments concerning the new requirements by housing authorities, and entities that work with them, that have had experience with these new requirements. HUD plans to re-examine the burden estimates after the new PBA requirement is operational, and, therefore, also welcomes comments concerning the burden experienced by housing authorities, especially specific descriptions of the steps taken by the housing authorities, the type of staff or consultant employed for the task, and the time actually taken by each type of staff member to implement the requirements for each project or cost center.

Dated: January 5, 1993.

Grady J. Norris,

Assistant General Counsel for Regulations.

[FR Doc. 93-945 Filed 1-13-93; 8:45 am]

BILLING CODE 4210-33-M

PENSION BENEFIT GUARANTY CORPORATION

29 CFR Part 2602

Ethical Conduct of Employees

AGENCY: Pension Benefit Guaranty Corporation.

ACTION: Final rule.

BASIS FOR THE RECOMMENDATION FOR CONTROL OF
CATHINONE INTO SCHEDULE I OF
THE CONTROLLED SUBSTANCES ACT

Cathinone, chemically 2-amino-1-phenyl-1-propanone, (also norephedrone, alpha-aminopropiophenone, and 2-aminopropiophenone) is a potent stimulant that possesses pharmacological properties closely resembling those of amphetamine. Cathinone is similar in pharmacology and chemical structure to other psychostimulants, including amphetamine and methamphetamine. Cathinone is a controlled substance analogue of these substances, both of which are controlled in Schedule II of the Controlled Substances Act (CSA). In addition, cathinone is not available for medical use in the United States and has no therapeutic application.

Cathinone was added to Schedule I of the Convention on Psychotropic Substances, 1971, by the United Nations Commission on Narcotic Drugs (CND) in 1986. Prior to its international control, cathinone was controlled by various governments including those of France, Kenya, Kuwait, Morocco, Somalia and Yemen. The United States is a signatory member of the 1971 Convention.

At the 1986 CND meeting, the World Health Organization (WHO) recommended that cathinone be placed into Schedule I. The recommendation was based on a scientific and medical review and reports of problems of abuse of cathinone in its naturally-occurring form, that is, as a constituent of the khat plant. Following, the Drug Enforcement Administration determined that cathinone must be placed into Schedule I of the CSA, and initiated procedures to comply with the Convention by publishing in the Federal Register a notice of proposed rulemaking (52 FR 41736-7; October 30, 1987). The FR notice noted that the Secretary of Health and Human Services had accepted the CND decision regarding cathinone and determined that current domestic controls were not sufficient to meet United States international drug control treaty obligations; in accordance with section 811(d)(3)(B), the Secretary recommended to the Attorney General that proceedings be initiated to place cathinone in the least restrictive schedule of the CSA that will fulfill our international obligations.

(-)-Cathinone was found by the United Nations Narcotics Laboratory to be the principle active constituent in the fresh leaf of khat. Khat is the leaf of Catha edulis, a shrub which grows in areas of East Africa and the Arabian peninsula. Khat users, who chew the fresh leaves of this plant, are reported to experience behavioral effects that are similar to those produced by amphetamine. Its effects have been described as "pleasurable" and the behavior of repetitive chewing of khat leaves has been labeled a form of "psychic dependence". Systemic animal studies on the pharmacology of khat could not be conducted until after its active chemical constituents were isolated. Upon drying or within three days after harvesting of the khat plant, cathinone rapidly decomposes into cathine [d-(+)-norpseudoephedrine].

Section 811(d)(3)(B) of the CSA requires that the Secretary of Health and Human Services recommend to the Attorney General that proceedings be initiated

to schedule the substance pursuant to 21 U.S.C. 811(a) and (b). Section 811(b) requires the Attorney General to obtain the Secretary's evaluation and recommendation regarding the control of a drug. The Secretary's evaluation and recvommendation must consider the eight factors listed in 21 U.S.C. 811(c). The eight factors determinative of control for cathinone which are listed in 21 U.S.C. 811(c) are addressed as follows:

(1) Its actual or relative potential for abuse.

Cathinone's effects parallel those of amphetamine's and reflect sympathomimetic activity. When administered to animals, cathinone has been shown to induce a sympathomimetic syndrome, and it causes anorexia, hypermotility and stereotyped oral activities such as licking and gnawing (Kalix and Glennon, 1986). There is also tolerance and cross tolerance to the properties of amphetamine and other stimulants. Cathinone is well absorbed orally and rapidly metabolized. Cathinone's toxicology is also similar to that of amphetamine.

(-)-Cathinone is an effective positive reinforcer, maintaining self-administration. In habitual consumers, khat dependence has been shown to be mild, as evidenced by the presence of craving and tolerance to sympathomimetic and neuroendocrine effects of khat, but with no definite abstinence syndrome (Nencini and Ahmed, 1989). Granek et al. (1988) reported, however, that a substantial number of khat chewers experience persistent hypnagogic hallucinations - attributed primarily to (-)-cathinone.

Many drugs, including substances of the amphetamine-type, induce in animals an aversion to a novel food (i.e., conditioned taste aversion -- CTA) when ingestion is repeatedly combined with administration of the drug. CTA, believed to be a determining factor in the intake of drugs of abuse by man, has been used to evaluate the aversive properties of cathinone. Cathinone possesses weak aversive properties, relative to amphetamine (Foltin and Schuster, 1981).

(2) Scientific evidence of its pharmacological effect, if known.

Cathinone releases dopamine from areas of the brain and norepinephrine from peripheral sites that contain the neurotransmitters. Cathinone blocks dopamine uptake. The release of dopamine produced by both cathinone and amphetamine is considered important in determining the central actions of cathinone. (-)-Cathinone's pharmacological profile and mechanism of action closely resemble (+)-amphetamine's. Cathinone causes release at physiological catecholamine storage sites. Both amphetamine and cathinone (with one-third the potency) induce release at CNS serotonin storage sites. Kalix (1984, 1985) compared releasing effects of (+)-amphetamine and (-)-cathinone of radioactivity from rat striatal tissue prelabelled with ^{3}H-serotonin and found that their releasing effects were similar.

There is evidence that serotonergic pathways play a role in the acute lethal effect of cathinone (Huang and Wilson, 1983). A specific role of serotonergic neurotransmission in the effects of cathinone has not been established in behavioral experiments . Serotonin levels in rat brain do not change with repeated administration of cathinone at high doses. Cathinone and amphetamine both effect serotonergic neurotransmission, but each has no great specificity with regard to release from serotonin storage sites.

Calligaro and Eldefrawi (1987) showed that cathinone and amphetamine are capable of displacing [3H]cocaine binding stereospecifically from a high affinity (KD 35 nM) binding site for [3H]cocaine in rat brain striatum present at 2-3 pmol/mg protein of synaptic membranes. Their potency was lower (IC50 approximately equal to 1 microM), however, than was cocaine's. The dopamine transporter in striatum is the putative "cocaine receptor." Dopamine reduces affinity of the "cocaine receptor."

(±)-Cathinone to (+)-amphetamine each released and blocked uptake of tritiated dopamine in synaptosomal preparations (Wagner et al., 1982). Repeated high doses of each produced long-lasting dopamine depletions in various rat brain regions and decreased synaptosomal dopamine uptake sites. Nielsen (1985) evaluated the effects of (±)-cathinone on neurons containing dopamine and 5-hydroxytryptamine in several rat brain regions (nuclei caudatus putamen, accumbens, amygdaloideus centralis, septi lateralis, preopticus pars suprachiasmatica and dorsomedialis (hypothalami) in vivo. Cathinone decreased levels of metabolite dihydroxyphenylacetic acid (DOPAC) and dopamine in caudatus putamen, accumbens, amygdaloideus centralis and septi lateralis. [Peak effect occurred 30-60 minutes after a dose of 6 mg/kg (i.p.), and had no effect on DOPAC in preopticus pars suprachiasmatica or dorsomedialis (hypothalami)]. Cathinone had approximately 20% the potency of (+)-amphetamine in this effect (Mereu et al.,1983). Kalix (1983) compared relative potencies of cathinone and cathine in inducing the release of radioactivity from dopamine-prelabelled CNS tissue and found that cathinone is about 8-times more potent than cathine.

(-)-Cathinone enhanced the release of prelabelled [3H]dopamine from rabbit striatal tissue, with similar potency as that of (+)-amphetamine (Kalix, 1980[3]). Pretreatment of the tissue with cocaine, which is known to prevent induction of release by (+)-amphetamine, similarly inhibited the efflux increase caused by (-)-cathinone (Kalix, 1981). Slices of rat nucleus accumbens, prelabelled with 3H-dopamine, were superfused with solutions of (-)-cathinone. (-)-Cathinone, as (+)-amphetamine, enhanced release of radioactivity from rat nucleus accumbens tissue.

In similar experiments on rabbit caudate nucleus, catecholamine reuptake inhibitors -- benztropine, nomifensine and mazindol -- blocked (-)-cathinone induced release, indicating that it has to penetrate to intraneuronal sites in order to evoke release. Pharmacologic similarity between (-)-cathinone and (+)-amphetamine extends to cellular level and behavioral effects of (-)-cathinone have been attributed to stimulation of release from central catecholamine storage sites (Kalix, 1982).

Effect of (-)-cathinone on the efflux of radioactivity from isolated rabbit atrium tissue prelabeled with 3H-labeled norepinephrine (I) was

investigated. Preincubation of the tissue with desipramine and cocaine prevented the induction of release by (-)-cathinone. (-)-Cathinone has the same amphetamine-like releasing effect on noradrenergic nerve endings and the cardiovascular symptoms due to release of neurotransmitter from physiological storage sites (Kalix, 1983). (-)-Cathinone had the capacity to induce release from presynaptic catecholamine stores, as evidenced by its effect on efflux of radioactivity from 3H-labeled dopamine-prelabeled rat caudate nucleus tissue (Kalix, 1986).

The enantiomer, (+)-cathinone, was compared by measuring the release of radioactivity in response to it, from tissue slices of various CNS areas in the rat and prelabeled with tritiated neurotransmitters, as indicated below: 3H-labeled dopamine: [nucleus accumbens and nucleus accumbens and nucleus caudate]; 3H-labeled noradrenaline: [atrium and vas deferens]. The enantiomers were each approximately equipotent in inducing release at peripheral noradrenergic endings. The (-)-isomer had about triple the potency of the (+)-isomer, however, at dopamine terminals in the CNS. The releasing effect of cathinone is characterized by some stereoselectivity with regard to dopamine storage sites in CNS, but not with regard to peripheral noradrenergic nerve endings (Kalix, 1986).

Glennon et al. (1981) reported that serotonin antagonists did not interfere with discriminative stimulus properties of cathinone, and rats trained with 5-methoxy-N,N-dimethyltryptamine, a hallucinogen that acts at serotonergic pathways, do not generalize to cathinone.

The behavioral effects of cathinone are due to an amphetamine-like effect traced to the cellular level. The effects of cathinone as a potent CNS amphetamine-like stimulant appear to be related to release of catecholamines from presynaptic storage sites, and amphetamine is known to activate dopaminergic CNS pathways by this mechanism. Chronic administration of cathinone to rats leads to a significant reduction of dopamine levels in the telencephalon, caudate and midbrain (Wagner et al., 1982).

One of the primary symptoms of amphetamine intoxication is hyperthermia and cathinone has been shown to increase rectal temperature of rabbits, and this effect is antagonized by pretreatment of the animals with either pimozide or with haloperidol (Kalix 1980). Cathinone and amphetamine have the same mode of action with regard to their effect on thermoregulation. Cathinone increases the metabolic rate and enhances lipolysis <u>in vitro</u> and <u>in vivo</u> (Nencini, 1980).

Cathinone's effect on locomotor activity and potency after subcutaneous administration to rats approached that of (+)-amphetamine (Yanagita 1979). Dopaminergic structures of the nucleus accumbens are believed to be involved in the locomotor response to amphetamine. The stimulant effect was also observed in monkeys, in which cathinone's self-administration resulted in extreme restlessness and tremor (Yanagita 1979). The time course of the locomotor effect of cathinone was compared in mice to that of cathine and it was rather short-lasting (Zelger et al., 1980). (-)-Cathinone has been shown to have one-seventh (Glennon and Showalter, 1981) to one quarter (Valterio and Kalix, 1982) the potency of (+)-amphetamine in mice, more active than its (+)-enantiomer, and twice as active as (±)-cathinone. Dose response curve of cathinone's effect on

locomotor activity is bell-shaped, i.e. increasing the dose beyond a certain point results in lowering its stimulant effect (Taylor and Snyder, 1970).

(-)-Cathinone and (+)-amphetamine each induced similar degree of hypermotility in rats that were hypophysectomized (Kalix, 1980[1]). Induction of locomotor activity by cathinone was prevented by pretreatment with low concentration of a dopamine antagonist neuroleptic, e.g., haloperidol (Valterio and Kalix, 1982). In reserpinized mice, the stimulating effect of cathinone was antagonized by uptake inhibitors such as nomifensine and mazindol. (-)-Cathinone caused increased locomotor activity in mice characterized by a dose-effect relationship typical for (+)-amphetamine. Pretreatment with reserpine moderately reduced (-)-cathinone's effect (Valterio and Kalix, 1982).

Zelger et al. (1980) investigated the different components of the stereotypical behavior in rats after intraperitoneal injection of different doses of (±)-cathinone, cathine, (+)-amphetamine and apomorphine. The type of behavior induced by cathinone was very similar to that evoked by amphetamine, though its potency was somewhat lower. Cathinone induces stereotyped behaviors similar to amphetamine. Prevention of stereotypical behavior by each substance was attained by pretreatment with an inhibitor of catecholamine synthesis.

Cathinone (5 and 10 mg base/kg) produced circling behavior in rats comparable to that induced by (±)-amphetamine (5 mg base/kg), using rotational test after unilateral lesion of the substantia nigra with 6-hydroxydopamine. Neurochemical studies of rat striatal slices showed that both inhibited reuptake and enhanced release of ^{3}H-labeled dopamine (Zelger and Carlini, 1981). Amphetamine-like drugs induce ipsilateral circling movements; apomorphine and other dopamine agonists induce circling that is contralateral to the site of the lesion.

Comparison of the cardiovascular effects of (-)-cathinone (I) and (+)-amphetamine (II) in dogs demonstrated similar effects. Intravenous injection of 10, 30, 100 mg/kg of each caused almost identical dose-related increases in heart rate and cardiac contractile force in anesthetized dogs. However, 100 mg/kg of (+)-amphetamine produced a significantly greater increase in blood pressure than the same dose of (-)-cathinone. They are similar in producing positive inotropic and chronotropic effects in the heart and being indirectly acting sympathomimetic amines (Kohli and Goldberg, 1982).

In humans, little direct information is known about cathinone's effects; human data that is available concerns khat effects. Khat induces mydriasis, tachycardia, increased respiration, increased blood pressure, blushing, conjunctival congestion, hyperthermia, headaches, insomnia and amphetamine-like subjective effects.

Analgesic effect of cathinone was induced by several nociceptive models in rodents, but only at doses that induce excitation. Cathinone increased reaction time in hot-plate test and reduced number of writhings caused by i.p. administration of acetic acid. In rats, cathinone prolonged reaction time of tail-flick test. Naloxone prevented cathinone antinociceptive actions. Catecholamines, opioid neurotransmitters are involved in the analgesic effect of cathinone (Nencini et al., 1982, 1984, 1988).

Both (±)-cathinone and (+)-amphetamine induced conditioned taste aversion (CTA) in rats, the potency ratio being 1:17 (amphetamine was more potent). Both drugs induced adipsia in deprived rats given access to water for 120 minutes with similar durations of action. The potency ratio in this procedure was 1:4 (Goudie and Newton, 1985).

Cathinone is metabolized mainly during the first pass through the liver and only a small fraction appears in urine along with cathine. Cathinone is absorbed rapidly from the gastrointestinal tract after oral administration. Following, cathinone reaches peak serum levels within less than an hour, and it disappears from serum within about 6 hours (Brenneisen et al., 1990). Four hours after oral administration of 16 mg cathinone, 4.4% was excreted unchanged and 20% as cathine in the urine . After 24 hours, 11% of the cathinone was excreted unchanged and 82% was excreted as cathine in the urine. S/S-(+)-Norpseudoephedrine (phenylpropanolamine) is the principal urinary metabolite in khat users (Guantai and Maitai 1983).

Cathinone has been shown to be stereospecifically transformed to norephedrine (Brenneisen et al., 1986). Cathinone's metabolism differs from that of amphetamine which is mainly inactivated by ring hydroxylation.

The main cathinone metabolites in human urine were identified; possible differences in metabolic pathway of the optically pure isomers and the racemate of synthetic cathinone were studied. The observed biotransformation was stereoselective whereas the 1R keto reduction is stereospecific (Brenneisen et al., 1985). Orally administered cathinone is metabolized to aminoalcohols by reduction of the C-1 keto group and excreted in urine; they were identified as norephedrine and norpseudoephedrine. The two diastereomers, isolated from 24 hour urine samples are only present in the (-)-form with 1R configuration. Cathinone (21-50%) was recovered in the urine as aminoalcohols, 0.6-3.3% as unchanged drug. On comparison of metabolism of the cathinone-isomers and racemate, the ratios of excreted stereoisomers R/S-(-)-norephedrine and R/R-(-)-norpseudoephedrine were differed.

Brenneisen et al. (1986) found that following oral administration in humans 22-52% of cathinone (isomers, racemate) was recovered after 24 hours in urine mainly as aminoalcohols. The main metabolite of S-(-)-cathinone was identified as RS-(-)-norephedrine and the main metabolite of R-(+)-cathinone was RR-(-)-norpseudoephedrine. In <u>in vitro</u> experiments, cathinone, as amphetamine, induces release at physiological catecholamine storage sites. <u>In vivo</u> experiments with respect to their ability to substitute for (+)-amphetamine in rats in drug discrimination test. Since the CNS stimulation caused by amphetamine is attributed to catecholamine release, cathinone and amphetamine may have the same mechanism of action. (-)-Cathinone is considerably greater than that of other structural analogs in induction of release from CNS dopamine terminals. Evidence for involvement of dopaminergic pathways in expression of the cathinone stimulus comes from experiments that demonstrate that haloperidol is capable of antagonizing, in a dose-related manner, the generalization of the amphetamine stimulus to cathinone. Pretreatment with haloperidol reduces cathinone discrimination (Goudie et al., 1986; Schechter, 1986; Kalix and Glennon 1986).

Cathinone enhanced electrically-induced constriction of the isolated rabbit ear artery, with about equal potency to that of amphetamine. In isolated guinea pig atria, cathinone had a positive inotropic and chronotropic effect (potency about twice that of amphetamine and cathine). At a dose of 1 mg/kg cathinone (i.v. in rats), the three substances caused about the same increase of heart rate, while blood pressure also increased but cathinone only about two-thirds that of cathine and of amphetamine. Administration of 1 mg/kg cathinone (i.v. in cats) caused the blood pressure to rise transiently by 30-35 mm Hg. Further, cathinone and amphetamine caused almost identical dose-related increases in heart rate, in blood pressure and in cardiac contractile force.

Analgesic properties of cathinone were established in which high doses were found to prolong reaction time of rats in the hot plate test. Analgesia induced by cathinone is secondary to its CNS-stimulating effect. In the writhing test, doses of cathinone necessary to produce analgesia were much higher than those required in the hot plate test, which indicated that cathinone is not a true analgesic (Knoll, 1979). The writhing test suggested that cathinone analgesia involves activation of alpha-adrenergic receptors. Cathinone's analgesic effect, as revealed by the tail flick reaction of rats, was of very long duration, and that early (30 min.) as well as late (24 hours) cathinone analgesia are prevented by depletion of either catecholamine- or serotonin-stores. Cathinone can induce an analgesic effect by interacting with environmental stimuli.

Cathinone has anorexigenic effects and tolerance develops to this action, with cross-tolerance to amphetamine comparing the drug to amphetamine and cathine by acute and chronic experiments in rat studies. Cathinone was more effective than cathine, and each was less active than amphetamine (Zelger and Carlini, 1980).

(±)-Cathinone (i.p. in rats) upon chronic administration led to substantial decrease in body weight (Zelger and Carlini, 1980). Racemic cathinone was found to be less potent than racemic amphetamine and its effect was short-lasting; tolerance developed to the cathinone effect and the weight-reducing effect disappeared within 3-4 weeks of continuous drug administration. In contrast, tolerance to amphetamine was only apparent after 2 weeks, and its effect persisted for more than 7 weeks. Also, there was development of cross-tolerance between the two compounds; (±)-cathinone and (+)-amphetamine was evaluated by their ability to decrease intake of sweetened milk by rats and it was found that tolerance development caused a shift of the dose-response curve by a factor of 8-12 for cathinone, but only by a factor of 2 for amphetamine.

Development of tolerance to the anorexigenic effect of amphetamine-like substances has been studied with cathinone . The hyperphagic response to a kappa-agonist opioid modified by chronic cathinone administration was studied in rats. Pretreatment with cathinone resulted in increasing the hyperphagic response by a factor of two, and this potentiation was naloxone-reversible (Nencini et al., 1988). Tolerance to the anorectic effect of amphetamine-like substances is associated with sensitization to kappa-opiate mediated activation of food intake. Many drugs, including substances of the amphetamine type, induce in animals an aversion to a

novel food when its ingestion is repeatedly combined with administration of the drug. This is known as conditioned taste aversion, and it has been used to evaluate the aversive properties of cathinone; cathinone is significantly less aversive than amphetamine (Foltin and Schuster, 1981). That cathinone possesses such weak aversive properties is of importance because these are believed to be a determining factor in the intake of drugs of abuse by man.

Foltin and Schuster (1981) measured gustatory avoidance conditioning (relative effect of substances on amount of food an animal consumes) for (±)-cathinone (0 - 16.0 mg/kg). Response for (±)-cathinone was determined in rats for 5 day periods. Food intake was significantly decreased only for the 16.0 mg/kg dose, indicating that cathinone to be less potent in this paradigm than amphetamine. Tolerance developed to this effect with chronic administration of (±)-cathinone and there was cross tolerance to d-amphetamine (Foltin & Schuster, 1982). Foltin and Schuster (1983) determined the relative effects of intragastric administration of various agents on food intake by rhesus monkeys were then determined by delivering a dose once every four days prior to initiation of a feeding session. Dose-dependent decreases in food intake were observed in following descending order of potencies: d-amphetamine, (-)-cathinone, fenfluramine and phendimetrazine.

There is little direct information on toxicity of (-)-cathinone. The majority of toxicity data derives from khat and therefore may be contributed to by other plant constituents. A number of gastrointestinal disturbances have been reported (stomatitis, gingivitis, buccal and esophageal epitheliomas and ulcer). Constipation and anorexia have been reported as have cerebral hemorrhage, myocardial insufficiency and pulmonary edema (McKee, 1987). Roper (1986) reported on bilateral optic atrophy in two individuals, who were long-time users of khat leaves and chewed very large quantities.

Cathinone, (+)-cathinone, and (+)-N-formylnorephedrine each produced leukocytosis that persisted for more than 4 hours in rat studies. (Al-Rashood, 1988).

Reproductive toxicity by the individual cathinone enantiomers was investigated in rats (Islam et al., 1990). There was significant decrease in sperm count and motility and increase in the number of abnormal sperms in cathinone-treated animals. Histopathological examination of testes revealed degeneration of interstitial tissue, cellular infiltration, and atrophy of Sertoli and Leydig's cells in cathinone-treated animals. Cathinone also produced a significant decrease in plasma testosterone levels of the rats. (-)-Cathinone was more potent in effect.

(3) The state of current scientific knowledge regarding the drug or other substance.

Cathinone [INN] is known by the following names: norephedrone; alpha-aminopropiophenone; (±)-2-amino-1-phenyl-1-propanone (racemic form - CAS Type 1 Name); 2-aminopropiophenone; UR 1425; cathinonum [INN-Latin]; catinone [INN-Spanish]; (-)-alpha-aminopropiophenone; (S)-2-aminopropiophenone. CAS Registry Numbers include the following: 5265-18-9; 16735-19-6 (hydrochloride); 75925-46-1 (+ -); 80096-54-4 (R);

76333-53-4 (R; hydrochloride); 71031-15-7 (S); 72739-14-1 (S; hydrochloride). Its molecular formula and weight are $C_9H_{11}NO$ and 149.20, respectively.

Racemic cathinone has been synthesized in an 85% yield with a modified version of the Gabriel synthesis using propiophenone as starting material (Schorno 1979; Brenneisen & Geisshusler, 1985). Resolution of the cathinone isomers was accomplished by diastereomer formation with (+)-beta-camphorsulfonic acid. A stereospecific synthesis has been described using Friedel-Craft's alkylation (Benzene, phosphorous pentachloride, aluminum chloride and methylene chloride) of N-acetyl S-alanine, followed by hydrolysis, giving (-)-cathinone hydrochloride (McClure et al., 1981). In addition, (-)-cathinone has been produced using the racemate of norephedrine as starting material (Berrang et al., 1982). (±)-Norephedrine was resolved into its enantiomers with O,O-dibenzoyl-d-tartaric acid. Conversion of the 1R;2S enantiomer to its N-formyl derivative, followed by oxidization with chromium trioxide in pyridine gave optically pure (-)-alpha-aminopropiophenone in approximately 40% overall yield.

Cathinone is a ketoamine base and as such is very unstable. Due to the easy enolization of the keto group (-)-cathinone racemizes quickly particularly as a free base and in polar solvents. Salts are stable in solid form. The (-)-isomer of cathinone is present in fresh leaves of the plant (Catha edulis Forsk., Celastraceae). l-Cathinone was the principal active constituent in the fresh leaf; isolated from freeze-dried leaves, cathinone rapidly decomposes into less potent substances. Drying of the plant material results in various degradation products or artifacts. The decomposition or transformation products formed by enzymatic reduction [(+)-norpseudoephedrine, (-)-norephedrine, l-phenyl-1,2-propanedione and 3,6-dimethyl-2,5-diphenyl pyrazine] were also isolated and characterized by Szendrei (1980) Therefore, fresh khat may contain a humdred times more cathinone than dried material, which in turn shows an increased content of cathines.

Cathinone has typical amphetamine-like properties and is considerably more potent than cathine. (-)-Cathinone, which is self-administered, is now considered to be responsible for most of the psychoactive properties of khat (Harris, 1986). The pure enantiomers of cathinone were used to study central and peripheral effects of these indirect sympathomimetics in rats and guinea pigs. The (-)-isomer was significantly more potent than the (+)-isomer in stimulating locomotor activity whereas no difference was observed with respect to their cardiac effects. Such variable isomer discrimination may be due to different stereoselectivities of amine uptake mechanisms in target tissues. (Gugelmann et al., 1985)

(-)-Cathinone induces release of catecholamines from storage sites. (-)-Cathinone and (+)-amphetamine have the same mechanism of action. (Kalix and Glennon, 1986). The (+)-amphetamine-like stimulus effects are antagonized by haloperidol in a dose-related manner in rats trained to discriminate between (+)-amphetamine and saline.

(4) Its history and current pattern of abuse.

There are currently no reports of abuse of cathinone except for (-)-cathinone which is naturally-occurring in fresh khat. Khat is an

evergreen shrub or tree that grows wild and is cultivated in East Africa and South Arabia. Khat users after chewing fresh leaves have reported experiencing behavioral effects, attributed to (-)-cathinone, similar to those produced by (+)-amphetamine. Khat chewing is deeply rooted in social life of people in the Middle East and southeastern Africa. The variability of the amount of cathinone in khat of different origin, type and quality correlates with quality estimation (price) of dealers and consumers (Greisshusler and Brenneisen, 1987).

Khat grows in eastern Africa and southern Arabia, but primarily in Democratic Yemen, Djibouti, Ethiopia, Kenya, Madagascar, Somalia, Tanzania and the Yemen Arab Republic. It grows wild at altitudes of 1500-2000 m above sea level. It contains more than 40 alkaloids, glycosides, tannins, terpenoids, as well as the phenylalkylamine substances. Users get a feeling of well-being, mental alertness and excitement. After-effects are usually insomnia, numbness, and lack of concentration. Concern among various parts of the populace is that excessive use may create considerable problems of social, health and economic nature.

Khat chewing has been reported to have started at different times in different parts of Somalia. From random interviews with consumers and non-consumers (7485 people) since World War II, prevalence of the practice has continuously increased and the custom includes many social groups (Elmi, 1986). Some khat users have been reported subject to psychic dependence. In recent years, several cases of khat intoxication observed in the USA and in Great Britain have been reported in the literature (Kalix, 1988). Few reported cases of psychosis due to khat usage are reported elsewhere despite its alleged heavy use. Four cases are reported in the United Kingdom. Additional cases here of psychotic reactions to khat in Somalian males. Features of khat psychoses are described and relationship to amphetamine and ephedrine psychoses is discussed. Forensic aspects of two of the cases that involved homicide and combined homicide and suicide are reported (Pantelis et al., 1989).

In Djibouti, it is estimated that 90% of men and 10% of the women practice khat chewing routinely. In 1981, in Somalia it was estimated that regular khat chewing was increasing and currently involved about 75% male and 7-10% female parts of the population. In 1976, it was estimated that in Democratic Yemen, 50% of the male adult population chewed khat. In 1972, it was estimated in Yemen that approximately 80% of adult men in the major cities and 90% of adult men in villages of regions that produce khat are regular khat chewers. The prevalence is much lower among women and abuse was common among whole families. In the northern part of Yemen, the percentage of khat-dependent individuals in a sample of 27,410 persons surveyed was 60.26% among men and 24.91% among women.

In general, few diseases or conditions among khat users occur with sufficient frequency to permit detailed analysis associated with khat use. Conditions most strongly associated with use by both sexes were histories of gastritis and insomnia, and the general body system groupings of gastrointestinal disorders. In males, the strongest associations were with the histories of anorexia, constipation, insomnia, headaches, and respiratory difficulties. In females, strong positive associations between khat use and acute gastritis, jaundice, bronchitis and hepatic diseases were correlated. Effects of age and residence diminished even further correlations.

(5) The scope, duration, and significance of abuse.

Siegel (1985) warned of possible new trends in drug abuse in the United States, especially among the youth. The five patterns of abuse were described: experimental, social-recreational, circumstantial-situational, intensified and compulsive. In addition to increased use of cocaine, psilocybin mushrooms, psychoactive phenylisopropylamines, phencyclidine, fentanyl, and codeine combined with glutethimide, the possibility of abuse of cathinone and fentanyl analogues have been projected.

Khat users get a feeling of well-being, mental alertness and excitement. Users have been reported to have amphetamine-like symptoms: agitation, restlessness and aggressive or silent, remote and aloof. After-effects are usually insomnia, numbness, and inability to concentrate. Excessive use has been associated with problems of social, health and economic nature (Elmi, 1986). Because of the popularity of khat chewing in social life of people of the Middle Eastern and southeastern Africa, fresh khat has been reported to be imported on a number of occasions into the United States by individuals who have immigrated from those regions.

To date there have been no reports of (-)-cathinone as an individual substance being abused. The likelihood of its abuse has been inferred solely because of abuse data on khat. There are no reports of cathinone illicit manufacture, traffic or abuse. However, for khat, 5 countries (United Arab Emirates, Bahrein, Saudi Arabia, Qatar, and France) have reported seizures of 7.2 metric tons of khat (1981-1983). The FDA has documented 8 entries of khat into the United States. The total amount was 772 kg with individual shipments ranging from 54 kg to 150 kg. The shipments came to Detroit, Michigan and Chicago, Illinois and were shipped by a London trading company. During 1983, DEA documented 2 more entries of khat totalling 54.8 kg (San Francisco and Detroit). Further, during 1984 U.S. Customs Service reported multiple entries of khat (14 kg each) via Dulles International Airport.

In 1957, Public Health Code of France was amended to prohibit importation, exportation, production, possession, trade, and use of khat in any form. The policy of the Ethiopian government would appear to be that khat is a high income crop, giving employment and providing tax revenue. It is not banned. An export monopoly commission is dealing with the business. In Kenya, control measures were introduced in 1939 but not strictly imposed until 1951. In that year, the Prohibition Ordinance was introduced but this only applied to the sale, cultivation, use, and possession of khat in certain areas. The Prohibitive Ordinance remained in force until it was repealed in 1974. Khat is prohibited in Kuwait, Somalia and Morocco. In Madagascar, though cultivation is not prohibited, it is not encouraged; however, exportation is forbidden. Other selected restrictions exist in Yemen.

(6) What, if any, risk there is to the public health.

Currently, the only known abuse of cathinone is in the form of the (-)-isomer and only in the khat plant. Khat is widely used in East Africa and the Arab Peninsula. Khat leaves have been reported to lose their effect

within about three days after harvesting, and this has formerly limited the exportation and expansion of the khat habit beyond regions where the plant grows. However, with modern transportation, the distribution of khat has spread more rapidly and efficiently, bringing about a spreading and a sharp increase in khat consumption. Due to the possibility of air freighting the leaves, khat has now made its appearance in countries far away from the areas of cultivation of the plant. (-)-Cathinone is mainly present in young leaves, in which it may account for up to 70% of the phenylalkylamine fraction. Cathinone is a biosynthetic precursor that accumulates in young leaves, while in adult leaves it undergoes enzymatic reduction to the less active cathine and norephedrine, which are then present at a ratio of approximately 4:1. It has been estimated that 100 grams of fresh khat contain 36 mg cathinone, 120 mg cathine and 8 mg norephedrine.

The clandestine manufacture of cathinone has never been reported, but is feasible; simple chemical processes from common chemical precursors have been published in the literature (Schorno 1979; Brenneisen & Geisshusler, 1985; McClure et al., 1981; Berrang et al., 1982). The initial evaluation of the pharmacological properties of cathinone was made with drug substance obtained through a modified Gabriel synthesis. Subsequently, a synthesis has been described that consists mainly of the oxidation of norephedrine, followed by resolution of the isomers.

Khat ingestion produces sympathetic activation, anorexia, euphoria, increased intellectual efficiency and alertness. (-)-Cathinone is the primary contributor to these effects; its pharmacological actions and those produced by (+)-amphetamine almost overlap.

Principle effects of fresh khat include euphoria and excitation often accompanied by loquacity. High doses induce hyperactivity and sometimes manic behavior. Only a few cases of psychosis have been reported, probably because of the physical limits to the dose that can be absorbed. Khat is also an anorectic. It causes hyperthermia and increased respiration. The active principle of the leaves, cathinone, an alkaloid chemically similar to amphetamine, has been isolated and studied (Kalix, World Health, 1986).

McKee (1987) reported on the acute pharmacological effects of khat in humans which include tachycardia, hypertension, transient facial and conjunctival congestion, headaches, increased respiration and inhibition of micturition. Psychological effects include excitement, increased alertness, anxiety and aggressive behavior. Insomnia and anorexia have been reported. Manic psychosis similar to that associated with amphetamine has been reported in chronic users of khat. Giannini and Castellani (1982) discussed the case of a male 23 year of age with symptoms of manic psychosis and increased sympathetic activity after khat ingestion. The causal role of khat has been verified by visual inspection of plant and chemical identification of phenylpropanolamine in urine.

(7) Its psychic or physiological dependence liability.

The dependence potential of cathinone has been studied extensively in animals. Cathinone is discriminated as amphetamine-like and is readily self-administered by rhesus monkeys. Self-administration by rhesus

monkeys previously trained with cocaine showed high rates of responding for both (±)- and (-)-cathinone. In addition, several physical withdrawal symptoms (undue fatigue, lassitude, shakiness and nightmares), though relatively mild, have been reported in humans (Kennedy 1980).

Cathinone has been compared to, and found similar to, amphetamine in a wide array of operant behavior procedures. The discriminative stimulus properties of drugs in animals are considered to be predictive of their subjective effects in humans. In a series of experiments, cathinone has been shown to generalize to various stimulants, including (+)-amphetamine, cocaine, methylphenidate and pipradrol.

Employing animals trained to discriminate either (+)-amphetamine or (±)-2,5-dimethoxy-4-methyl-amphetamine (DOM) from saline in a 2-lever operant procedure, stimulus generalization studies made it possible to classify substances as either amphetamine-like or DOM-like, and cathinone was evaluated as amphetamine-like. (Glennon, 1986).

In the progressive-ratio test in rhesus monkeys, the final ratio obtained was slightly higher with cocaine than (-)-cathinone. In another progressive ratio experiment in rhesus monkeys, the reinforcing efficacy of (-)-cathinone was comparable to that of (+)-amphetamine (Yanagita, 1984). In drug discrimination experiments, cathinone produced effects like those of amphetamine in rats trained to discriminate amphetamine from saline; however, haloperidol did not block discriminative effect of cathinone at the comparable dose that reduced amphetamine's effect (Rosecrans et al., 1980).

De la Garza and Johanson (1983) assessed (-)-cathinone and (+)-amphetamine abilities to substitute for cocaine in controlling cocaine appropriate responding. Cocaine (0.008-0.5 mg/kg), (+)-amphetamine (0.03-0.25 mg/kg) and (-)-cathinone (0.03-0.5 mg/kg) produced dose-dependent increases in the percentage of cocaine-appropriate responding in rhesus monkeys trained to discriminate cocaine (0.25 mg/kg) from saline under conditions where responding was maintained on one of two levers under a FR 30 schedule of food delivery. At the highest doses tested, cocaine, (+)-amphetamine and (-)-cathinone each produced more than 90% cocaine-appropriate responding, suggesting that they share discriminative stimulus properties. A similar assessment of the discriminative stimulus properties (De la Garza and Johanson, 1985) was observed for pigeons trained to discriminate cocaine (2 mg/kg), with responding maintained under a FR 30 schedule of food delivery. There was complete substitution of cocaine, (+)-amphetamine, and (-)-cathinone for the training dose of cocaine in all pigeons.

Rats trained to discriminate stimulus properties of (±)-cathinone (0.6 mg/kg) from saline, in a 2-lever operant task for food reinforcement, were administered doses of (-)-cathinone, (+)-cathinone, and (+)-cathine. The cathinone enantiomers and (+)-cathine produced patterns of responding similar to training drug; (-)-cathinone (ED50 = 0.22 mg/kg) was the more active of the enantiomers, while (+)-cathinone (ED50 = 0.72 mg/kg) was more active than (+)-cathine (ED50 = 1.61 mg/kg). (Glennon et al., 1984). The dose-response curve after (+)-amphetamine was shown to be parallel to that of cathinone and the ED50 generated was 0.21 mg/kg. Doses of cocaine and methamphetamine were observed to transfer to cathinone cue and each drug exhibited decreased discriminative performance with decreasing

doses. ED50 for (±)-cathinone, (±)-methamphetamine and cocaine were 0.23, 0.17, and 1.97 mg/kg, respectively; the three curves were parallel (Schechter and Glennon, 1985).

Discrimination by rats of 2.0 mg/kg (±)-cathinone in a 2-lever operant task showed dose-related generalization to a wide range of stimulants including (+)-amphetamine, cocaine, methylphenidate, pipradrol and cathine, i.e. (+)-norpseudoephedrine. Haloperidol, chlordiazepoxide, fenfluramine and fentanyl failed to generalize to cathinone, even in large doses. Involvement of dopaminergic systems in the cathinone cue was investigated by examining generalization to apomorphine and antagonism by haloperidol. Apomorphine produced at most 29% generalization to cathinone. Haloperidol, at doses up to 0.3 mg/kg, produced at most 50% antagonism of both the cathinone cue and of the ability of amphetamine to substitute for cathinone (Goudie et al., 1986).

Huang and Wilson (1986) compared the discriminatory stimulus properties of (±)-cathinone, (+)-amphetamine, and cocaine and effects of haloperidol pretreatment on these properties in rats. Greater than 75% of responses occurring on the drug lever occurred with each as training drug and to the three test drugs. Haloperidol administration partially antagonized the stimulus complex induced by (+)-amphetamine and cocaine. (-)-Cathinone was evaluated for its ability to substitute for (+)-amphetamine in rats trained to discriminate between (+)-amphetamine-like stimulus effects (Kalix and Glennon, 1986). Schechter (1986[4]) similarly showed that pretreatment of rats with 0.2 mg/kg haloperidol increased the ED50 of (-)-cathinone from 0.27 mg/kg to 0.47 mg/kg and significantly decreased discriminative performance when co-administered with either 0.15, 0.3 or 0.6 mg/kg (-)-cathinone.

Rats trained to discriminate (+)-amphetamine (0.8 mg/kg) in the operant task were unable to discriminate amphetamine when pretreated with an agent that inhibits dopamine release. Cathinone (0.8 mg/kg) and cocaine (10.0 mg/kg) given to amphetamine-trained rats recognized each as amphetamine. Coadministration of a dopamine inhibiting agent and cathinone totally antagonized the generalization. In the case of cocaine coadministration, cocaine's effects were significantly reduced (Schechter and Boja, 1988).

When trained with (-)-cathinone (0.6 mg/kg), rats showed dose-dependent decrease in discrimination performance with lower (-)-cathinone doses (ED50 = 0.19 mg/kg). Administration of either (±)- or (+)-cathinone produced discriminative responding similar to (-)-cathinone with ED50s of 0.29 and 0.63 mg/kg, respectively, thus establishing the relative potencies of the enantiomers of cathinone. (-)-Cathinone's effect peaked at 15-30 minutes post-administration and lasted 180 minutes. Cathinone was shown to exert discriminative response control within 5 minutes of intraperitoneal injection with a shorter duration than amphetamine and cocaine (Schechter, 1989[1]). Pretreatment with a serotonergic receptor blocker did not affect (-)-cathinone discrimination, whereas pretreatment with 0.2 mg/kg haloperidol, the dopamine receptor blocking agent, attenuated (-)-cathinone discrimination (Schechter, 1986[1]). Schechter (1986[3]) further showed that tolerance to discriminative effects of (-)-cathinone may occur within 10 days of chronic administration and recovery from this observed tolerance occurs within 15 days of ceasing chronic administration.

Using the same standard operant training procedure, but with (+)-amphetamine sulfate (1.0 mg/kg) as training drug, tests of stimulus generalization indicated that cathinone was equipotent with amphetamine and each S-isomer was more active than its respective R-isomer (Glennon, Young et al., 1984).

Self-administration experiments are useful in evaluating the dependence potential and attributing these effects to pharmacological properties. Johanson and Schuster (1981) showed that monkeys trained to lever-press for cocaine respond at higher rates when cathinone is substituted for cocaine, and that cocaine is a more potent reinforcer than amphetamine. It was further shown that (±)-cathinone had equivalent reinforcing efficacy to that of cocaine (Woolverton and Johanson, 1984).

Each suppresses in monkeys responding maintained by a multiple fixed-interval and fixed-ratio schedule for the delivery of food reward (Johanson and Schuster, 1981). Johanson and Schuster (1981) studied the ability of the following positive reinforcers (over a wide dosage range) to maintain responding under a FR10 and FR30 schedule of delivery: (-)-cathinone (0.0008-0.05 mg/kg/infusion), (±)-cathinone (0.0016-0.1 mg/kg/infusion) and (+)-amphetamine (0.0016-0.025 mg/kg/infusion). (+)-Amphetamine was 2-4 times more potent than (-)- and (±)-cathinone which were essentially equipotent.

Both enantiomers of cathinone maintained higher rates of responding than amphetamine. Behavioral effects of cathinone on responding maintained by food were similar to those of (+)-amphetamine. Although (±)-cathinone was less potent than amphetamine, both lower and higher doses of (-)-cathinone maintained responding above saline levels relative to amphetamine. The effects of (-)- and (±)-cathinone were compared to (+)-amphetamine on responding maintained by food; (+)-amphetamine was more potent than both cathinone which were similar in potency. The greater potency of (+)-amphetamine in disrupting food-maintained responding may have limited its ability in the earlier experiment to maintain high rates of responding (Johanson and Schuster, 1981). Both forms of cathinone maintained responding. Although the potency of (-)-cathinone and (±)-cathinone in disrupting food-maintained performance was similar, the (-)-isomer was more potent than the racemic mixture as a reinforcer. The two isomers may have different potency ratios for these two behavioral actions. (Johanson and Schuster, 1981)

Goudie (1985) characterized (±)-cathinone as a psychostimulant with potent reinforcing properties due to amphetamine-like stimulant actions with very weak aversive properties. Operant responding of (±)-cathinone and (+)-amphetamine were compared in rats. Effects of each drug were predominantly suppressive on behavior maintained by a fixed interval of 2 minutes schedule of reward. Both drugs had equivalent durations of action in suppressing responding. The actions of cathinone were qualitatively similar to those of amphetamine in this behavioral test. Furthermore, the observed potency ratio for (±)-cathinone to (+)-amphetamine (1:3) was similar to that reported elsewhere in a range of other behavioral tests (anorexia, adipsia, drug-induced rotation, lethality) for this pair of isomers. The conditioned taste aversion procedure has produced the only major difference (related to the weak potency of cathinone) reported to date between behavioral actions of cathinone and amphetamine.

Woolverton and Johanson (1984) demonstrated that cocaine and (±)-cathinone are each positive reinforcers when delivered intravenously to rhesus monkeys. Three monkeys were allowed to choose between saline and several doses of (±)-cathinone or cocaine as well as between several doses of each substance in a discrete-trial choice procedure. Doses (0.5 to 0.2 mg/kg/injection) of each drug maintained self-administration with higher doses preferred over saline. Doses of (±)-cathinone preferred to saline were then compared to a range of cocaine doses in drug-drug choice. As the (±)-cathinone dose was increased, the cocaine dose had to be increased in order to maintain preference for the latter. Comparison of drug-drug choice data to dose combinations predicted to be chosen with equal frequency revealed the relative reinforcing efficacies of (±)-cathinone and cocaine to be equivalent.

Acutely, cathinone produced anorexia and diuresis in the rat. After 9 days of daily cathinone, tolerance to its anorectic effects had developed. Apparently, tolerance to anorectic effects of an amphetamine-like agent was found to be associated with sensitization to kappa-opiate mediated activation of feeding (Nencini et al., 1988).

In an attempt to identify receptors associated with reinforcing properties of amphetamine, cathinone, cocaine and related phenylethylamines, their potencies in studies of drug reinforced behavior were compared with their binding potencies at monoaminergic uptake sites and neurotransmitter receptor sites. (+)-Amphetamine has a micromolar affinity for dopamine, norepinephrine and serotonin uptake sites as well as for alpha-2 adrenergic receptor sites (Ritz and Kuhar, 1989).

TABLE I below indicates the pre- and postsynaptic monoaminergic sites. Binding experiments indicated that uptake sites for dopamine, norepinephrine and serotonin as well as alpha-2 adrenergic receptors correlated with amphetamine reinforcing effects. Amphetamine had low micromolar affinities for these sites and there was a marked stereospecificity at all of these sites except alpha-2 receptors, with (+)-amphetamine showing much greater potency than (-)-amphetamine. (+)-Amphetamine was most potent at norepinephrine uptake sites and alpha-2 sites, and least potent at 5-HT uptake sites. Reinforcing potencies are compared. The phenylethylamines which exhibited reinforcing properties were more potent at noradrenergic sites than at dopamine uptake sites. Amphetamine-related drugs which have not been shown to be behaviorally reinforcing bind to both dopamine and norepinephrine uptake sites with the lowest potencies. Binding to the 5-HT transporter was found to be significantly, but inversely, related to reinforcing properties of amphetamine and related phenylethylamines. The inverse relationship suggests that greater inhibition of 5-HT uptake from the synapse results in subsequent decreases in responding for amphetamine-related drugs.

[In addition, K_i values of amphetamine at other brain monoamine sites not believed to be related to reinforcing effects were indicated as follows, respectively for (+)- and (-)- isomers: at D_1 (greater than 1000 and 750) and D_2 dopaminergic (both greater than 1000), alpha-1 (52.78 and 113.10) and beta (90.76 and 58.67) adrenergic and 5-HT_1 (both greater than 1000) and 5-HT_2 (37.88 and 9.61) serotonergic receptors were determined. (±)-Cathinone comparative potency for the 5-HT_2 receptor site was provided (K_i = 27.56 uM) (Ritz and Kuhar, 1989)].

TABLE I (Ritz and Kuhar, 1989): POTENCIES OF AMPHETAMINE AND RELATED COMPOUNDS IN BIOCHEMICAL AND SELF-ADMINISTRATION STUDIES.

Relative behavioral potencies of amphetamine and related drugs were determined from studies of drug reinforcement. S.E. values for K_i values (mean of 3 to 5 assays) were less than 10% of the values. n.a., not available.

	BIOCHEMICAL STUDIES Ki Values (uM)				SELF-ADMIN STUDIES	
	Dopamine transporter	5-HT transporter	Norepinephrine transporter	Alpha-2 noradrenergic receptor	Relative behavioral potency	Subjects
(-)-Cocaine	0.64	0.14	1.60	n.a.	1	
(+)-Amphetamine	3.6	10.50	0.82	2.37	0.21	Rhesus monkey Dog, Baboon
(±)-Cathinone	19.36	150.5	3.67	3.13	0.26	Rhesus monkey
(-)-Amphetamine	31.2	50.1	6.64	2.94	0.64	Baboon
(+)-Ephedrine	148.8	138.2	16.55	13.39	2.63	Rhesus monkey

(8) Whether the substance is an immediate precursor of a substance already controlled under the Controlled Substances Act.

Cathinone is not an immediate precursor, as defined by 21 U.S.C. 802(23), of any substance already listed in a schedule of the CSA.

Recommendation

After consideration of the eight factors determinative of control of a substance [21 U.S.C. 811(c)], which are referred to above, the FDA recommends that because cathinone's abuse potential is similar to those of amphetamine and methamphetamine, both of which are controlled in Schedule II of the CSA, and because cathinone has not been accepted for medical use in treatment in the United States, cathinone should be controlled in Schedule I.

The necessary criteria for placing a substance into Schedule I of the CSA are set forth in 21 U.S.C. 812(b)(1), as follows:

(A) The drug or other substance has a high potential for abuse.

Cathinone's potential for abuse is equivalent to that of amphetamine which is listed in Schedule II -- the most restrictive schedule of control for a drug with an accepted medical use. Cathinone elicits many of the same pharmacological responses as this psychostimulant, including sympathomimetic activity, development of tolerance and cross-tolerance with amphetamine, being well absorbed after oral administration and being rapidly metabolized, being a positive reinforcer maintaining self-administration, being discriminated as amphetamine-like in animals experiments, and demonstrating signs of an abstinence syndrome upon withdrawal. Its easy clandestine synthesis is feasible, though documented abuse of cathinone has been solely that of the naturally-occurring (-)-cathinone enantiomer in khat.

(B) The drug or other substance has no currently accepted medical use in treatment in the United States.

A New Drug Application (NDA) for cathinone has not been submitted to FDA for review and approval; there are no reports in the literature of any application of cathinone for medical purposes; these factors are consistent with cathinone lacking a currently accepted medical use in treatment in the United States.

(C) There is a lack of accepted safety for use of the drug or other substance under medical supervision.

As an NDA regarding a therapeutic application of cathinone has never been submitted to the FDA for evaluation, the safety for use of cathinone under medical supervision has never been determined or accepted.

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