

SOFT 22nd ANNUAL MEETING



PROGRAM

OCT. 13-16, 1992

RADISSON HOTEL & CONFERENCE CENTER

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ABSTRACTS

PLATFORM SESSION 1

"Response of the EMIT II Amphetamine/methamphetamine assay to specimens collected following use of Vicks inhalers." A. Poklis, S.A. Jortani, Dept. of Pathology, Medical College of Virginia, Richmond, VA. 23298-0597 and C.S. Brown and C.R. Crooks, National Psychopharmacology Laboratory, Knoxville, TN. 37923

The possible cross-reactivity of *l*-methamphetamine (desoxyephedrine) to the Syva EMIT II Amphetamine/Methamphetamine assay was evaluated in urine specimens collected from seven subjects using Vicks Inhalers. The subjects were six males and one female ranging from 24-47 yrs of age. Three were cigarette smokers. Four subjects used the inhaler every two waking hours for five consecutive days; while three subjects inhaled hourly for three consecutive days. All urine voids were collected totaling 150 specimens. All specimens were analyzed by the EMIT II assay on a Hitachi 717 automatic analyzer with a 1000 ng/ml d-methamphetamine cut-off calibrator. None of the inhaler specimens produced an EMIT II response equal to or greater than the cut-off calibrator; all were negative. Specimens producing the highest rates were further analyzed by chiral GC/MS (Fitzgerald, et al. JAT, 12, 255, 1988). The highest concentrations of *l*-methamphetamine were observed in urines from two subjects inhaling hourly; 1390 ng/ml, 1290,ng/ml and 740 ng/ml. These specimens were collected the evenings of the second and third day. When used "as directed" or even doubling the daily dose, Vicks Inhaler use did not cause false-positive result with the EMIT II Amphetamine/Methamphetamine assay.

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"Detection of Cocaine and Anhydroecgonine Methyl Ester in air and on wall surfaces by GC/MS after "crack" vaporization." David Yousefnejad, Mary J. Hillsgrove and Edward J. Crone, Addiction Research Center, NIDA, Baltimore, MD.

During clinical studies of human subjects who were exposed to "crack" cocaine, air samples and wall swabs were collected to determine if cocaine and its byproducts were present. Cocaine base (100 and 200 mg) was vaporized in the center of the room (ca 7x8x8 ft.) at 200°C. Air samples were collected periodically by vacuum through SPE extraction cartridges (1 L/min). Each wall was swabbed (2.0 M sodium acetate buffer, pH 4) before and after passive cocaine exposure sessions. Concentrations of cocaine metabolites, and anhydroecgonine methyl ester (AEME), a pyrolysis product of cocaine, were measured by GC/MS. Cocaine was detectable in air samples within 5-10 min of "crack" vaporization and peaked in approximately 20 min. Peak cocaine air levels after vaporization of 200 mg of "crack" varied from 0.8-1.1 µg/L. Air levels gradually decreased over the one hour of passive exposure. AEME appeared in room air shortly after cocaine and peaked and declined in a similar manner to cocaine. AEME levels were approximately one-half those found for cocaine. Wall swabs were positive for cocaine (ca. 0.1 µg/swab) and AEME ca. 0.5 µg/swab). The presence of cocaine and AEME in the environment appears to be a useful marker for detection of "crack" use.

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"Toxicity from crack cocaine ingestion." Kevin S. Merigian, Kenneth Leaper, Linda Park, and Arthur Kellermann. The Toxicology Center, Memphis, Tennessee.

Crack cocaine is thought to pose no clinical threat if swallowed. We present two patients who became symptomatic after ingesting 28 and 12 crack nuggets.

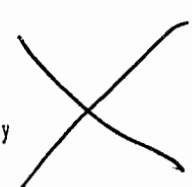
The first patient was a 21 year old wheel chair bound black female who developed generalized convulsions, cardiovascular collapse, cardiopulmonary arrest. After successful resuscitation, the patient had extreme

PLATFORM SESSION 2

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"Infrared techniques for drug analyses." Kathryn S. Kalasinsky, Joseph Magluilo Jr. and Tereasa Schaefer, Armed Forces Institute of Pathology, Division of Forensic Toxicology, Washington D.C. 20306

Studies for infrared method development for drugs of abuse are currently pursued by several laboratories for routine drug testing. Vapor phase GC/FT-IR techniques have been successfully developed for absolute concentrations of low nanogram amounts which are equivalent to 200ng/ml urine. Cryogenic deposition GC/FT-IR techniques are being developed which indicate low picogram amounts of material are detectable. Some preliminary work with amphetamines have shown that reference quality spectra can be obtained with as little amount of material as 500 picograms, and quantities below 50 pg or 10 ng/ml can be obtained for identification.



The prime advantage of GC/FT-IR methods over GC/MS methods is the absolute identification that is available from infrared of the drug, its isomers and metabolites. The sensitivities of the cryogenic deposition GC/FT-IR techniques are now comparable to that of GC/MS.

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"A new nitrogen phosphorus detector designed for ease of use." J.M. Raccio, B. Welton, J. Purcell and R. Dang. Perkin-Elmer Corp.

The nitrogen phosphorus detector has been the detector of choice in the application areas of drug analysis and environmental pesticide/herbicide analysis. The new nitrogen phosphorus detector for the AutoSystem Gas Chromatograph provides excellent sensitivity and selectivity in these application areas. Examples of the following will be shown: EPA method #607 Waste Water Analysis - Nitrosamines and EPA method #507 for nitrogen and phosphorus containing pesticides in water. Drugs of abuse and therapeutic drugs. Nitro-aromatics.



The NPD, even though the best detector for these applications, has suffered from major shortcomings. The source or catalyst used in the detector has a history of inconsistency, short life and the replacement and conditioning process has been difficult and time consuming for the operator.

The NPD for the AutoSystem Gas Chromatograph has addressed these shortcomings. A new, innovative method is used to manufacture the source, a glass bead which contains an alkali metal. The manufacturing process produces a consistent bead. This provides results which match from one bead to another. The operator can replace the bead and be operational within two hours time. Minimizing down time and improving throughput are essential in drug and environmental analyses.

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"Automated confirmation of drugs of abuse by GC/MS." D. Swain. Fisons Instruments, Manchester, U.K. Ft. Rutter, MedExpress National Laboratory Center Inc. Memphis TN 38175-2210



Urine drug testing is an important in efforts to combat drug abuse and in the proper context, can be used to deter drug abuse in general. Reliable discrimination between the presence or absence of specific drugs is critical. To insure reliable results, laboratory quality control procedures must be designed to monitor the system at each step in the process. NIDA certified laboratories are required to have quality control samples comprise 10% of each analytical batch. Quality control measures include validation of limits of detection (LOD) and limits of quantitation (LOQ), determination of linearity, extraction of 'blank' samples, extraction of conjugated samples to determine efficiency of hydrolysis, determination of possible carry-over from sample to sample and validation of a linear calibration curve for multi-point calibrations.

In a high volume, high throughput laboratory, most samples are injected by an autosampler and the analytical runs are often left unattended with the data being reviewed after the analytical run is completed. Failed calibration, failed QC and extraction problems may require that the run be reinjected or repeated. In

laboratories where manual injection of calibrators and controls is performed, the operator involved in the analysis can make real time decisions regarding the goodness of the fit of the calibration curve, acceptability of the QC samples and efficiency of the extraction.

This paper describes a software package which permits automated injection of calibrators, controls, blanks and unknown samples and makes decisions similar to those one would make if the injections were done manually. Some of the decisions made by the system are reinjection of individual calibration standards should the correlation coefficient not exceed predetermined value and reinjection of controls which violate QC rules. Blank samples are examined for the possibility of carry over and flagged if an analyte is found above user defined level. Other parameters which an operator must be aware of in reviewing sample data are quantitative values which exceed the linearity of the assay, quantitative values which are above the level at which carry over might be suspected, incomplete hydrolysis as shown by poor recovery of a hydrolysis control and quantitative values less than the predetermined LOQ or LOD. For each of these situations the operator can allow sample data to be flagged by the system. The operator has the flexibility to set each of these flags individually as well as set the levels at which the samples will be flagged.

The decision making capability of the system as well as the flagging of suspect data allows for more thorough review by the certifying scientist. The determination of goodness of fit of calibration and real time review of quality control samples provides for faster turn around of positives. In the event the calibration fails or QC is unacceptable, the run can be aborted and the next method started rather than wasting valuable instrument time. Again, the operator has great flexibility in making these determinations.

With respect to QC samples, Westgard rules¹ can be invoked by the operator making it easier to recognize shifts, trends and biases in QC results. Random and systemic errors become more apparent.

The system also allows flexibility in calibration. Historical calibrations can be used as well as single point and multi-point calibration (up to 6 calibrators). The origin can be included or excluded from multi-point calibrations, ion ratios for qualifier ions in SIR can be determined as a weighted average, a straight average or determined by a single calibrator. The advantage to the operator is that the analysis and data manipulation can be custom tailored to the method and analyte.

1) J.O. Westgard, *Clinical Chemistry*, Vol. 27 No. 3, 1981

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"The analysis and distribution of Zopiclone in 3 medical examiners cases." Peter Singer and Ashraf Mozayani. Medical Examiners Office, 4070 Bowness Rd. N.W., Calgary Alta T3B 3R7

Zopiclone is a cyclopyrrolone hypnotic agent, marketed under the trade name of ImovaneTM, which has recently been released in Canada. The analytical methods are complicated by the sensitivity of zopiclone to acid and base; neutral conditions should be used throughout the analysis. The formation and identification of some of the acid/base hydrolysis products will be reported. Three Medical Examiners cases will be reviewed:

- (1) An overdose (blood 0.38 mg/l) with ethanol (2.0 g/l) and fluoxetine (0.98 mg/l).
- (2) A therapeutic level (0.095 mg/l) with ethanol (1.7 g/l) and disipramine overdose (11.9 mg/l)
- (3) A therapeutic level (0.110 mg/l) combined with ethanol (2.2 g/l) and anileridine (0.28 mg/l).

Liver levels in these cases were 3.5 mg/kg, 0.40 and trace amount respectively.

Postmortem levels expected from therapeutic use are in the range of 0.040 to 0.100 mg/l. Losses on storing specimens under different conditions will be reported.

Poster Presentations

"Liquid ready-to-use homogeneous enzyme immunoassays for drugs of abuse testing." C.I. Lin, P. Khosropour, D. Curtis and Y.G. Tsay. Diagnostic Reagents, Inc. Mountain View CA. 94041

We have developed a homogeneous enzyme immunoassay for the detection of cocaine metabolite, amphetamines, phencyclidine (PCP), opiates, and THC metabolites in urine. Each assay consists of two reagents in a liquid ready-to-use format conveniently packaged in a 100 mL or 500 mL plastic bottle. The liquid format eliminates the need for reconstitution of lyophilized reagents and subsequent dilution with working buffer.

The assay can be performed with most clinical chemistry analyzers such as BM/Hitachi 704, 705, 717,

747, Olympus AU5000 and IL Monarch 2000. Assay parameters for each analyzer have been developed according to the instrument specifications. The sample to total reaction volume was optimized to 4.3%.

The assays are highly specific, sensitive and correlate well with GC/MS and commercially available EIA assay. The negative, low control, cutoff, high control and high calibrators are assayed with a Hitachi 717 analyzer and generated the following results (? rate):

Calibrator	Cocaine	Amp	PCP	Opiate	Calibrator	THC
negative	-3	14	6	6	negative	0
low control	24	143	98	53	50 ng/ml	54
cutoff	30	154	113	63	100 ng/ml	99
high control	39	166	126	68	200 ng/ml	161
high	114	195	148	108		

With the high specificity and sensitivity as well as ready-to-use liquid format, the assay can significantly improve the efficiency of drug testing in the laboratory.

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"Data file format translations from Hewlett-Packard Chemstations: A convenient way to produce publication quality chromatograms and spectra." William D. Darwin and Edward J. Cone, Addiction Research Center, NIDA, Baltimore, MD.

Often, it is difficult to produce finished, publication quality chromatograms of spectra from laboratory generated data. These "finished" products are frequently need for presentations (e.g., 35-mm slides, overhead transparencies) and graphics for scientific reports and articles. We developed a simple and convenient method of translating Hewlett-Packard Graphics Language (HPGL) files from HP ChemStations to Macintosh PICT format, the standard graphics format used for Macintosh applications. The use of HiJaak^R, Version 2 (Inset Systems) is used with the HP DOS ChemStation for screen captures and graphics conversion. Once a screen capture has been executed, HiJaak allows the HPGL files to be translated into Computer Graphics Metafile (CGM) format. With the Apple File Exchange translation software in Macintosh, screen captures in the CGM format can be translated into the PICT format. In PICT format, any graphics application, such as MacDraw II^R or Superpaint^R, can be used to annotate the chromatogram or spectrum by deleting unnecessary background to produce a finished product. To use HiJaak initially, the HPGL data file must be in a DOS environment. HP ChemLAN and Advanced Research Projects Agency (ARPA) Services software can be utilized to cop[y data files from GC/MS UNIX ChemStations to a DOS ChemStation. This method is used in our laboratory for publication quality graphics.

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"The identification and quantitation of Triamterene in blood and urine from a fatal aircraft accident." Vicky L. White, Dennis V. Canfield and Jerry R. Hordinsky, Civil Aeromedical Institute, Federal Aviation Administration, Oklahoma City, OK 73125

Triamterene, a diuretic drug used in combination with other drugs for the treatment of hypertension, was found in the blood and urine of a fatal aircraft accident victim. The extraction and identification of triamterene is difficult. It exhibits poor extraction efficiency using some standard base extraction procedures and the parent drug is unsuitable for analysis using gas chromatography. In this case a thin layer chromatography solvent system and high performance liquid chromatography were used to identify and quantitate triamterene in blood and urine. Triamterene is a strong absorber in the ultraviolet region and has an unusual UV spectrum, which simplifies the identification and quantitation of this substance by high performance liquid chromatography.

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"Extraction and simultaneous elution and derivatization of Tetrahydrocannabinol (THC) prior to GC/MS analysis of urine using SPEC On-Disc^R." Kent G. Johnson, Alan H.B. Wu, Ning Liu, Yoon-Jae Cho, and Shan S. Wong, Toxicology Laboratory, Hermann Hospital and Department of Pathology and Laboratory Medicine, University of Texas Medical School, Houston TX. =THC-C

THC is one of the drug classes currently listed on NIDA guidelines for workplace testing in urine. Confirmation analysis by GC/MS involves extraction and derivatization prior to injection. Most laboratories with a high test volume make use of solid-phase extraction columns. These methods are time consuming because of the numerous washings steps prior to elution, and because concentration of eluates by evaporation is usually needed. We evaluated SPEC C₁₈ Ondisc extractions (Toxi-Lab) and compared results against Bond-Elut (Analytichem)

In the SPEC procedure, alkaline-hydrolyzed urine spiked with internal standard is applied to SPEC, and rinsed with acetic acid. The disk containing THC and internal standard is dried under gentle vacuum. MSTFA is added to simultaneously elute and convert THC to the corresponding TMS derivatives following incubation at 70°C for 20 minutes. The reagent containing eluated drugs is directly injected onto the capillary (DB-5, J&W Scientific) GC/MS analyzer (ITS40, Finnigan MAT).

The within-run and day-to-day precision of the SPEC procedure for a three-level urine control (DOA, Hycor Biomedical) ranged from 3-8%. The limits of detection and quantitation, determined from replicates of blank urine, were 1.1 and 2.5 ng/mL, respectively. The linearity of the assay was 250 ng/mL, and the absolute analytical recovery, determined by comparison of peak areas of extracted vs. unextracted solvent standards, was 60%. These data and results of unknown urines correlated well with the Bond Elut method ($y=0.816x + 8.44$, $r=0.9985$). The advantages of SPEC include a significant reduction in time for extraction (3 vs 1 hour), the elimination of organic solvent use, and the production of cleaner chromatograms, when analyzed under full-scan electron impact MS analysis.

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"Diazem^R chromatographic packings: Utility in forensic toxicology laboratory." J.A. Patel, D.E. Williams and H.M. Kilminsch. University Hospital, Ann Arbor MI.

DIAZEM^T chromatographic materials packaged in extraction cartridges and HPLC columns are utilized for toxicological evaluations in biological fluids. The hydrophilic exterior of the packing material is designed to exclude large molecules of proteinaceous materials and the interior retains the drug components thus reducing interfering peaks, including fatty acids from the chromatographic analysis. The extraction of drugs is simple, quick and very efficient. The concentrated extract is suitable for GLC, HPLC and GC/MS analysis. The high efficiency of the packing material and superior small molecule retention eliminates the use of different types of extraction cartridges, only selection of an elution fluid on a specific mobile phase is required to achieve suitable analysis.

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"Cocaine and metabolite excretion in saliva under stimulated and unstimulated conditions." Kenichi Kato, Mary J. Hillsgrove, Linda Weinhold, David A. Gorelick, William D. Darwin and Edward J. Cone. Addiction Research Center, NIDA, Baltimore, MD

Saliva is an easily obtainable, non-invasive biological fluid that can be useful for chemical validation of cocaine use. However, there is little information on the excretion pattern of cocaine and its metabolites in saliva. We studied the time course of appearance and disappearance of cocaine and its metabolites under stimulated (sour candy) and unstimulated conditions. Mixed, whole saliva samples were obtained from 6 healthy volunteers who were administered three, equally spaced, single intravenous doses of 25 mg of cocaine

over 6 hours. On different days, either stimulated or unstimulated saliva samples were obtained periodically throughout the day. The samples were analyzed for cocaine and metabolites by GC/MS. Cocaine, benzoylecgonine (BE) and ecgonine methyl ester (EME) were quantitated in the saliva of all subjects. Cocaine was the predominant analyte in all samples. Unstimulated saliva contained substantially more drug than stimulated samples. The ratio of cocaine in unstimulated to stimulated saliva was variable, but generally cocaine was in five-fold excess in unstimulated saliva. The ratios of BE and EME to cocaine were similar under both conditions. These results indicate that cocaine is the predominant analyte in saliva and that the concentration of analytes can be diluted by stimulation. These factors should be taken into account in the design of saliva tests for cocaine exposure.

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"Method comparison of Syva EMIT II and Roche Online with RIA for drug screening." David Armbruster, Robert Schwarzhoff, Barbara L. Pierce and Edward C. Hubster. Armstrong Laboratory Drug Testing Division, Brooks AFB, TX 78235

The slopes for the calibration curve for the Emit II and Online assays for marijuana (THC), Cocaine (BE), barbiturates (BARBS), and opiates suggest that the new Online tests, utilizing the kinetic interaction of microparticles in solution (KIMS) methodology, offer greater sensitivity (change in analytical signal/change in analyte concentration). Within run and day-to-day precision for both types of assays was typically 10% CV. About 53,000 urines were screened using ROCHE Abuscreen RIA assays and Emit II and Online. Screen positives were submitted for GC/MS confirmation. Method comparison data is summarized below.

Drug	RIA Pos(%)	Emit II Pos(%)	Online Pos(%)	GC/MS Pos
THC	223 (100)	201 (90)	222 (99.5)	223
BE	192 (100)	190 (98.9)	191 (99.5)	192
BARBS	33 (100)	33 (100)	33 (100)	33
OPIATES	79 (100)	79 (100)	79 (100)	79

The Emit II and Online tests compare favorably with RIA in screening efficiency for BE, Barbs and opiates. The Online THC test missed only one confirmed positive detected by RIA but the Emit II THC test detected only 90% of positives. Similar numbers of urines which screened positive by all three assays failed to confirm as shown below.

Number of screen positives failing to confirm

Drug	RIA	Emit II	Online
THC	12	7	8
BE	12	9	11
Opiates	20	19	17

The newest versions of the Emit assays and the recently released Online tests appear to perform comparably and agree well with established RIA procedures.

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"Method comparison of EMIT 700 and EMIT II with RIA for drug screening." Robert H. Schwarzhoff, David A. Armbruster, Barbara L. Pierce and Edward C. Hubster. Armstrong Laboratory Drug Testing Division, Brooks AFB, TX 78235.

Calibration curves and minimum acceptable absorbance rate separations for Syva Emit 700 and Emit II, performed using a Hitachi 717 analyzer, are very similar for the marijuana (THC), cocaine (BE), barbiturates (BARBS), and opiate assays. Within-run and run-to-run CVs for calibrators and controls for both Emit assays are typically <10%. A group of about 68,000 urine samples were tested for all four drugs using Emit 700 and Roche Abuscreen RIA assays. Another group of about 53,000 urines were screened using Emit II and Abuscreen. Screen positives were submitted for GC/MS confirmation. Method comparison data is summarized below.

DRUG	RIA POS (%)	EMIT 700 POS (%)	GC/MS POS
THC	192 (100)	173 (100)	192

24, 7, 38 and 42% for RIA#1, RIA#2, EIA-s and FPIA-s, respectively. For triazolam at 70 ng/mL, it was 37, 13, 66 and 71% for the same assays. None of these assays was effected by aging the human blood at room temperature up to 5 weeks. Commercial immunoassays can be used to detect benzodiazepines in blood. When the blood is extracted with an organic solvent and reconstructed in a reduced volume benzodiazepines could be detected at low ng/mL concentrations.

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"Investigation of blood-related matrix effect: Impact on the quantitation of Tricyclic Antidepressants in whole blood." W.B. Walker, J.M. Mayer and K.W. Hindmarsh. Centre of Forensic Sciences, Toronto, Canada.

The aim of this study was to determine whether the quantitation of amitriptyline, nortriptyline and imipramine in putrefied postmortem blood samples is subject to variations due to the matrix of the samples. Previously screened, drug free postmortem (PM) samples (n=29), in various stages of apparent putrefaction, were spiked to achieve blood antidepressant concentrations ranging from high therapeutic to potentially fatal. Control groups consisted of similarly spiked fresh (FR) and six-week-old aged (AGD) whole blood samples (n=30 each) obtained from drug free subjects. Drug measurements were done with a Hewlett-Packard GC/MSD, in a single ion monitoring mode, using the respective deuterated homologues as the internal standards. Linear regressions, for all experimental groups, derived by plotting the analyte peak areas vs. concentration (external standard method), and the peak area ratios of the analyte over internal standard vs. concentration (internal standard method), were compared on the basis of regression coefficient and intercept.

Significantly lower (as much as 40%) recoveries for the drugs were observed only in the highly putrefied PM samples when compared to the control groups in the external standard method. This was associated with a decrease in the regression coefficient. By contrast, no statistical significant differences in the external standard regression lines were observed between the FR and AGD groups.

Concomitant lower recoveries of the deuterated internal standards were also observed in the highly putrefied PM samples. However, analysis of the data using the internal standard method resulted only in minor differences between the regression lines for the experimental groups, compared to the large differences seen with the external standard method.

The present data suggest that the presence of putrefaction within postmortem blood samples may result in decreased recovery of the tricyclic antidepressants. The use of deuterated internal standard controls this effect to a large measure, and reduces the potential for underestimation of drug concentration.

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"Predictive models for estimating time of Marijuana usage from plasma Cannabinoid levels." Marilyn A. Huestis, Jack E. Henningfield and Edward J. Cone. Addiction Research Center, NIDA, P.O. Box 5180, Baltimore MD 21224

Two mathematical models are described for the prediction of time of marijuana usage from the analysis of a single blood sample for cannabinoids. The models were derived from cannabinoid blood data obtained from a controlled clinical study of acute marijuana smoking. Model I was based on THC concentrations and Model II was based on the ratio of THCCOOH to THC levels in plasma. The two models were validated with cannabinoid blood data from nine published and unpublished clinical studies, including blood samples obtained from infrequent and frequent marijuana smokers and after oral marijuana administration. The accuracy of model prediction was evaluated by comparison of the predicted time of drug usage to the actual time of exposure and by determining if the actual time of usage was within 95% confidence limits. Model I correctly predicted the time of exposure within the 95% confidence interval for 235 of 261 samples (90.0%), and Model II was correct in 232 of 260 samples (89.2%). These prediction models may be beneficial to forensic scientists in the interpretation of cannabinoid blood levels.

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"Analysis of delta-9-tetrahydrocannabinol (THC) metabolites in plasma using Gas Chromatography/ Mass Spectrometry (GC/MS) Chemical Ionization." P.M. Kemp, J.E. Manno, B.R. Manno and D.D. Alford. Departments of Pharmacology, Psychiatry and the Center for Excellence in Clinical and Forensic Toxicology, Louisiana State University Medical Center, PO Box 33932, Shreveport, LA 71130-3932.

Studies of the metabolism of THC require assays with a high degree of sensitivity and specificity to detect various metabolites in biologic matrices. A GC/MS method was developed for the identification of THC, 8 α -hydroxy-THC, 8 β -hydroxy-THC, 11-hydroxy-THC and 11-nor-9-carboxy-THC in plasma. The cannabinoids were extracted with hexane:ethyl acetate (7:1, v/v) from two mLs of acidified plasma following basic hydrolysis. The free metabolites were derivatized with N,O-bis-trimethylsilyl-trifluoroacetamide (BSTFA) + 1% trimethylchlorosilane (TMCS) heated for 10 minutes at 60° C. The samples were separated and analyzed by a Hewlett-Packard GC/MS (5890/5988) equipped with a 5% phenylmethylsilicone capillary column. The separation occurred using temperature programming of 180-280° C and a 10° C rate of rise. The limit of detection for the method was 500 pg/ml with linearity ranging from 0.5ng/ml to 100 ng/ml. Supported in part by NIDA Grants DA05850 and DA06643.

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PLATFORM SESSION 4

"An overdose of Bron and Verapamil." Barry Levine, Robert Jones, Michael L. Smith, Kevin Klette and Edward Kilbane. Office of the Armed Forces Medical Examiner, AFIP, Washington D.C. 20306

A case is presented of a 19-year-old white male whose body was found in his family's quarters. He lived as a recluse, primarily occupying himself playing computer and video games. An autopsy failed to determine the cause of death and specimens were sent for toxicologic analysis. No ethanol or other volatiles were detected in the blood, urine or vitreous fluid. Comprehensive drug testing of the urine identified chlorpheniramine, dihydrocodiene, methylephedrine, salicylate and verapamil. The first three drugs listed appear together in an over-the-counter cough suppressant in Japan under the name BRON. Mental disturbances such as hallucinatory-paranoid state and affective disorder have been reported from abusing this drug. Salicylate was identified by color test and confirmed and quantitated by fluorescence polarization immunoassay. All other drugs were identified and quantitated by gas chromatography and confirmed by full scan electron impact gas chromatography/ mass spectrometry. Blood quantitations (mg/L) were as follows: chlorpheniramine 2.6; dihydrocodeine 4.7; methylephedrine 5.6; salicylate 150; verapamil 6.0. The cause of death was multiple drug intoxication and the manner of death was undetermined.

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"Forensic Medicine in Greece." M. Michalodimitrakis, a. Tsakalof and A. Tsatsakis. Department of Forensic Sciences, University of Crete, Iraklion, Greece, 71110.

The main feature of forensic medicine in Greece is that medicolegal investigation takes place only after the issuance of a pertinent order by state authorities prosecutor, police, investigation judge.) Thus, the Greek forensic pathologists are not empowered with the independent authority of his British and American colleagues. In Greece there are nine medicolegal services, most of which belong to Medical Schools but they function in different ways. In the University of Alexandropolis there is only a forensic pathology practice but in the Medical Schools of Athens and Patras there is only toxicology. there are also three other state services in Athens, Pireus and Heraklion Crete dealing only with forensic pathology as well as a Police Crime lab in Athens. Only the Universities of Thessaloniki and the newest University of Crete have full authority in all topics of forensic medicine, the last one actually having a Department of Forensic Sciences. The situation is believed to be reformed soon and it is hoped that this calamity will be rectified in the interests of Justice, Practice and Medical training in Greece.

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"Characterization of a novel stationary phase for toxicological analysis." Richard Morehead. Restek Corporation, 110 Benner Circle, Bellefonte, PA 16823

Current capillary gas chromatographic methods for screening drugs in biological fluids based upon the use of either methyl silicone or phenylmethyl silicone capillary columns. Although methyl silicone and phenylmethyl silicone stationary phases provide adequate resolution for a large set of analytes, changing the polarity by increasing the phenyl content of the stationary phase will not always resolve closely eluting compounds. Incorporation of different functional groups into the stationary phase can yield separations of compounds that had been difficult to resolve on standard stationary phases. Evaluation of a novel trifluoropropyl-methyl stationary phase has shown unique selectivity for a variety of drugs. Chromatographic performance on this phase can be predicted based on the inclusion of certain functional groups in the structure of the compound. The retention behavior of over 125 commonly analyzed drugs was characterized on the trifluoropropyl stationary phase and compared to methyl silicone and phenylmethyl silicone stationary phases through the use of a retention index system. Key separations on the trifluoropropyl column will be highlighted that illustrate the separation mechanism of the stationary phase. The utility of trifluoropropyl capillary columns for the use in drug screening will also be discussed.



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PLATFORM SESSION 5

"Borohydride reduction - Possible aid in Morphine identification." John Fenton, Judy Mummert and Michael Childers. West Chester University and Crozer-Chester Medical Center.



Many opiates cross-react in immuno-assay screens and some have retention times and principle ions so similar to morphine and codeine that false positives may result. We have prepared acetyl and trimethylsilyl derivatives of a series of morphine and codeine analogs (hydrocodone, hydromorphone, oxycodone, oxymorphone, dihydrocodeinone) and have determined parameters which improve their recognition by GC-MS. A simple procedure for reduction of opiates with sodium borohydride has been developed which improves identification because the reduced products of the analogs have different retention times and ions. We have examined enol formation in opiate analogs with keto groups. Enols are very similar to morphine and codeine in chromatographic behavior. It was found that enol formation is favored at higher temperature and/or lower pH and is more likely with TMS derivatives than with acetyl derivatives. Our protocol involving reduction is helpful in this context because the reduced opiates are protected from enol formation thus eliminating this possible cause of false positives for morphine or codeine.

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"Immunoassay evidence for Fentanyl in hair of surgery patients." Wen-Ling Wang and Edward Cone. Addiction Research Center, NIDA, Baltimore MD. and James Zacny, Department of Anesthesia and Critical Care, University of Chicago, Chicago IL.

Numerous opioids have been detected in hair including morphine, codeine, 6-acetylmorphine, heroin and methadone. However, there appears to be no reports of detection of fentanyl in this unique biological matrix, likely as a result of fentanyl's high relative potency and the lack of sensitive analytical methods. We sought evidence for the excretion of fentanyl in hair of surgery patients by radioimmunoassay (RIA). Thirteen hair locks were obtained from patients who received from 1.0-6.0 mg fentanyl. The interval between fentanyl administration and hair collection varied from 7-273 days with a median of 31 days. The length of the locks varied from 10-130 mm. Twenty control samples (10 male and 10 female) also were obtained from staff members who reported no surgery within the last year. Samples were cut in approximately equal portions (root and tip), weighed into approximate 10 mg portions, and washed with methanol for 5 min at room temperature. The washed hair samples were extracted with methanol for 18 hours at 40°C. The extracts were evaporated and the residues dissolved in 0.1M citrate buffer (pH 6.0). They were analyzed by RIA (DPC's Coat-a-Count[†] Fentanyl assay) with a

standard curve prepared from similar extracts. Seven of the surgery patients had fentanyl in the root portions of their hair at concentrations of 0.13-0.46 ng/10mg and 0.03-0.25 ng/10mg in the tip sections. One patient had a concentration of 0.48 and 0.82 ng/10mg, respectively. The interval between drug administration and hair collection for this patient was only 7 days. Five of the fentanyl patients had levels similar to those observed for the control subjects (0-0.08ng/10mg, n=19). One control subject who had experienced environmental exposure to fentanyl had levels of 0.29ng/10 mg in the extract and 0.63 ng/10 mg in the wash fraction. These RIA data provide strong evidence that fentanyl can be detected in hair following fentanyl administration and environmental exposure.

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"Identification of Heroin, 6-Acetylmorphine and Morphine in post mortem urine by GC/MS." Bruce A. Goldberger, Terrance M. Grant, William D. Darwin, Amanda J. Jenkins and Edward Cone. Addiction Research Center, NIDA, Baltimore, MD and Yale Caplan, National Center for Forensic Science, Baltimore MD.

Toxicologic interpretation of heroin related deaths rely upon the identification of 6-acetylmorphine and morphine to document heroin use. Recently we developed a procedure for the determination of heroin, 6-acetylmorphine and morphine using solid phase extraction coupled with gas chromatography/mass spectrometric detection. In the present study, urine specimens were collected from cases of death due to acute narcotic intoxication (n=12) and tested for heroin and metabolites. Urine specimens were selected on the basis of previous identification of 6-acetylmorphine in blood and/or urine or history of recent heroin use. In addition, control specimens (n=4) were collected from cases of death due to cardiovascular disease. The mean concentration of analytes in urine were : heroin, 11.5 ng/ml (n=6), 6-acetylmorphine, 292.9ng/ml (n=12) and unconjugated morphine, 881.2 ng/ml (n=12). No correlation between the presence of heroin and the concentration of 6-acetylmorphine and morphine was evident. All control samples were negative for heroin and metabolites. The discovery of heroin in urine provides additional analytical proof which can be used to discriminate heroin use from other forms of opiate exposure in cases of acute narcotic intoxication.

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"A simplified procedure for the determination of Free Codeine, Free Morphine, and 6-Acetylmorphine in urine." Dwain C. Fuller, Sierra Nevada Laboratories Inc. 888 Willow Street., Reno, Nevada 89502; and William H. Anderson, University of Nevada School of Medicine, Reno Nevada.

Free codeine, free morphine, and 6-acetylmorphine were extracted from urine at neutral pH by mixed moiety solid phase extraction prior to derivatization to their trifluoroacetyl derivatives. The derivatized extracts were analyzed by gas chromatography/mass spectrometry in the electron impact mode. Confirmation of the analytes was accomplished by comparing the ion abundance ratios of the analytes to those of previously analyzed standard. The qualitative ion abundance ratios were required to be within 20% of those of the standard for acceptance. Qualification was based on the tri-deuterated analogs of the analytes. Linearity was obtained in the range of 10 ng/mL to 1000 ng/mL, with correlation coefficients of all analytes exceeding 0.999. Percent recoveries were 90% for codeine, 88% for morphine, and 85% for 6-acetylmorphine. No hydrolysis of 6-acetylmorphine occurs during the extraction procedure. The authors also studied the stability of 6-acetylmorphine at various storage conditions of pH, temperature, and chemical preservation. 6-Acetylmorphine was found to be stable for 12 weeks when stored at -17°C.

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"Homicide by Morphine injection." Jeanne M. Beno. Medical Examiner's Office, Rochester, New York 14620.

A 66 y.o woman was admitted to hospital in full arrest after allegedly experiencing chest pain and being administered 25mg. morphine sulfate in 2 doses by her physician husband. She was resuscitated, placed on a respirator and died two days later. Twenty six blood or serum and 2 urine samples taken during the course of her hospitalization were obtained for toxicology.

Blood and urine samples were analyzed for free and total morphine by RIA and GC/MS. Free and total morphine in admission serum were 0.56 and 3.68 mg/L respectively. Serum morphine levels declined over time consistent with normal pharmacokinetics. Urine levels 1½ hrs. post admission were 4.65 and 30.0 mg/L free and total respectively. Levels were inconsistent with the purported dose of 25 mg and the case was ruled homicide. At trial, 1 month of testimony was devoted to establishing the chain of custody of the 28 hospital samples. Despite this the judge ruled that the safe-guards employed by the hospital relative to sealing, marking and tracking samples were no consistent with those of a forensic lab. All of the samples were ruled inadmissible and the case was dismissed. This paper will explore the evidence in this case and the judge's precedent setting decision.

PLATFORM SESSION 6

"Paraquat Poisonings. Never is late." M. Michalodimitrakis, A. Tsatsakis, A. Tsakalof, M. Dimopoulou and G. Troulinos. Department of Forensic Sciences, University of Crete, Iraklion, Greece

Lethal poisonings involving ingestion of paraquat are known to the wide public through news-media on suicide cases. Paraquat is the second poison of choice among suicide victims in Crete in the last years according to our records. From all cases admitted to the major hospitals and/or treated in the intensive care units and suspected for intoxication, we get samples of urine, blood, vomit or stomach content in order to detect and quantify the poison and accordingly support therapy management. In case of good coordination between clinical physicians and us the best for detoxification is achieved and was proved that never is late. Two cases with similar toxicological index of paraquat and other parameters came to different finishes. In the first case, although the intoxicated person was transferred to the hospital 16 hours after ingestion of paraquat, managing with continuous and alternative treatment using hemosorbition and plasma substitution (prednisone, vitamin E and allopurinol were also given), after ten days recovered. Histological findings and lethal concentrations of poison in fluids and tissues from fatal cases are demonstrated.

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"Matrix effects in Radioimmunoassays for drugs of abuse." Sandra L. Dickerson and Edward J. Cone. Addiction Research Center, NIDA, Baltimore, MD

Preparation of new standard curves and controls for radioimmunoassay (RIA) is often necessary when alternate biological matrix is analyzed. Use of the manufacturer's supplied calibrators and controls can result in substantial quantitative errors if appropriate adjustments are not made for matrix differences. We evaluated differences in response between urine- and plasma- based RIA curves with two Diagnostic Products Corporation's assays. In the Coat-a-Count[®] Methadone assay, a 45% reduction in maximum binding occurred in plasma versus urine standards. A similar reduction was observed in all standard concentrations. No changes occurred in percent bound fraction. In Buprenorphine Double Antibody assay, no changes occurred in the maximum binding; however there was a progressive reduction in the percent bound fraction in all standard buprenorphine concentrations prepared in plasma. Plasma nonspecific binding was significantly increased; both intra- and inter-subject differences were noted. The data indicate that matrix effects can diminish accuracy when commercial radioimmunoassays are used for the analysis of alternate biological specimens.

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"Does Nystagmus have a role in alcohol induced changes in Static Ataxia?" B.R. Manno, M.E. McWilliams and J.E. Manno. Louisiana State University Medical Center, Center for Excellence in Clinical and Forensic Toxicology and Departments of Psychiatry, Neurology and Pharmacology, P.O. Box 33932, Shreveport, LA 71130-3932

Subjects (n=10) receiving oral doses of 80 proof vodka in orange juice calculated to produce 0, 25, 50 or 100 mg/dl blood alcohol levels were tested on a device designed to measure vertical and horizontal static ataxia (body sway) with and without proprioceptor input. Preliminary studies indicated that a dose dependent increase in body sway was observed, occurring primarily in the vertical vector. Also, subjects were observed to have an altered pivotal point for body sway and which we have previously termed "truncal ataxia". Truncal ataxia is defined as vertical sway with a pivot point in the pelvic-waist area of the body. The vertical sway occurring with placebo and the two lower doses of alcohol had a pivot point in the ankles of the subject. Horizontal sway which increases with increasing doses of alcohol did not change by the same magnitude as vertical sway. The question of the role of nystagmus in maintaining body stability at the four doses of alcohol has been further evaluated in four of the subjects tested. Supported by NIDA Grant DA05850.

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"Validity testing of the Hycor Accupinch THC test." Amanda J. Jenkins, Edward J. Cone, William D. Darwin and Marilyn A. Huestis. Addiction Research Center, NIDA, Baltimore MD. and John Mitchell, Navy Drug Screening Laboratory, NAS, Jacksonville, FL.

A validity assessment study was performed on the Hycor *accuPINCH*TM THC TEST. The assay is a qualitative competitive enzyme immunoassay for the detection of cannabinoids in human urine. Three healthy male volunteers with a history of marijuana use participated in the study. Marijuana cigarettes (1, 2 or 4; 2.6% THC) were smoked on test days. A set of three hundred specimens, consisting of clinical urines (178), drug free urines fortified with standards (72) and drug free urines (50), were assayed in random order under blind conditions by the *accuPINCH* THC test and by GC/MS (≥ 15 ng/mL THCCOOH cutoff = +GC/MS). A positive immunoassay result was indicated by a green color \geq the 'A' reference color standard. The 'B' reference color standard indicated the presence of THCCOOH at 100 ng/mL. Results were determined independently by three readers and interpreted as positive A (+A); positive B (+B) or negative (N). Assay of specimens from subjects who smoked marijuana resulted in 7-11% false negatives (N; +GC/MS) and no false positives (+B;-GC/MS). One reader interpreted all 50 drug free urines as N and two readers interpreted 3 and 5 samples as +A, respectively. The readers agreed on an average of 85% of the results. All 3 readers detected THCCOOH at 100 ng/mL, but reported the 50 ng/mL standard as N. Overall, the test was easy to perform and generally produced accurate results; however, the low sensitivity of the assay will likely result in a high rate of false negatives.

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"Selection of toxicologic specimens in decomposed human remains." Edward T. McDonough, Office of the Chief Medical Examiner, Farmington, CT.

The autopsy in only one slice of the death investigation pie and must be put in proper perspective along with other data, such as the toxicology report, in order that a particular death be certified correctly. Communication is extremely important between the toxicology laboratory and the Forensic Pathologist. "Drugs" may be the actual cause of death, but also may be a contributory factor. The results of the analysis may also give a clue as to what further medical investigation may be needed.

The body undergoes regular and predictable changes of decay after death. The availability of different tissues for toxicologic analysis vary with time and with the questions that need to be answered. The spectrum ranges from well-preserved and separated premortem serum samples to dry skeletonized remains. Valuable information can be generated with adequate specimen sampling and cautious interpretation by the Forensic Pathologist.