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# Microgram Bulletin

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# Welcome to *Microgram Bulletin*

This is the first unclassified issue of *Microgram Bulletin*. Some background for our new subscribers: *Microgram* was started as a law enforcement restricted forensic chemistry newsletter in November 1967 by the Bureau of Drug Abuse Control (BDAC) and Bureau of Narcotics and Dangerous Drugs (BNDD). It was continued by the Drug Enforcement Administration (DEA) from 1973 to April 2002, when it split into *Microgram Bulletin* and *Microgram Journal* (the latter being dedicated to the publication of research articles).

This issue also marks the first electronic posting of *Microgram Bulletin* (and separately, of *Microgram Journal*). Both publications may be accessed at the following website:

http://www.dea.gov/programs/forensicsci/microgram/index.html

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**- INTELLIGENCE ALERT -**

**VERY LARGE ECSTASY LABORATORY SEIZED IN JAKARTA**

The DEA Singapore Country Office and DEA Special Testing and Research Laboratory (Dulles, Virginia) recently assisted in the seizure of a very large MDMA/amphetamine operation in Tangerang, Jakarta, Indonesia. The laboratory was seized by the Indonesian National Police,

and consisted of a chemical synthesis laboratory and a separate tabletting operation. The synthetic route to MDMA involved reductive amination of 3,4-methylenedioxyphenylacetone (MDP2P or PMK) with methylamine and sodium borohydride; the hydrochloride salt was produced by gassing an acetone solution of the free base with commercial hydrochloric acid gas. The amphetamine was synthesized via the Leuckart reduction route, and was crystallized as the sulfate salt. Small amounts of MDA were also produced by contamination of the amphetamine syntheses with MDP2P (and MDA was therefore identified in some of the resulting tablets). The production scale was 60 - 90 kilograms per batch, corresponding to 428,000 to 642,000 tablets per batch, based on a standard dosage unit of 140 milligrams of MDMA per tablet. Over 100 kilograms of MDMA hydrochloride (>90 percent purity), over 10 kilograms of amphetamine sulfate (>90 percent purity), over 100 kilograms of caffeine, and over 1.5 metric tons of MDP2P (determined to be of Chinese (PRC) manufacture) were seized at the site. Intelligence indicated that the laboratory had been in operation for approximately three years, and also that approximately 3.5 metric tons of MDP2P had already been processed prior to the laboratory's seizure.

The concomitant seizure of the tabletting operation (and all its associated tablet dies) indicated that the operation was producing tablets with 23 different monograms. Source determination (toolmark) analysis indicated that fifteen of these monograms are connected through an unusual single scored tablet face (see Photo 1 and Table I), while the other eight were connected by an

Photo 1

## Table I - Descriptions of Monograms Depicted in Photo 1

**Lightning bolt** on blue, round (8.1-8.2 mm diameter) tablets, partial single score, biconvex, average tablet weight 210-230 mg/tablet;

**"dR"** on orange or green, round (8.1-8.3 mm diameter) tablets, partial single score, biconvex, average tablet weight 200-210 mg/tablet;

**Outline of squirrel** on yellow, round (8.1 mm diameter) tablets, partial single score, flat/convex, average tablet weight 210 mg/tablet;

**Outline of apple** on green, round (8.1 mm diameter) tablets, partial single score, biconvex, average tablet weight is 210 mg/tablet;

**"2000"** on green or blue, round (8.1-8.3 mm diameter) tablets, partial single score, biconvex, average tablet weight 210-230 mg/tablet;

**"ABC"** on blue, round (8.1-8.2 mm diameter) tablets, partial single score, biconvex, average tablet weight 210 mg/tablet;

**"U2"** on orange, round (8.1-8.2 mm diameter) tablets, partial single score, biconvex, average tablet weight 210 mg/tablet;

**"J-A"** on orange, round (8.1 mm diameter) tablets, partial single score, biconvex, average tablet weight 210 mg/tablet;

**Stylized flying horse** on orange, round (8.1-8.2 mm diameter) tablets, partial single score, biconvex, average tablet weight is 210 mg/tablet;

**Honda "H" company trademark** on orange or green, round (8.1 mm diameter) tablets, partial single score, biconvex, average tablet weight is 200-250 mg/tablet;

**Chili peppers** on orange or green, round (8.1 mm diameter) tablets, partial single score, biconvex, average tablet weight is 205-210 mg/tablet;

**Outline of heart** on pink, round (8.1 mm diameter) tablets, partial single score, biconvex, average tablet weight 210 mg/tablet;

**Stylized lobster (or fish)** on red, round (8.1-8.2 mm diameter) tablets, partial single score, biconvex, average tablet weight is 210 mg/tablet;

**Toyota company trademark** on red, round (8.1 mm diameter) tablets, partial single score, biconvex, average tablet weight is 210 mg/tablet;

**no monogram** (partial single score on each side) on pink or brown, round (8.1 mm diameter) tablets, partial single score, biconvex, average tablet weight is 210-250 mg/tablet;

**"234"** on orange or blue, round (8.1-8.3 mm diameter) tablets, partial single score, biconvex, average tablet weight 205-210 mg/tablet.

unscored tablet face (see Photo 2 and Table II). Most of the tablets contained a mixture of MDMA and caffeine; some also contained from trace to small amounts of amphetamine and MDA. Additional seizures submitted to the Special Testing and Research Laboratory's Source Determination Program indicated widespread distribution of these tablets in the United States, Australia, Myanmar (Burma), the People's Republic of China, and elsewhere.

Photo 2

**Table II - Descriptions of Monograms Depicted in Photo 2**

**"?" [question mark]** on green, round (8.1-8.2 mm diameter) tablets, unscored, flat/beveled, average tablet weight is 240 mg/tablet;

**Outline of butterfly** on blue, round (8.1 mm diameter) tablets, partial single score, flat/convex, average tablet weight 205 mg/tablet;

**Stylized flying dove or peace dove symbol** on light blue, round (8.2 mm diameter) tablets, unscored, flat/beveled, average tablet weight is 235 mg/tablet;

**"A1"** on brown, round (8.0-8.1 mm diameter) tablets, unscored, flat/beveled, average tablet weight is 210 mg/tablet;

**Stylized Chanel company trademark (double Cs, back-to-back and overlapping)** on red, round (8.1 mm diameter) tablets, unscored, flat/beveled, average tablet weight is 240 mg/tablet;

**"FOR" and "YOU" in two lines** on pink, round (8.1 mm diameter) tablets, unscored, flat/beveled, average tablet weight is 200 mg/tablet;

**"KISS" inside lips** on orange, round (8.1 mm diameter) tablets, unscored, flat/beveled, average tablet weight is 220 mg/tablet;

**Stylized horseshoe (Etienne Aigner company trademark; stylized "A" and "E")** on orange, round (8.1-8.2 mm diameter) tablets, unscored, flat/beveled, average tablet weight is 240 mg/tablet.

## - INTELLIGENCE ALERT -

## KETAMINE ON SUGAR CUBES IN CARROLL COUNTY, MARYLAND

The Maryland State Police Crime Laboratory (Pikesville, Maryland) recently received a submission of 34 sugar cubes, each individually wrapped in aluminum foil, net mass 85.3 grams, suspected LSD (see Photo 3). The exhibits were discovered by a mechanic who was performing a state inspection on a vehicle, and were turned over to Maryland State Police. The cubes were white, standard sized, and had no outward discoloration. However, they did not fluoresce under ultraviolet light, and analysis of a chloroform extract by GC/MS, GC/FID, and UV spectrometry indicated not LSD but rather ketamine. This is the first time the Crime Laboratory has received a submission of ketamine-laced sugar cubes.

Photo 3

[Editor's Notes: According to the analyst, submissions of aluminum foil-wrapped sugar cubes to the Crime Laboratory are not unusual; however, most such submissions contain LSD. This likewise appears to be the first exhibit of ketamine-laced sugar cubes reported to *Microgram Bulletin*.]

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## - INTELLIGENCE ALERT -

## MDMA "MIMIC" ASPIRIN TABLETS IN EASTERN OHIO

The DEA North Central Laboratory (Chicago, Illinois) recently received 60 yellow tablets with a raised heart logo on one side, suspected Ecstasy (MDMA) (see Photo 4). The tablets were purchased in and nearby Warren, Ohio, by agents from the DEA Youngstown Resident Office, and were round and biconvex, measuring 7.5 mm x 4.5 mm x 2.1 mm, weighed 185 milligrams each, and were film coated with a white interior. Analysis by MS and IR, however, indicated not MDMA but rather aspirin (not quantitated).

Photo 4

[Editor's Notes: DEA/Youngstown indicates that these tablets are frequently sold as Ecstasy in eastern Ohio and neighboring regions. Interestingly, this product does not appear to be

listed in the FDA database for approved Over-the-Counter medications. However, an inquiry on a national pharmacists' list server indicated two manufacturers of this or highly similar products, Smart Pharmaceuticals, Inc. (Vancouver, Washington), and TimeCap Labs, Inc. (Farmingdale, New Jersey). In both cases, the tablets contain 81 milligrams of aspirin, and are intended for use as "preventive medicine" against heart attacks (this information courtesy of Dr. Donald H. Williams, Executive Director, Washington State Board of Pharmacy).]

* * * * *

## HEROIN SUITCASE FRAMEWORK-LINERS IN MIAMI, FLORIDA

The DEA Southeast Laboratory (Miami, Florida) recently received a large green suitcase with an internal framework-liner consisting of a hard, reddish colored, woodlike material, suspected to contain heroin (see Photo 5). The suitcase was seized at the Miami International Airport by the U.S. Customs Service from a passenger arriving from Cali, Colombia. The net mass of the removed material was about 3.64 kilograms. Analysis by GC, GC/MS, and FTIR-ATR confirmed 52 percent heroin hydrochloride and lidocaine (not quantitated). The supporting matrix was soluble in methylene chloride, but not in methanol, and was suspected to be a non-polar polymer (not further identified).

Photo 5

* * * * *

## PIPERAZINE MIXTURE TABLETS IN CHICAGO, ILLINOIS

The Cook County Sheriff's Police Department Forensic Laboratory (Maywood, Illinois) recently received 150 rose-colored tablets, imprinted with the Chanel logo, suspected 3,4-methylenedioxymeth-amphetamine (MDMA) (see Photo 6). The tablets were seized by the Cook County Sheriff's Police Department in Chicago from two Bosnian nationals, and were allegedly from the Philadelphia area. The tablets were approximately 10 x 4 millimeters, weighed approximately 450 milligrams each, and had a moist "mash" consistency rather than the standard dry powder form. Analysis by GC/MS, however, indicated not MDMA but rather a mixture of 1-benzylpiperazine (BZP), 1-(3-trifluoromethylphenyl)piperazine (TFMPP), and *ortho*-methoxyphenylpiperazine.

Photo 6

Standards of all three chemicals were acquired and submitted to GC/MS analyses to confirm the identifications (see Figures 1 - 3 on pages 8, 9, and 10). This was the Forensic Laboratory's first encounter with these type tablets.

The following articles and Intelligence Briefs have more information about one or more of the above chemicals:

1) Legal Ecstasy (MDMA)? Forensic Drug Abuse Advisor 2001;13(8):60.
2) BZP and TFMPP: Chemicals Used to Mimic MDMA's Effects. Microgram Bulletin 2002;35(5):123.
3) deBoer D, et al. Piperazine-like Compounds: A New Group of Designer Drugs-of-Abuse on the European Market. Forensic Science International 2001;21(1-2):47.
4) Recent Notifications Concerning BZP, TFMPP, 2C-T-7, and GBL. Microgram Bulletin 2002;35(7):177.
5) Unusual Piperazine Mixture in Alliance, Ohio. Microgram Bulletin 2002;35(8):190.

[Editor's Notes: These tablets appear to be quite similar to those reported in the next Intelligence Brief, below. Note that a compact red powder also containing a similar mixture of these same three piperazines was reported in the August 2002 issue of *Microgram Bulletin*. That exhibit was seized in Alliance, Ohio (Reference 5 above). Also note that *ortho*-methoxyphenyl-piperazine is sometimes referred to as "OMP"; however, this terminology has not yet been widely accepted.]

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## PIPERAZINE MIXTURE TABLETS IN THE BALEARIC ISLANDS (SPAIN)

The Laboratory of Drugs in The Balearic Islands (Spain) recently received five round red tablets (net mass 2.296 grams) with an unidentifiable logo on one side and single score on the opposite side, suspected Ecstasy (MDMA) (photo not available). The tablets were seized by the Guardia Civil at a beachside disco on Ibiza Island. Analysis by GC-FID and GC/MS, however, indicated not MDMA but rather a mixture of 1-benzylpiperazine (BZP), 1-(3-trifluoromethylphenyl)-piperazine (TFMPP), and methoxyphenylpiperazine (isomer not determined). This was the first submission of these type tablets to the Laboratory of Drugs. Two small, noncommercial bottles of ketamine were also seized with the tablets. None of the exhibits were quantitated.

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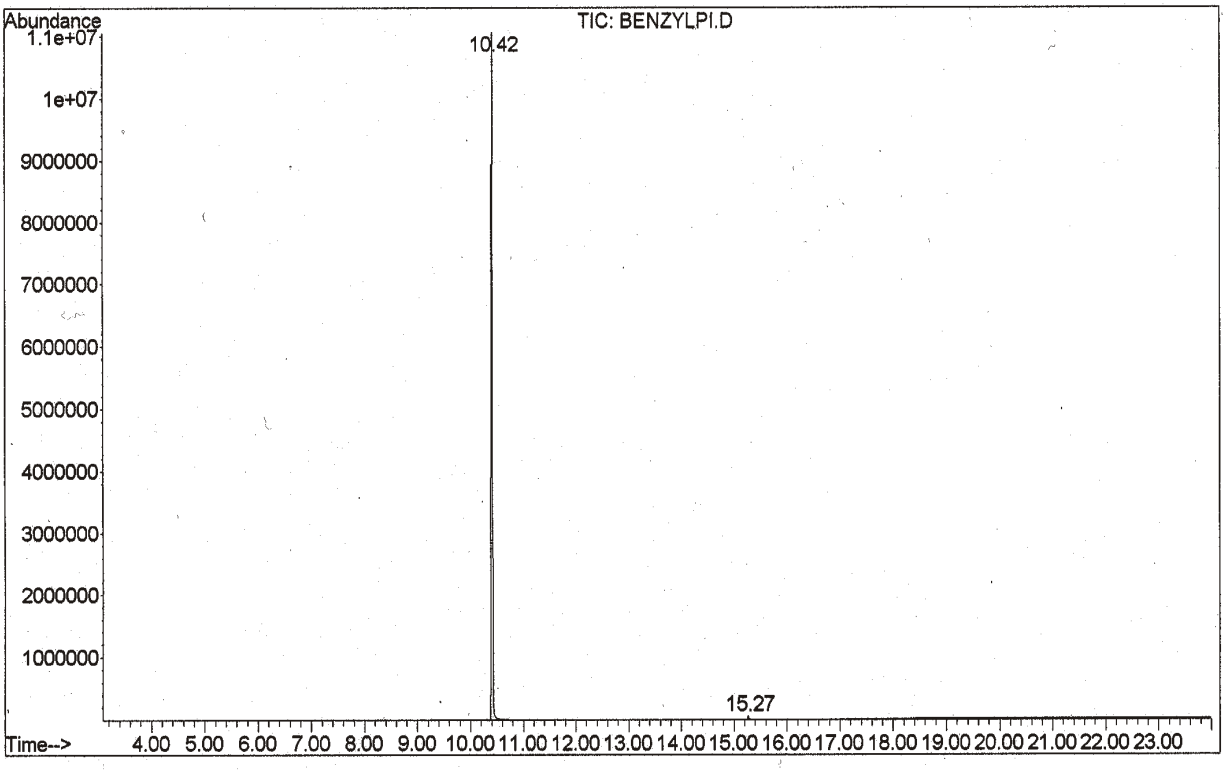
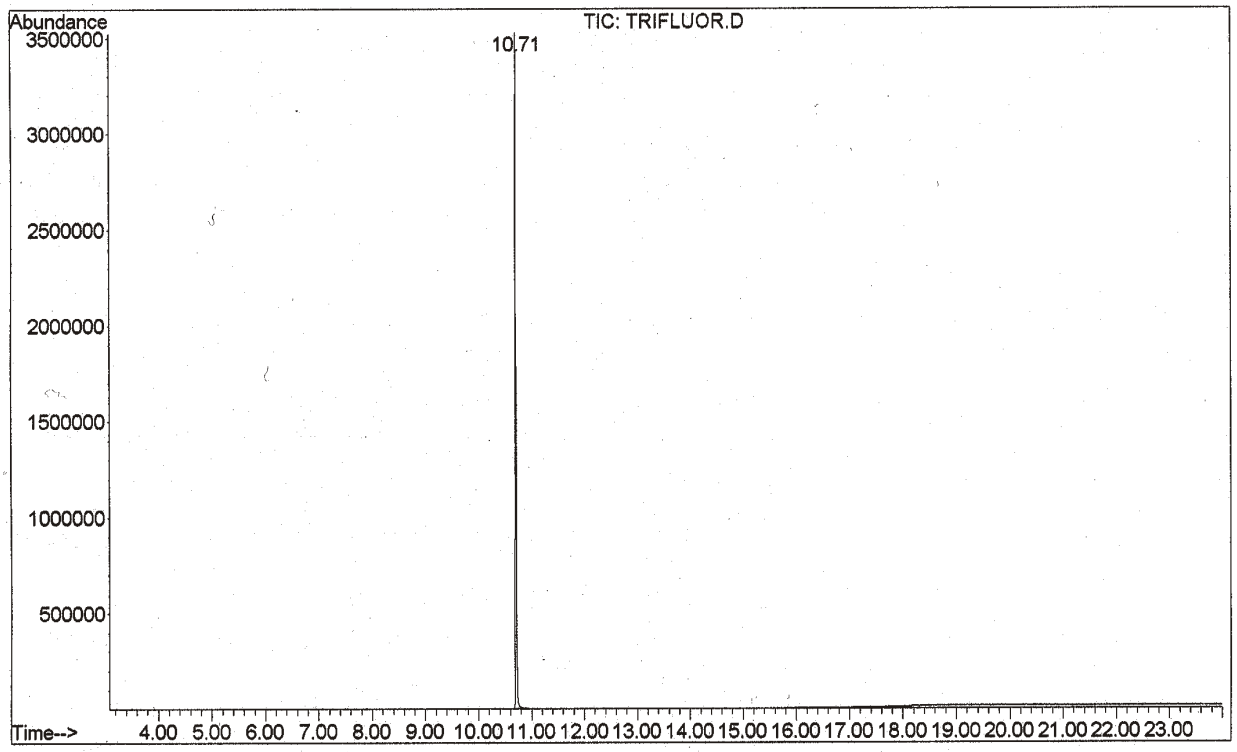
**Figures 1a - b**

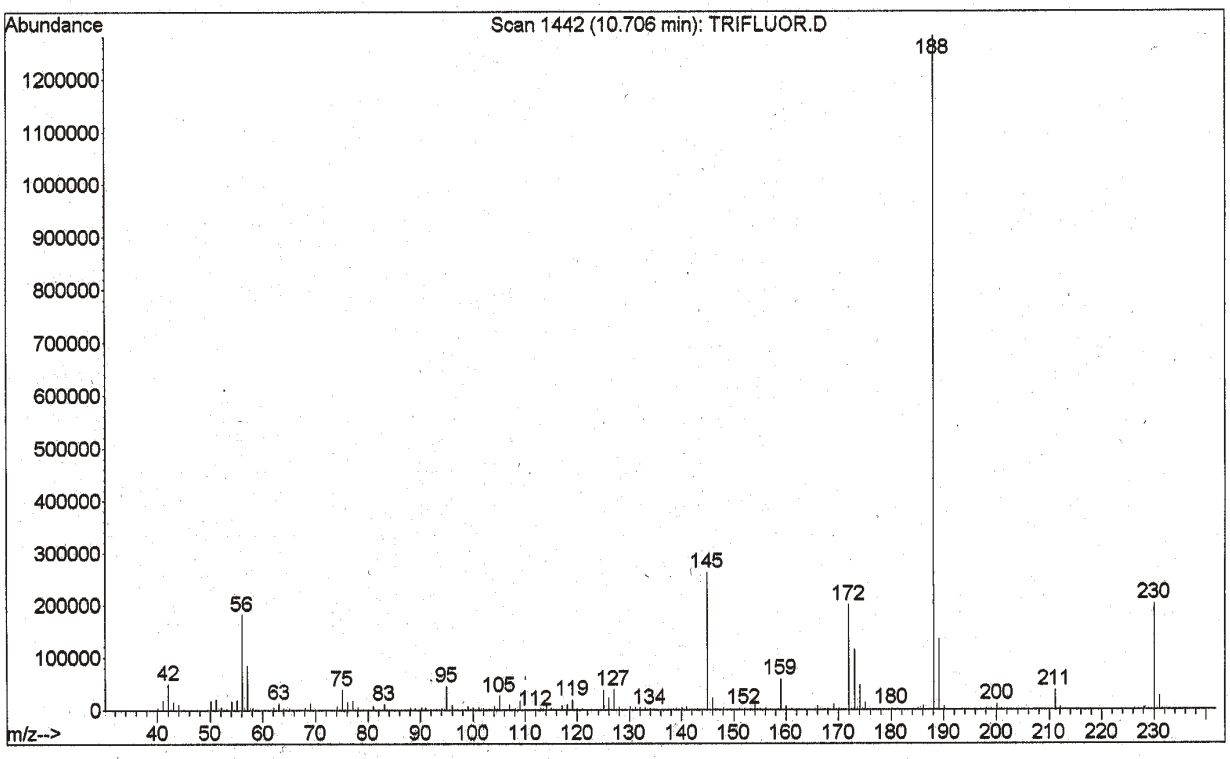
**Total Ion Chromatogram and Mass Spectra of 1-Benzylpiperazine (BZP)**



**Figures 2a - b**

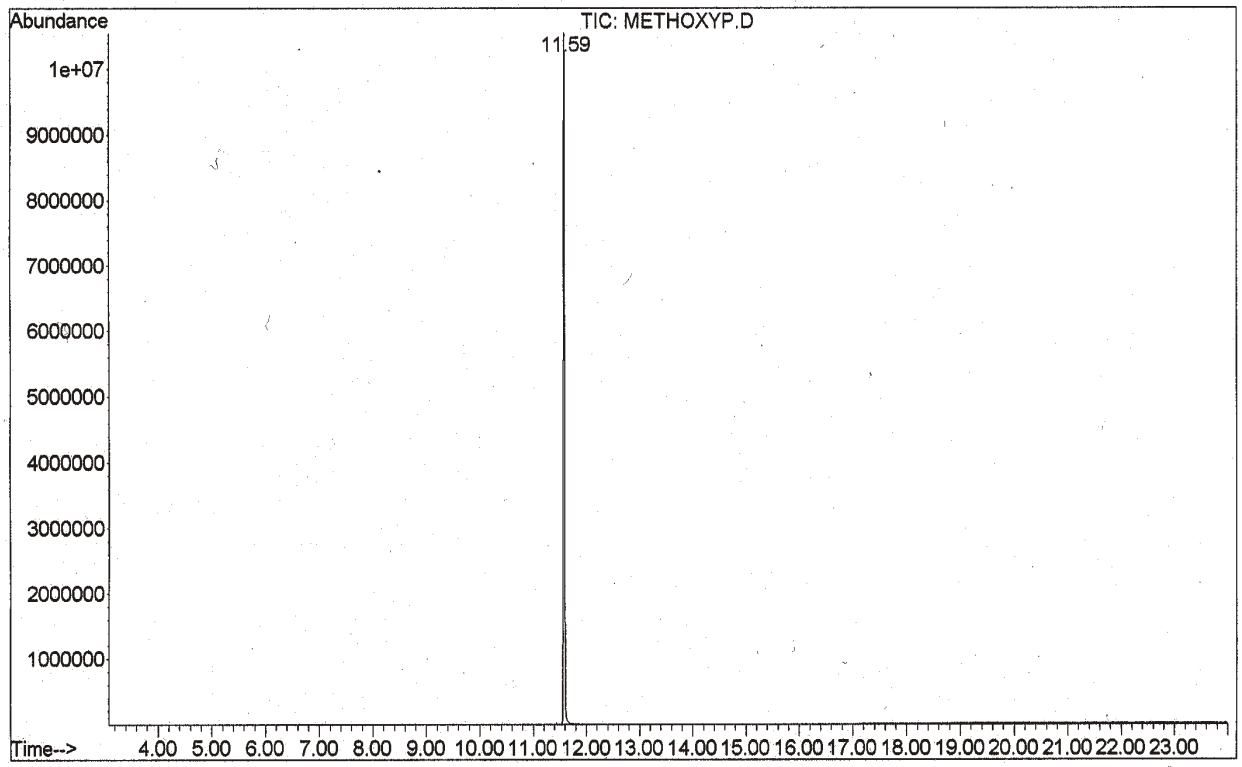
**Total Ion Chromatogram and Mass Spectra of 1-(3-Trifluoromethylphenyl)piperazine (TFMPP)**

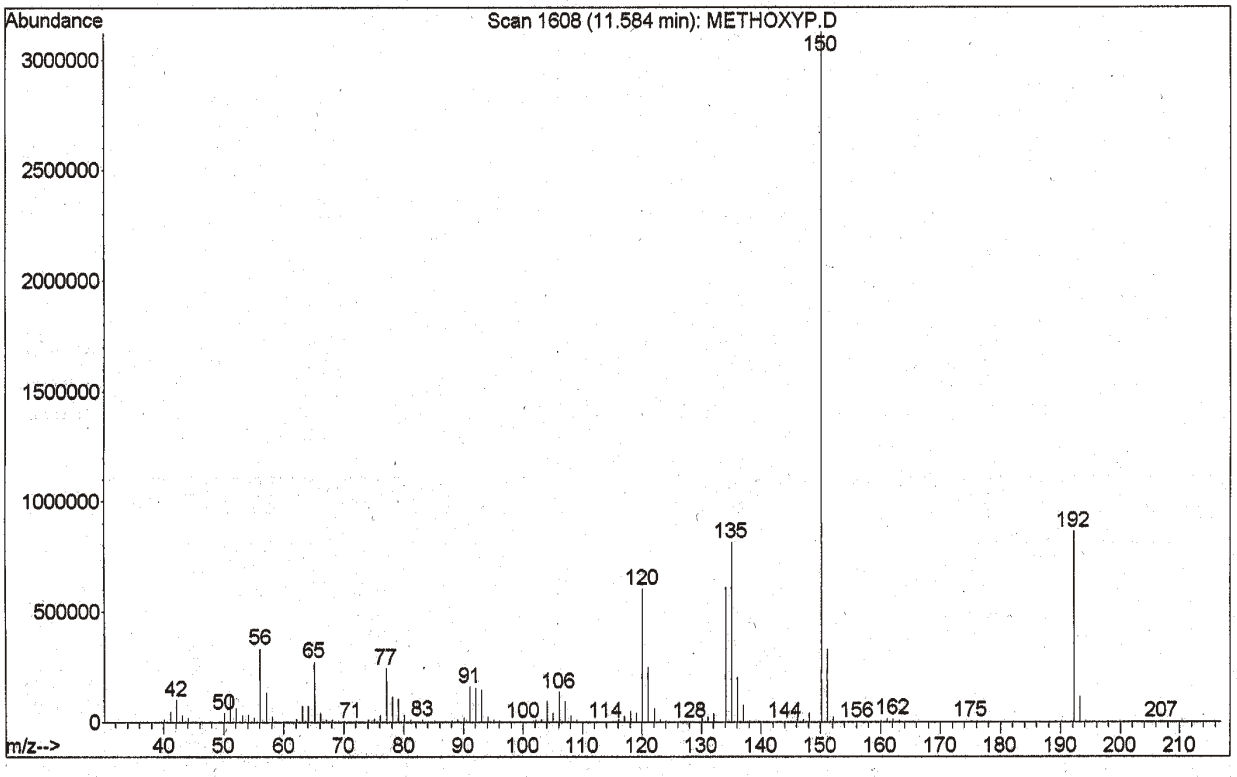


**Figures 3a - b**

**Total Ion Chromatogram and Mass Spectra of *ortho*-Methoxyphenylpiperazine**



# Technical Communication

## Butorphanol

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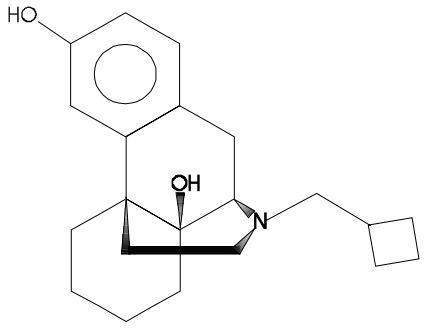
**Drug Enforcement Administration**
**Southeast Laboratory**
**5205 N.W. 84th Avenue**
**Miami, FL 33166**

Butorphanol tartrate is an opioid agonist-antagonist analgesic used for pain management in humans and is marketed under the brand name Stadol NS® (Bristol-Myers Squibb Co.) For veterinary use, butorphanol is prescribed as an analgesic and antitussive under the trade names Torbutrol® (Fort Dodge) and Torbugesic® (Fort Dodge).[1,2,3]




**Butorphanol**[4]

Chemical Name: 17–(Cyclobutylmethyl)morphinan-3,14-diol
Chemical Formula: $C_{21}H_{29}NO_2$; M.W. = 327.5
(Tartrate) = $C_{21}H_{29}NO_2 \bullet C_4H_6O_6$ ; M.W. = 477.6
CAS #: [042408-82-2]
(Tartrate) = [58786-99-5]
Melting Point (Tartrate) = 217 – 219° C
Therapeutic Category (Human): Analgesic (Narcotic)
(Veterinary): Analgesic, Antitussive
Solubility (Tartrate) = Soluble in dilute acid; slightly soluble in water and methanol, practically insoluble in ethanol, chloroform and ether.[5]

**Commercial Butorphanol Preparations**

Human

Stadol® (Bristol-Myers Squibb Co) - Butorphanol tartrate injection: 1 mg/mL in 1 mL vial; 2 mg/mL in 1, 2, and 10 mL vials.

Stadol NS® (Bristol-Myers Squibb Co) - Butorphanol nasal spray: 10 mg/mL.

Animal

Torbutrol® (Fort Dodge) - Butorphanol tartrate injection: 0.5 mg/mL; 10 mL vials.

Torbutrol® (Fort Dodge) - Butorphanol tartrate tablets: 1 mg, 5 mg (Figures 1 and 2), and 10 mg tablets; bottles of 100.

Torbugesic® (Fort Dodge) - Butorphanol tartrate injection: 10 mg/mL; 50 mL vials (Figure 3).

**Instrumentation and Supplies**

Mass spectra (Figures 4 and 5) were obtained on a Hewlett-Packard 6890 GC /5973 MSD using a HP 5MS, 5% phenyl methyl siloxane, 30 m (length) x 0.25 mm (internal diameter) x 0.25 µm (film thickness) column. Temperature programming began at 120˚C for 0.80 minutes, followed by a ramped run at 25˚C per minute to 300˚C, where the temperature was held for 2 minutes. Column flow was 1.2 mL per minute with an average velocity of 41 cm per second. The inlet was set on a 100:1 split mode with an initial temperature of 250˚C. The total inlet flow was 122.6 mL per minute. The scan parameters were set at a Low Mass of 35 amu, High Mass of 500 amu, and a threshold of 150.

Fourier transform infrared spectra (Figures 6, 7 and 8) were obtained with a Nicolet Magna 560 with a potassium bromide (KBr) beamsplitter and a Deuterated Triglycine Sulfate (DTGS) KBr detector. A Durascope Dicomp™ ATR accessory with a 3-bounce Diamond ATR element was also utilized. KBr was IR grade. The resolution was set at 4.000 $cm^{-1}$ for 32 scans between 4000 $cm^{-1}$ and 550 $cm^{-1}$. The mirror velocity was 0.6329 cm per second.

Vapor phase infrared spectra (Figure 9) were obtained with a 6890 GC/BioRad IRD II Infrared Detector using a HP 5, 5% phenyl methyl siloxane, 25 m x 0.32 mm x .52 µm column. The temperature parameters began at 50˚C for 1.50 minutes, followed by a ramped run at 35˚C per minute to 290˚C, where the temperature was held for 3 minutes. Column flow was 1.5 mL per minute with an average velocity of 28 cm/sec. The inlet was set at a splitless mode with an initial temperature of 260˚C. The purge gas was nitrogen at 50.0 mL per minute.

Nuclear magnetic resonance (NMR) spectra (Figures 10, 11, and 12) were obtained with a Varian Gemini 300 Nuclear Magnetic Resonance Spectrometer (FT-NMR, 300 MHz). A 1D observed proton experiment was run for each sample, with the number of transients set to 64. Deuterated chloroform ($CDCl_3$), deuterated methanol ($CD_3OD$), and deuterated water ($D_2O$) were all obtained from Aldrich.

The butorphanol tartrate standard was supplied by Sigma-Aldrich (lot number 47H1023), with a purity stated at 99.4 percent. Conversion to the free form base was accomplished by dissolution in 1N NaOH (aq) with subsequent extraction with $CDCl_3$ for the NMR and $CH_2Cl_2$ for the GC/IRD and FTIR. The extraction for the FTIR was dried over 50˚C on the heated ATR plate.

**Discussion**

Effective October 31, 1997, butorphanol, including its salts and optical isomers, was placed into Schedule IV of the Controlled Substances Act (CSA), Section 1308.14, paragraph (f) (2).[2,6] This action was in response to increasing reports of diversion and abuse of butorphanol following the introduction of the

Stadol NS nasal spray in 1992.[1] For example, in the March 1997 issue of *Microgram,* the Division of Forensic Science in Roanoke, Virginia reported an increase in the number of Stadol NS nasal spray submissions.[7] Significantly, veterinary prescriptions of butorphanol have also been subject to abuse. In one such case, a woman was found to be taking her dog to various veterinarians and providing false statements attesting to the canine's cough and collapsing trachea (ailments were consistent with a therapeutic regimen requiring Torbutrol®). In this manner, the perpetrator obtained 7,568 dosage units in 180 visits to veterinarians.[9] Following her arrest, a DEA Diversion Investigator involved with the case reported that the tablets were being dissolved in water and the resulting solution injected with a hypodermic syringe. The Investigator also reported the scene as being rife with drug paraphernalia, and also that friends of the subject had been solicited into the scheme.

Not surprisingly, butorphanol has also been linked to recreational drug use. Tennessee veterinarian Timothy A. Williams, DMV, whose office is close to a college campus, has had to rigorously restrict butorphanol prescriptions to clients with valid veterinary requirements, and then only after a valid patient-client-veterinarian relationship has been established, due to recreational abuse by the students. According to Dr. Williams, butorphanol is colloquially referred to by the students as "Torbo."

Figure 1 - Torbutrol® 5mg

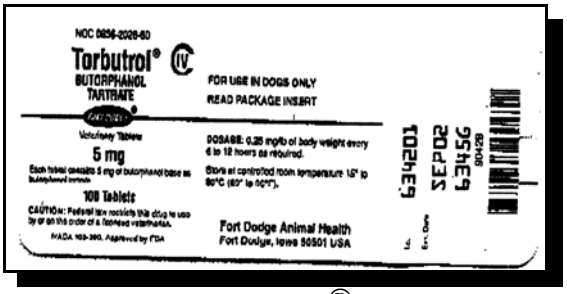



Figure 2 - Torbutrol® Packaging

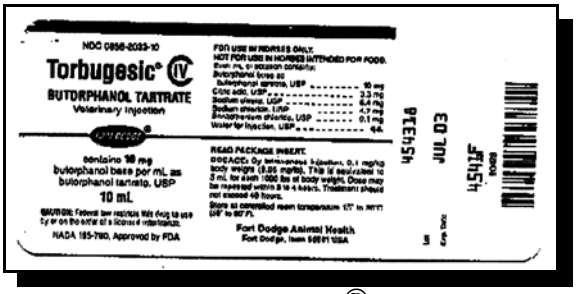



Figure 3 - Torbugesic® Packaging

Note: Pictures of Stadol are also available in Physicians' Desk Reference, 53rd Edition

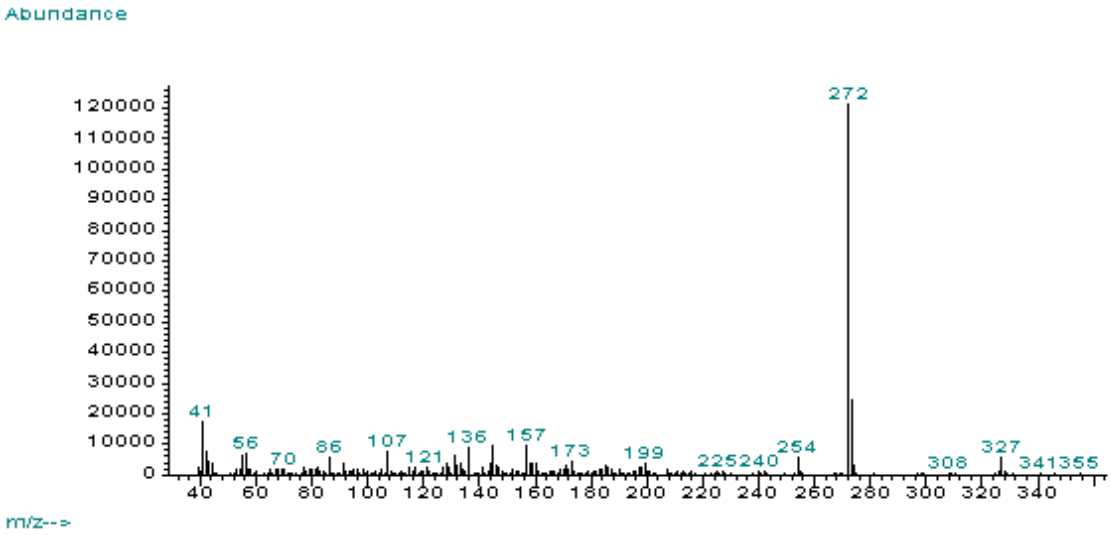



Figure 4 – Mass Spectrum of Butorphanol

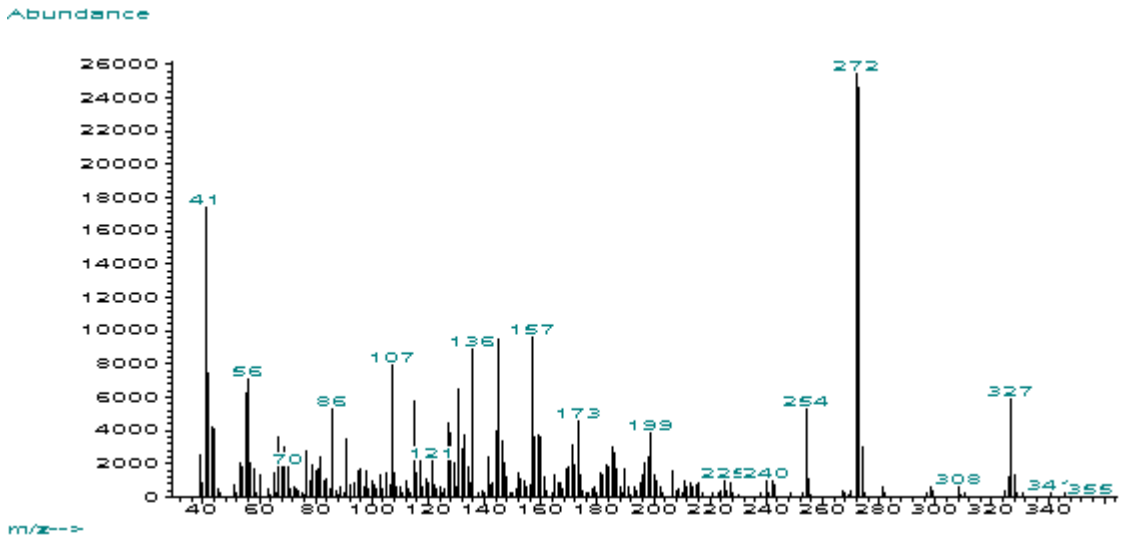



Figure 5 – Mass Spectrum of Butorphanol (Normalized to the 273 ion)

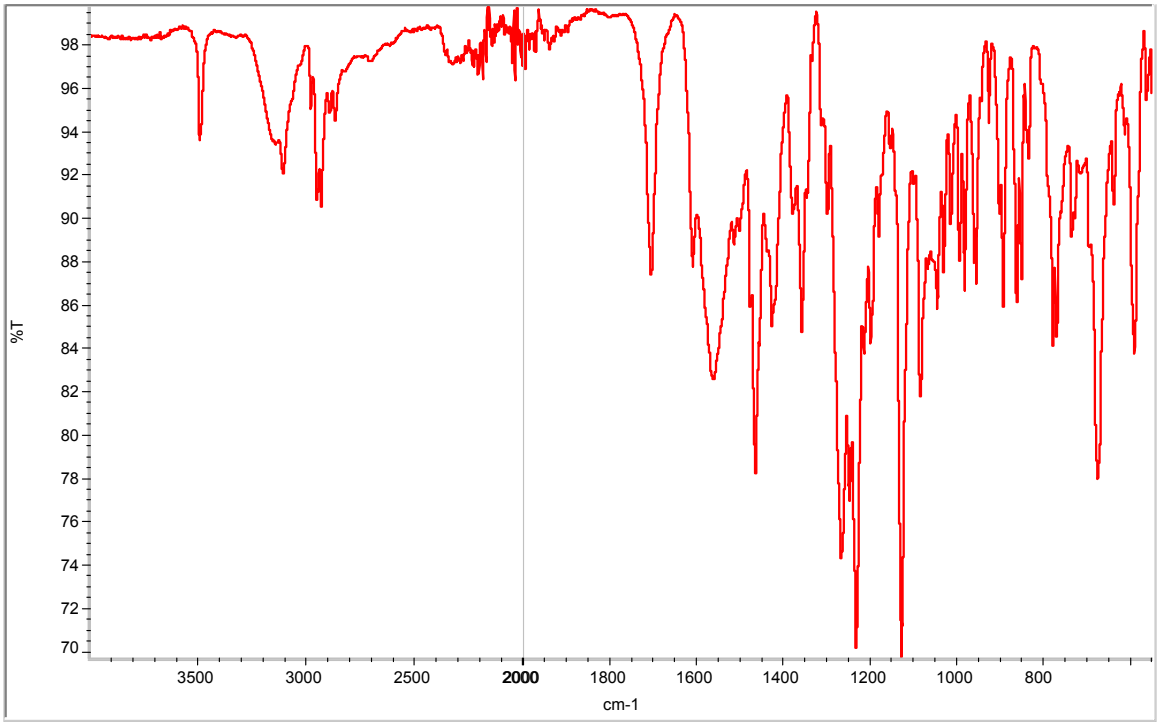



Figure 6 – Infrared Spectrum of Butorphanol Tartrate on 3 - bounce Diamond ATR

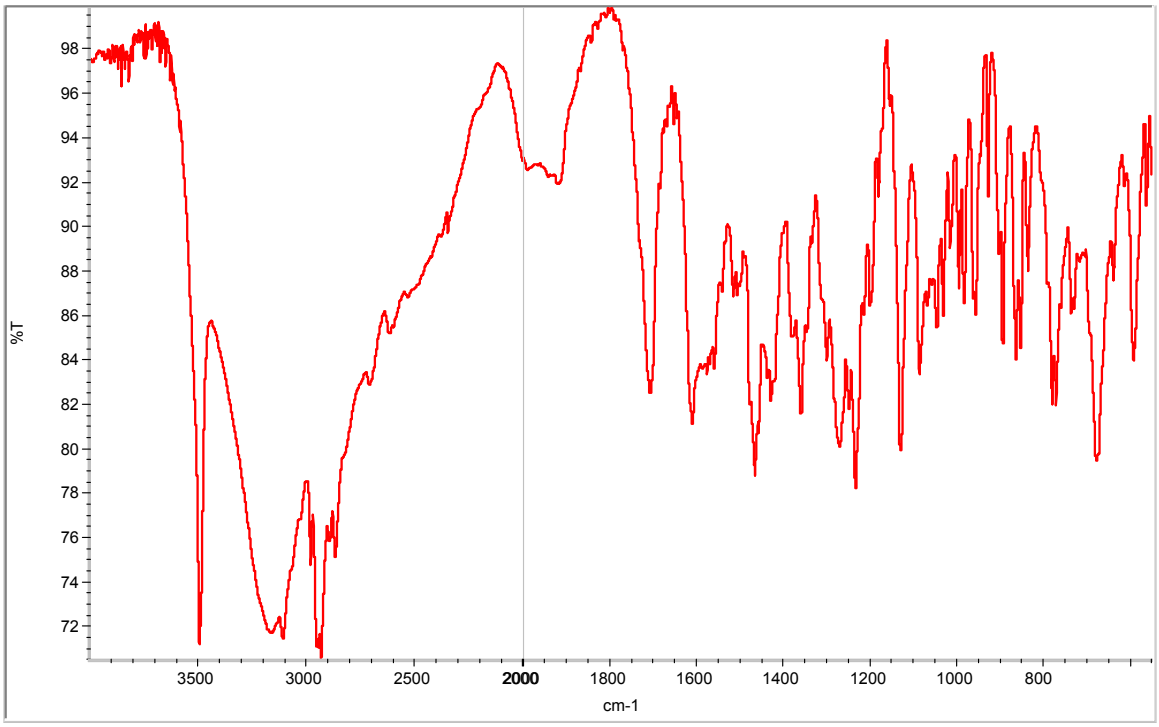



Figure 7 – Infrared Spectrum of Butorphanol Tartrate KBr pellet

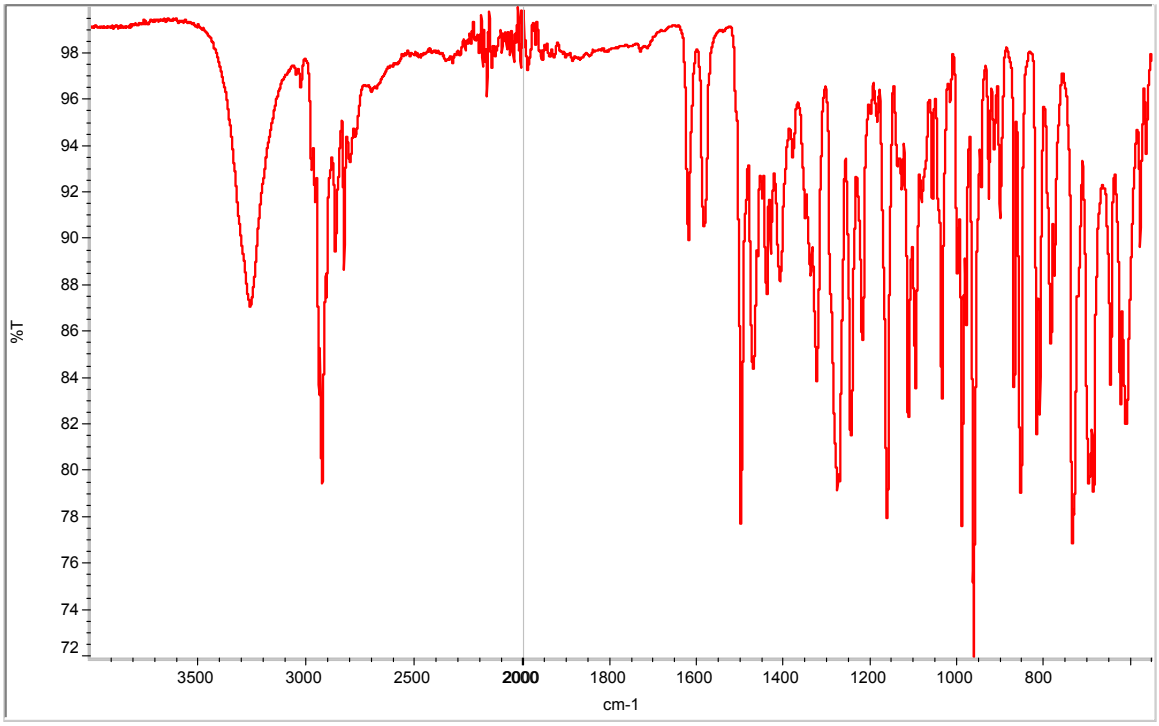



Figure 8 - Infrared Spectrum of Butorphanol on 3 - bounce Diamond ATR

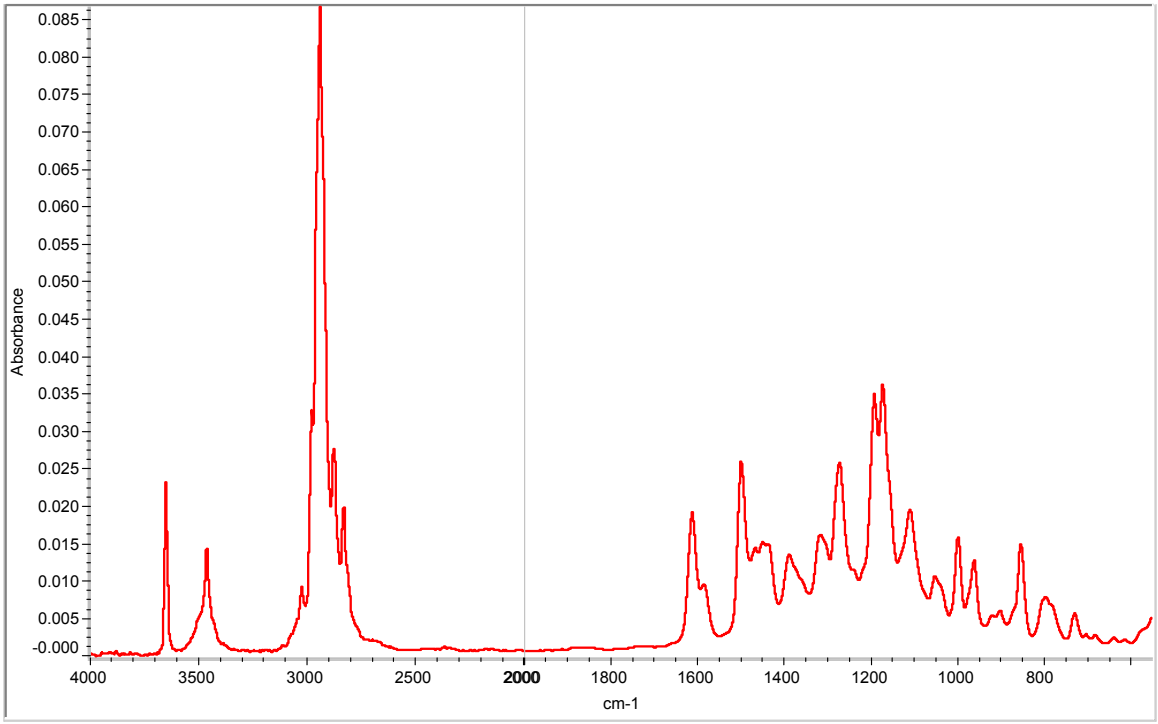



Figure 9 – Vapor Phase Infrared Spectrum of Butorphanol

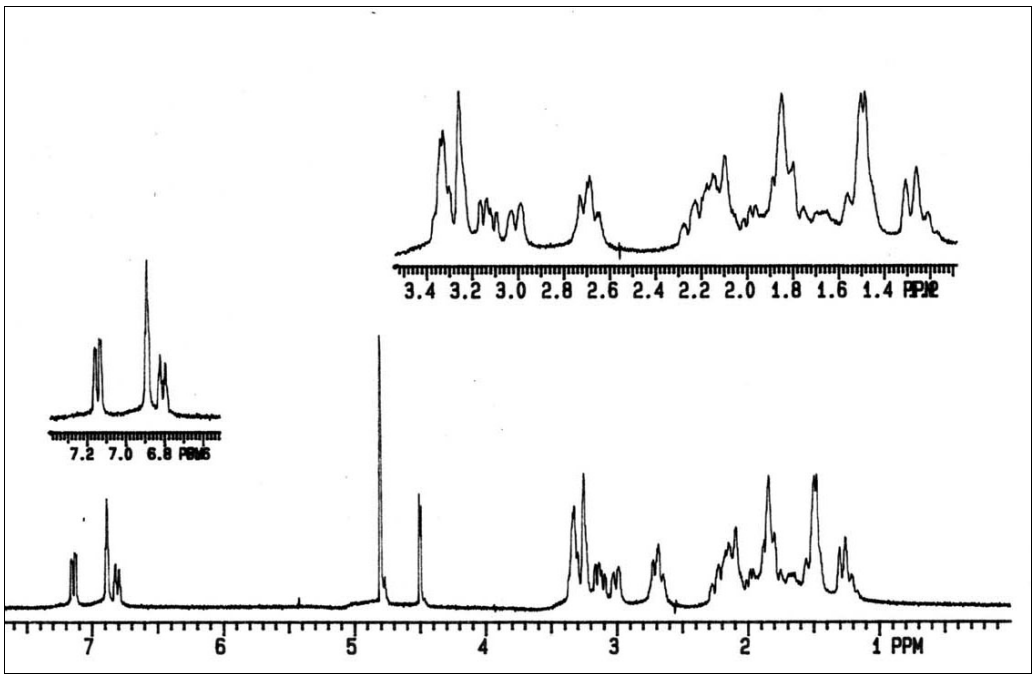



Figure 10 – NMR spectrum of Butorphanol Tartrate in $D_2O$

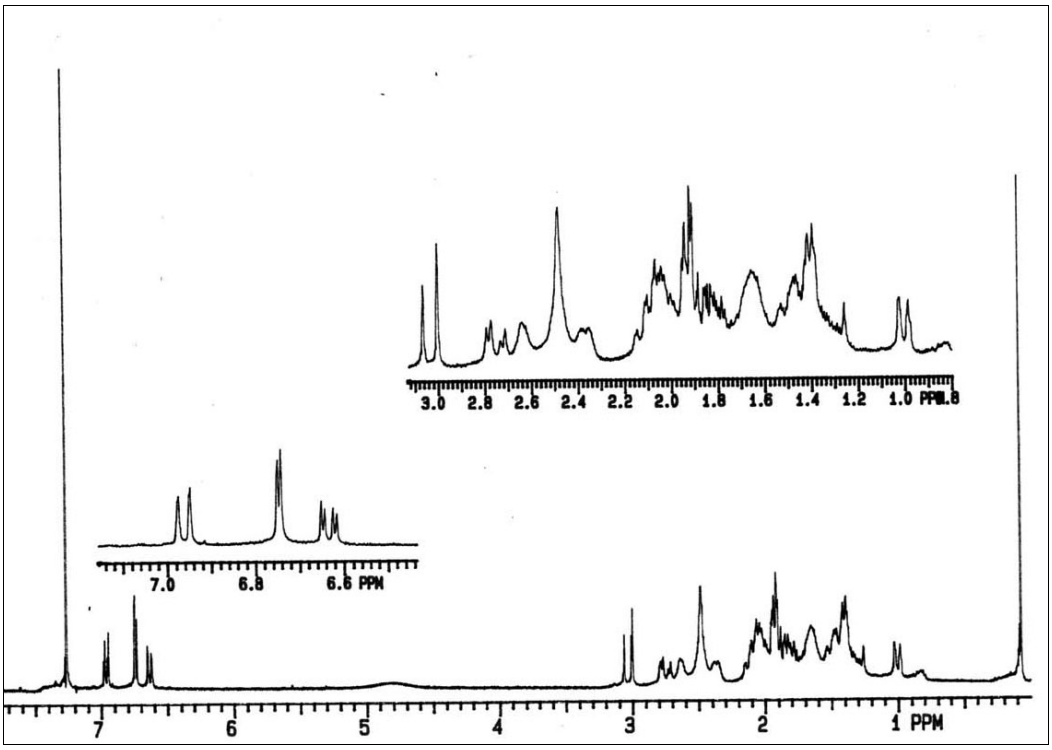



Figure 11 – NMR spectrum of Butorphanol in $CDCl_3$

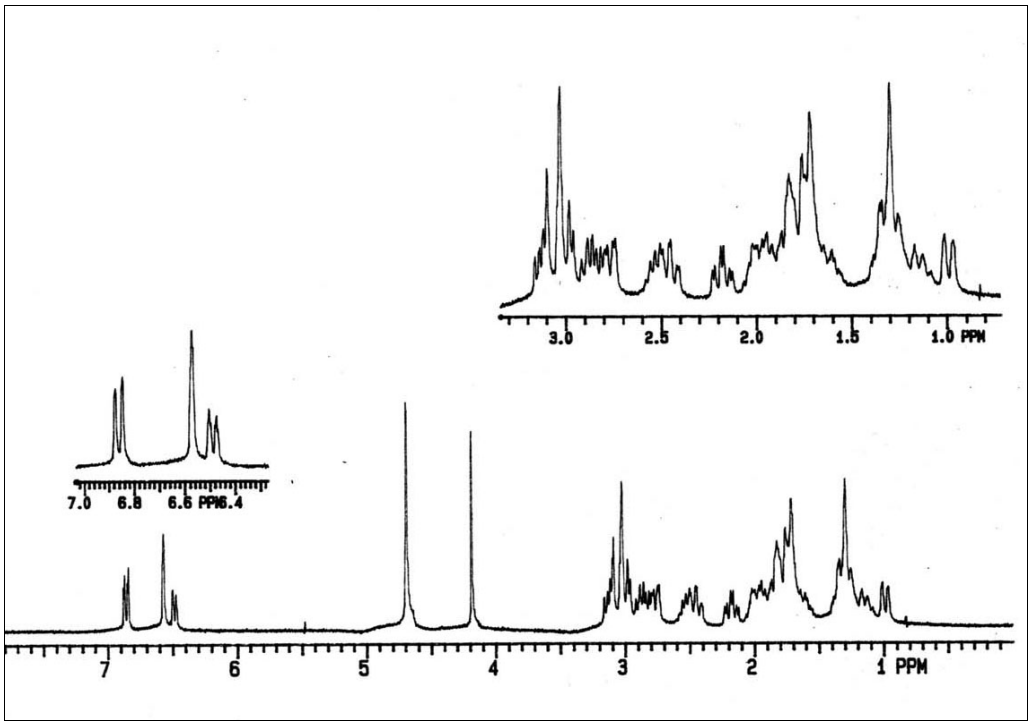



Figure 12 – NMR spectrum of Butorphanol Tartrate in $CD_3OD$

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Acknowledgements

We would like to thank William M. Callan, Diversion Investigator, Drug Enforcement Administration, Timothy A. Williams, DVM, Animal Medical Center, Murfreesboro, TN, and Edwin C. Derks, DVM, Derks Animal Clinic, P.A, Miami, FL, for their valuable contributions.

## SELECTED REFERENCES

[Note: Selected references are a compilation of recent publications of presumed interest to forensic chemists. Unless otherwise stated, all listed citations are published in English. If available, the email address for the primary author is provided as the contact information. Listed mailing address information (which is sometimes cryptic) exactly duplicates that listed by the abstracting services.]


1. Taber DF, Neubert TD, Rheingold AL. **Synthesis of (-)-morphine.** Journal of the American Chemical Society 2002;124(42):12416. [Editor's Notes: No abstract was provided. Contact: DF Taber, Univ Delaware, Dept Chem & Biochem, Newark, DE 19716.]

2. Booth G, Johnston F, Jackson G. **Case assessment and interpretation - Application to a drugs supply case.** Science and Justice 2002;42(2):123. [Editor's Notes: Presents a model for establishing drug trafficking patterns, emphasizing precise use of language. Contact: Forensic Science Service, Chepstow Laboratory, Usk Road, Chepstow, Gwent NP6 6YE, United Kingdom.]

3. Su C-W, Babcock K, deFur P, Noble T, Rigdon S. **Columnless GC/IMS (II) - A novel on-line separation technique for ionscan analysis.** International Journal of Ion Mobility Spectrometry 2002;5(2):160. [Editor's Notes: Presents results indicating that placing an extra layer of filter paper either under or over a swipe sample during ionscan analysis improved drug detection results (this was attributed to a temperature ramping and chromatographic effect). Contact: U.S. Coast Guard Research and Development Center, Groton, CT 06340.]

4. Su C-W, Rigdon S, Babcock K, Noble T, deFur P. **Columnless GC/IMS (I) - A study of the variation in the thermal desorption profiles of three models of ionscan IMS instrument.** International Journal of Ion Mobility Spectrometry 2002;5(2):175. [Editor's Notes: Presents results indicating that placing an extra layers of filter paper under a sample induced a thermal delay effect (similar to GC temperature ramping), whereas placing an extra layers of filter paper over a sample induced a chromatographic effect (similar to a GC column) during ionscan analysis. Contact: U.S. Coast Guard Research and Development Center, Groton, CT 06340.]

5. Griffin LBS. **Trace level confirmation of controlled substances found by ion mobility spectrometry, with quadrupole ion-trap spectrometry.** International Journal of Ion Mobility Spectrometry 2002;5(3):31. [Editor's Notes: Presents a study that indicates the CI-MS/MS is well suited to confirming results obtained by IMS spectroscopy. The method has been used for methamphetamine and cocaine. Contact: No contact information was provided.]

6. Alizadeh N , Mehdipour R. **Drug-selective electrode for ketamine determination in pharmaceutical preparations and electrochemical study of drug with BSA.** Journal of Pharmaceutical and Biomedical Analysis 2002;30(3):725. [Editor's Notes: For for determination of ketamine hydrochloride in pharmaceutical preparations using direct potentiometry. A secondary study examining the binding between ketamine and bovine serum albumin (BSA) was also presented. Contact: Alizadeh N, Tarbiat Modarres Univ, Sch Sci, Fac Sci, Dept Chem, POB 14115-111, Tehran 14488, Iran.]

7. Nudelman NS , Cabrera CG. **Spectrofluorimetric assay for the photodegradation products of alprazolam.** Journal of Pharmaceutical and Biomedical Analysis 2002;30(3):887. [Editor's Notes: Presents a new spectrofluorimetric assay for the photodegradation products of alprazolam. The drug was found to be highly photolabile, and special care should be taken to avoid light

exposure during storage and handling. Contact: Nudelman NS, Univ Buenos Aires, Fac Ciencias Exactas & Nat, Dept Quim Organ, Pab 2, P3 Ciudad Univ, RA-1428 Buenos Aires, DF, Argentina.]

8. Cody JT , Valtier S. **Differentiation of the 2,3-methylenedioxy regioisomer of 3,4-MDMA (Ecstasy) by gas chromatography-mass spectrometry.** Journal of Analytical Toxicology 2002;26(7):537. [Editor's Notes: No abstract was provided. Contact: Cody JT, AMEDD C&S, MCCS HMP PA Branch, Ft Sam Houston, TX 78234.]

9. Yritia M, Riba J, Ortuno J, Ramirez A, Castillo A, Alfaro Y, delaTorre R, Barbanoj MJ. **Determination of N,N-dimethyltryptamine and beta-carboline alkaloids in human plasma following oral administration of Ayahuasca.** Journal of Chromatography B - Analytical Technologies in the Biomedical and Life Sciences 2002;779(2):271. [Editor's Notes: Presents an analytical methodology for the quantification of the four main alkaloids present in ayahuasca, plus two major metabolites in human plasma, using GC and HPLC with fluorescence detection. Contact: Barbanoj MJ, Univ Autonoma Barcelona, Area Invest Farmacol, Inst Recerca, Dept Farmacol & Terapeut, Hosp Santa Creu & Sant Pau, St Antoni Maria Claret 167, Barcelona 08025, Spain.]

10. AboulEnein HY, Ali M, Laguerre M, Felix G. **Molecular modeling of enantiomeric resolution of methylphenidate on cellulose tris benzoate chiral stationary phase.** Journal of Liquid Chromatography & Related Technologies 2002;25(18):2739. [Editor's Notes: The enantiomeric resolution of (+/-)-threo methylphenidate (Ritalin) was achieved on a Chiralcel OB column using hexane-ethanol-methanol-trifluoroacetic acid (480:9.75:9.75 :0.5, v/v/v/v), containing benzoic acid and phenol as mobile phase additives, with UV detection at 230 nm. Molecular modeling was carried out to explain the chiral resolution mechanism. Contact: Aboul-Enein HY, King Faisal Specialist Hosp & Res Ctr, Biol & Med Res Dept MBC03, Pharmaceut Anal Lab, POB 3354, Riyadh 11211, Saudi Arabia.]

11. Drager B. **Analysis of tropane and related alkaloids.** Journal of Chromatography A 2002;978(1-2):1. [Editor's Notes: Presents a review of the current methods for chromatographic separation and determination of tropane alkaloids, including hyoscyamine and scopolamine and their derivatives, cocaine and derivatives, the metabolites and degradation products of these compounds occurring in plant material, calystegines as nortropane alkaloids, anatoxins as homonortropane alkaloids, and pelletierines and pseudopelletierines as alkaloids with isomeric structures. Recent developments in GC, HPLC, CE, and TLC are presented. Contact: Drager B, Univ Halle Wittenberg, Inst Pharmaceut Biol, Hoher Weg 8, D-06120 Halle Saale, Germany.]

12. Gambelunghe C, Melai P. **Absinthe: Enjoying a new popolarity** [sic] **among young people?** Forensic Science International 2002;130(2-3):183. [Editor's Notes: Includes chromatographic profiles of ethanolic extracts of *Artemisia absinthium* leaves, and the mass spectra of *beta*-thujone, the presumed active constituent. Contact: P. Melai at: med_leg@unipg.it]

**Additional References of Possible Interest:**

1. Peng LJ , Wen ML , Yao Y. **Potentiometric determination of fentanyl in pharmaceutical formulations.** Journal of Pharmaceutical and Biomedical Analysis 2002;30(3):667. [Editor's Notes: For determination of fentanyl citrate in injectable solutions. Contact: Wen ML, Yunnan Univ, Dept Chem, Kunming 650091, Peoples R China.]

2. Chamberlain RT. **Dry transfer method for sample preparation and transfer of forensic test samples, especially for explosives and narcotics.** U.S. US 6,470,730 (C1. 73-1.03; G01N17/00), 29 Oct 2002, Appl. 640,660, 18 Aug 2000. [Editor's Notes: Presents a method for sample preparation for analysis that includes the use of a non-porous flexible polytetrafluoro-ethylene (PTFE) strip. Contact: No contact information was provided.]

3. Gomez MR , Olsina RA , Martinez LD , Silva MF. **Simultaneous determination of dextromethorphan, diphenhydramine and phenylephrine in expectorant and decongestant syrups by capillary electrophoresis.** Journal of Pharmaceutical and Biomedical Analysis 2002;30(3):791. [Editor's Notes: Presents analysis via MECC and CZE with direct absorptiometric detection. Contact: Gomez MR, Univ Nacl San Luis, Catedra Control Calidad Medicamentos, Fac Quim Bioquim & Farm, RA-5700 San Luis, Argentina.]

4. Gentili S, Torresi A, Marsili R, Chiarotti M, Macchia T. **Simultaneous detection of amphetamine-like drugs with headspace solid-phase microextraction and gas chromatography-mass spectrometry.** Journal of Chromatography B - Analytical Technologies in the Biomedical and Life Sciences 2002;780(1):183. [Editor's Notes: Presents a headspace-SPME-GC/MS procedure for the simultaneous detection of MDA, MDMA, MDEA, and MBDB in hair. Contact: Macchia T, Ist Super Sanita, Dept Clin Biochem, Drug Abuse Sect, Viale Regina Elena 299, I-00161 Rome, Italy.]

5. Liu RH, Lin D-L, Chang W-T, Liu C, Tsay W-I, Li J-H, Kuo T-L. **Isotopically labeled analogues for drug quantitation.** Analytical Chemistry 2002;74(23):619A.. [Editor's Notes: Presents an overview and review of the topic, with an emphasis on analysis of biological matrices. Contact: rayliu@uab.edu]

6. Ang CYW, Cui Y, Chang HC, Luo W, Heinze TM, Lin LJ, Mattia A. **Determination of St. John's Wort components in dietary supplements and functional foods by liquid chromatography.** Journal of the AOAC International 2002;85(6):1360. [Editor's Notes: Presents a rapid extraction technique and reversed-phase LC/UV analysis to determine the 4 characteristic biactive compounds in St. Hohn's Wort in dietary supplements and various foodstuffs. Contact: cang@nctr.fda.gov]

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## SCIENTIFIC MEETINGS

1. **Title: 50th Anniversary Meeting of the Canadian Society of Forensic Science (CSFS)** (Third and Final Posting)
**Sponsoring Organization:** Canadian Society of Forensic Science
**Inclusive Dates:** March 24 - 29, 2003
**Location:** Vancouver, British Colombia, Canada (Sheraton Wall Centre)
**Meeting Registration Procedure, Deadline, and Costs:** [See website]
**Recommended Lodging (Registration Deadline and Costs):** [See website]
**Contact Individual's Name, Phone Number, and email Address:** [None Listed; CSFS General Number is: 613 738-0001; CSFS General email Address is: csfs@sympatico.ca]
**Website:** [www.csfs.ca]

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## THE DEA FY - 2003 STATE AND LOCAL FORENSIC CHEMISTS SEMINAR SCHEDULE

The remainder of the FY - 2003 schedule for the DEA's State and Local Forensic Chemists Seminar is as follows:

March 10 – 14, 2003
June 9 – 13, 2003
September 15 – 19, 2003

Note that the school is open only to forensic chemists working for law enforcement agencies, and is intended for chemists who have completed their agency's internal training program and have also been working on the bench for at least one year. There is no tuition charge for this course. For additional information, eligibility requirements, or to enroll, see the September 2002 issue of *Microgram Bulletin*, or call 703 668-3337.

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## THE JOURNAL/TEXTBOOK COLLECTION EXCHANGE

## *FREE TO ANY SUBSCRIBER*

The following, partial collections of the journals *Forensic Science International*, *Journal of Analytical Chemistry*, *Journal of Chemical Information and Computer Sciences*, and *Journal of Toxicology - Clinical Toxicology* are offered free of charge to any subscriber who wants them, on an all-or-nothing basis for each journal (i.e., no "cherry picking" of single issues). Forensic Science Libraries will be given preference. If interested, please contact the Editor at: microgram_editor@mailsnare.net [Note: Postage will be covered by the DEA Office of Forensic Sciences.]

*Forensic Science International* - 1997 - 2000 (various issues missing from each year).

*Journal of Analytical Chemistry* - 1999 and 2001 (various issues missing from both years).

*Journal of Chemical Information and Computer Sciences* - 1995 - 1999 (missing 1995(6) and 1998(5)).

*Journal of Toxicology - Clinical Toxicology* - 1995 and 1996 (both years complete).

If there are no responses, these collections will be discarded one month after the hard copy of the January 2003 issue (this issue!) is mailed; therefore, interested subscribers should contact the Editor as soon as possible.

Note that the next offering of journals and textbooks will be in the April 2003 issue of *Microgram Bulletin*. Subscribers who are interested in donating items or collections should consult the Information and Instructions section on pages 25 - 29 of this issue.

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# Computer Corner #166

## Digital Evidence Collection Strategies

by Michael J. Phelan
DEA Special Testing
and Research Laboratory

An essential element in every digital evidence examination is the creation of an exact duplicate of the original evidence. This "working copy" is always preferred because it eliminates any possibility that either the original evidence or the associated date/time stamp file information could be changed during the examination processes.

Advances in computer forensic technology give today's examiners a variety of software and hardware tools for creating duplicate copies. However, selection of the proper tool can be a complex decision, and may require compromises between the desired depth of analysis and time constraints, amount of data, and investigative scope.

### Situation Assessment

When a computer forensic examiner receives a case that will require a significant amount of data acquisition, one of the first and most important steps is determining the overall scope of the investigation. For example, is a specific database (corporate sales, purchasing, shipping files, etc.) needed? Are network audit logs, e-mail archives, or other files needed? Are the required data files just a small fraction of a large search domain? Will the search be limited to just a few computers (i.e., gigabytes of data) or rather many dozens or hundreds of computers (i.e., terabytes of data)?

The answer to these questions drives the initial search. Small search domains (a few computers) can err on the side of caution and copy all of the potential digital evidence. However, large search domains (many computers) necessarily must restrict the data collection to either a workable number of computers or a reasonable number of files or databases. Failure to limit the scope in the latter such cases will result in an enormous amount of data that could easily take many months or even years to analyze.

### Intake Reduction

Data reduction at the time of collection can follow one of several strategies. The actual number of computers seized or duplicated on-site can be minimized by a discussion between the examiner and the investigator(s). Knowledge of the alleged crime and the nature of the business are also valuable intelligence that can be used to limit the scope of seizure. For example, a medical fraud case may need to focus only on one doctor and cover only a limited period of time. Similarly, in a large business, only the computer belonging to the subject of the investigation, one or two server(s), the computers(s) with Internet connections, and/or the computer on the loading dock used for shipping, etc., may need to be examined. Limiting the number of seized computers means that the examination can likely be conducted in matter of weeks as opposed to several months, with little or no loss of material of investigative value.

### Data Reduction

Similarly, even greater efficiencies can be achieved by focusing on the collection of just a few specific files, databases, or data storage folders. This approach requires advanced knowledge of how the computer system operates, where the pertinent data is stored, and what types of data are needed for the investigation. This strategy is most frequently successful when administrative inspection warrants are used to collect very narrow categories of information such as Medicare records, pharmacy prescription records, etc. Other scenarios may include specific accounting records, an individual's e-mail, or a document folder (such as /My Documents) containing employee, patient, or client correspondence.

### Hard Drive Copy Tools

There are several good choices of hard drive duplication tools available today. The selection of a duplication tool is usually based upon factors such as prior

examiner training or familiarity, cost, or ease of integration of the duplication tool into the follow-on examination software. For example, only Encase examination software will make a duplicate hard drive copy from an Encase image.

**Encase or Ilook**

Graphical User Interface (GUI) based Computer Forensic platforms, such as Guidance Software's Encase or the British Ilook software, come with relatively fast hard drive duplication utilities. These functions enable exact one-to-one copying and bit-stream imaging capabilities (enabling large data blocks to be mounted as a virtual drive that contain all of the data and format structure contained in the original evidence). These tools operate from a Windows operating system environment, with a hard drive write-blocking protection used to prevent the original evidence from being changed during the normal hard drive boot up and access processes.

**Ghost**

"Ghost" is a commercial hard drive software duplication utility that is included in Symantec's System Works suite. Ghost has a wide range of support levels, because it performs a number of different information technology functions, including file and hard drive backup. Note that it is important to always use the "forensic" software switches in order for Ghost to produce a complete, sector-by-sector copy.

**Safeback**

A widely used DOS-based Computer Forensic tool is New Technologies, Inc.'s "Safeback". This utility can both duplicate hard drives and produce a bit stream image file. Safeback files can also be processed by the Encase or Ilook examination platforms. However, Safeback only operates using DOS, and this greatly reduces its copying speed versus GUI-based tools.

**Unix "dd" and SMART**

Another effective choice can include use of the Unix "dd" copy command. This choice requires moving the examination platform, at least for the hard drive data copying process, to a Unix-based computer running Linux Red Hat or some other variant. Unix is able to write-block a hard drive through standard line commands (a unique feature). However, a potential problem with the Unix-based acquisition approach involves the complexity of the command line syntax. This requires examiners to receive specialized training or on-the-job skill development.

Recently, ASR Data Systems released their SMART software, which uses a GUI-based "click-and-drag" interface to simplify hard drive duplication and imaging processes.

**Hard Drive Duplicators**

Hard drive duplicators are hardware-based solutions to the data duplication process. Some of the latest devices are forensically enabled, and will copy all sectors on a hard drive to a second hard drive. The devices themselves are small and can fit into a small carry case or standard briefcase. Integrated Computer Solution's Image Maaster Solo2 and Logicube's SF-5000 are two products that are specifically designed for on-site hard drive duplication. Similar hard drive duplicators exist, but are commercially used to deploy clones of network clients or specialized computer terminals. However, some of these systems only copy active files, limiting their utility if a complete forensic examination is required.

**Conclusions**

The increasing volume of potential data to search is creating a nationwide problem for law enforcement. Seizing all the computers at a search site, and examining them at the deepest levels, are the most significant factors contributing to the examination backlog. In order to alleviate this problem, new data intake and data reduction strategies must be implemented. Data acquisition strategies must be adapted to the case-specific investigative goals, and these strategies must be pragmatic with regards to data volume and time constraints. Failure to recognize that yesterday's computer is not the equivalent of today's computer - and is not even remotely similar to tomorrow's computer - will inevitably result in lost investigative leads, and ineffective prosecutions.

Questions or comments?
e-mail: mphelan@erols.com

# Information and Instructions for *Microgram Bulletin*

[Editor's Preface: The following information and instructions are derived from the *Microgram* website < http://www.dea.gov/programs/forensicsci/microgram/index.html >, and are provided here for the convenience of those subscribers who do not have access to the Internet. This material will henceforth be published only in the respective January issues for each year.]

**General Information**

*Microgram Bulletin* is a monthly newsletter published by the U.S. Drug Enforcement Administration's Office of Forensic Sciences, and is primarily intended to assist and serve forensic scientists concerned with the detection and analyses of suspected controlled substances for forensic/law enforcement purposes.

**Subscriptions to Microgram Bulletin**

*Microgram Bulletin* is unclassified (as of the January 2003 issues), and is published on the DEA public access website (see the above URL). **Private citizens should use the website to access *Microgram Bulletin*.** Professional scientific and law enforcement personnel may either use the website or request a subscription. Subscriptions are available electronically and in hard copy. Electronic subscriptions require Internet access. The publications themselves will not be sent electronically to any subscriber; rather, an email notification of the pertinent URL will be sent to the subscriber when the respective issue is posted on the website. Requests for hard copies are strongly discouraged, and should be limited to those offices that do not have access to the Internet, require hard copies for their libraries, or have some other valid reason (Note: "For my personal collection" is not considered to be a valid reason). Requests for hard copies should indicate the number of copies required (maximum of two allowed per office), and should also include formal justification. Note that due to publication delays beyond the control of the Office of Forensic Sciences, hard copies will arrive from 30 to 90 days after electronic posting.

Requests to be added to the subscription list should be submitted via email to the *Microgram* Editor at: microgram_editor@mailsnare.net **[NOTE: NEW email address!]** If email submission is not possible, requests should be mailed to: *Microgram* Editor, Drug Enforcement Administration, Office of Forensic Sciences, 2401 Jefferson Davis Highway, Alexandria, VA 22301. All requests to be added to the *Microgram* mailing list should include the following **Standard Contact Information**:

* The Full Name and Mailing Address of Submitting Laboratory or Office;

* The Full Name, Title (Laboratory Director, Assistant Special Agent in Charge, Librarian, etc.), Phone Number, FAX Number, and Preferred email Address of the Submitting Individual (Note that subscriptions are mailed to titles, not names, in order to avoid subscription problems arising from future personnel changes);

* If available, the generic email address for the Submitting Laboratory or Office;

* If a generic email address is not available, **one** private email address for an individual who is likely to be a long-term employee, who has a stable email address, and who will be responsible for forwarding *Microgram* information to all of the other employees in the requestor's Office (Note that only one email address per Office will be honored);

* If requesting hard copy mailings, the number of copies requested (two max), and justification.

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Note that, due to mailing delays and/or publication timeframes, subscription requests/changes may take as long as 90 days to implement.

**Costs**

Subscriptions to *Microgram* are free.

**Submissions to *Microgram Bulletin***

*Microgram Bulletin* includes Intelligence Alerts, Safety Alerts, Intelligence Briefs, Selected Intelligence Briefs, Selected Literature References, Meeting Announcements, Employment Opportunities, pertinent sections from the Code of Federal Regulations (CFR-21), Columns of topical importance, and similar material of interest to the counter-drug community. Explanatory details for most of the above types of submission are detailed below, and typical examples are provided in most issues of *Microgram Bulletin*.

All submissions must be in English. Because *Microgram Bulletin* is unclassified, **case sensitive information should not be submitted!** All submissions should, whenever possible, be submitted electronically, as straight email or as an IBM® PC-compatible Corel WordPerfect® or Microsoft Word® attachment, to: microgram_editor@mailsnare.net **[NOTE: NEW email address!]** *Current* versions of Corel WordPerfect® or Microsoft Word® (defined as having release dates less than 5 years old) should be utilized. If email submission is not possible, submissions may be mailed to: *Microgram* Editor, Drug Enforcement Administration, Office of Forensic Sciences, 2401 Jefferson Davis Highway, Alexandria, VA 22301. Hard copy mailings should be accompanied by an electronic version on a 3 ½ inch IBM® PC-compatible diskette. **Note that diskettes should be mailed in an irradiation-proof protective sleeve, and the mailing envelope should be marked: "Warning - Contains Electronic Media - Do Not Irradiate"**. Note also that mailed submissions may be subject to lengthy handling delays beyond the control of the Office of Forensic Sciences, and electronic media sent through the mail may be destroyed en route by sanitizing procedures, despite protective measures and written warnings. All submissions should include the following **Contact Information:** The Full Name and Address of Submitting Laboratory or Office, and the Full Name, Phone Number, FAX Number, and Preferred email Address of the Submitting Individual.

**Intelligence Briefs** are concise synopses of the physical and chemical characteristics of novel and/or interesting exhibits submitted to law enforcement laboratories involved in the detection and analyses of suspected controlled substances for forensic/law enforcement purposes. They should include descriptive details adhering to (as appropriate) the following outline:

What laboratory did the analysis?
Where is the laboratory located?
What agency seized the exhibit?
Where was the exhibit seized?
Were there any special circumstances of the seizure (unusual smuggling technique, etc.)
What controlled substance was suspected upon submission?
Detailed physical description (appearance, dimensions, logos, odor, packaging, etc.)
Quantities (numbers of tablets, packages or bricks, average mass, net mass, etc.)

Photos (jpeg images preferred)
What techniques were used to analyze the exhibit?
Actual identity of the exhibit?
Quantitation data? (if approximate, so state)
Adulterants and diluents? (if identified)
First seizure of this type? (if not, provide brief details of previous examples)
Editorial comments? (if any)
Literature references? (If any)

In order to avoid confusion, if uncommon controlled substances are identified (e.g., "2C-T-7", "Nexus", or "STP"), the description should include the full name(s) of the identified substances (acronyms or street names can be included in parentheses after the full name). Photographs of subject exhibit(s) should include either a metric ruled scale or a coin or bill (U.S. currency) to place the exhibit's size in context.

**Intelligence Alerts and Safety Alerts** are urgent communiques to the *Microgram Bulletin* readership which give notice of a specific forensic/drug-related enforcement and/or safety issue. In addition to the descriptive details listed under "Intelligence Briefs" above, they should include a concise synopsis of the issue, recommendations (if any), pertinent literature citations (if any are known), and a mechanism for providing feedback (if appropriate).

**Selected Intelligence Briefs** are reprinted (with permission) unclassified intelligence briefs of presumed interest to the *Microgram Bulletin* readership that have been previously published in restricted or non-restricted publications or websites that are also dedicated to the detection and analyses of suspected controlled substances for forensic/law enforcement purposes. Selected Intelligence Briefs must be unclassified, and should be a minimum of 1 page and a maximum of 10 pages in length (single spaced at 11 pitch Times New Roman font, including photos, tables, charts, etc.) All *Microgram Bulletin* subscribers are invited to submit such material, which must include the author's and publisher's contact information.

**Selected Literature References** is a monthly compilation of reference citations of presumed interest to the *Microgram Bulletin* readership, derived from approximately 2500 scientific periodicals. The focus of the Selected Literature References is the detection and analysis of suspected controlled substances for forensic/law enforcement purposes. References from clinical and toxicological journals are included only if the material is considered to be of high interest to forensic chemists. Note that citations from obscure periodicals may be missed, and all *Microgram Bulletin* subscribers are invited to submit citations of interest if they do not appear in *Microgram Bulletin* within three months of their publication. Citations should include a summary sentence and the primary author's email or mailing address.

**Meeting Announcements** is a monthly compilation of upcoming meetings of presumed interest to the *Microgram Bulletin* readership. **In general, only meetings which are dedicated to forensic chemistry/forensic drug analysis or include a subsection so dedicated will be publicized in *Microgram Bulletin*.** Meeting Announcements should include the Formal Title, Sponsoring Organization, Inclusive Dates, Location (City, State, and specific locale), Meeting Registration Costs and Deadline, Recommended Hotel Registration Costs and Deadline (include details on special rates where available), and Contact Individual's Name, Phone Number, and email Address. If available, the URL for the meeting website should also be included in the Announcement. Meeting Announcements will be posted for a maximum of three consecutive months, but not past the registration deadline.

**Employment Opportunities** is a monthly compilation of job announcements of presumed interest to the *Microgram Bulletin* readership. **In general, only jobs with a forensic chemistry/forensic drug analysis**

**focus for Federal, State, or Local Crime Laboratories or Offices will be publicized in *Microgram Bulletin*.** Exceptions may be requested and will be considered on a case-by-case basis. Employment Opportunity announcements should include the Formal Title of the Organization, Formal Title of the Laboratory or Office, Position Title, Laboratory or Office Location (City and State), Salary Range, Opening and Closing Dates, Duties, General Requirements, Specialized Requirements (if any), Application Procedures, and the Contact Individual's Name, Phone Number, email Address, and Mailing Address. If available, the URL for the agency's website, and (if available) the specific URL for the job posting should also be included in the Announcement. Employment Opportunities will be posted for a maximum of 3 consecutive months, but not past the application deadline.

**The Journal/Textbook Collection Exchange**

If any subscriber is interested in donating any forensic or analytical chemistry journal and/or textbook collection to a fellow subscriber or library, *Microgram Bulletin* is willing to list the offered materials and the associated contact information in a future issue (currently January, April, July, and October). The general format should follow the example in this issue, and should be sent via email to the *Microgram* Editor at: microgram_editor@mailsnare.net **[NOTE: NEW email address!]** Only items for donation (not for sale) will be considered for publication, and donations to libraries should adhere to journal restrictions and/or time limits (if any) on such offers.

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All issues of *Microgram* (November 1967 - March 2002) and the first nine issues of its successor *Microgram Bulletin* (April - December, 2002) were **Law Enforcement Restricted** publications, and are therefore (permanently) unavailable to the general public. [Note that this restriction includes requests made under the Freedom of Information (FOI) Act.]

Past issues or individual sections of issues (e.g., specific articles) are available to law enforcement affiliated offices and laboratories. Requests from such offices and laboratories **must be made on official letterhead** and mailed to:

Deputy Assistant Administrator
Office of Forensic Sciences
Drug Enforcement Administration
2401 Jefferson Davis Highway
Alexandria, VA 22301

Note that requests made via email will not be honored.

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