



# TOXTALK

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## RALEIGH—DURHAM—CHAPEL HILL, NC HERE WE COME!

For those of you already registered and those planning to, the SOFT 2007 Organizing Committee would like to welcome you in advance to North Carolina, home to the first officially incorporated SOFT meeting.

The mission of SOFT is to promote and develop the science of forensic toxicology, and the 2007 program committee has organized an excellent forum to fulfill that mission, including the first presentation of the SOFT Student Enrichment Program (SSEP). The SSEP will provide North Carolina High School and College students with a full day of activities designed to expose them to the toxicology laboratory and to practicing forensic toxicologists.

A broad array of topics will be covered in the five full-day and three half-day workshops followed by approximately 30 platform and 86 poster presentations. The program this year has been formatted to prevent concurrent scientific sessions. Three receptions, including an evening at Durham's Historic Tobacco Campus, will provide food, drink, dance and multiple opportunities to socialize and enjoy the city.



The Sheraton Imperial Hotel is located in Research Triangle Park, an almost 3600 acre public/private, planned research park established in 1959 by leaders from business, academia and industry. The hotel will provide shuttles to nearby areas, including shopping malls and downtown Chapel Hill where you will find marvelous restaurants and more.

Please remember to thank the many exhibitors and sponsors for their continued contributions to S.O.F.T. In addition to financially supporting the meeting activities, these groups provide the resources we need to perform our regular jobs efficiently and accurately.

On behalf of the 2007 Organizing Committee we hope you receive valuable scientific information from the program and have a chance to enjoy the southern hospitality for which our area is known.

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## S.O.F.T. STUDENT ENRICHMENT PROGRAM

The S.O.F.T. Student Enrichment Program (SSEP) has numerous openings still available for high school and college students. The SSEP Committee would also like to announce that interested graduate students should apply, and that their applications will be considered on a first-come, first served and space available basis. While the official deadline for application was September 14, we will continue to accept applicants after this date until all slots are filled. Please bring this pro-

gram to the attention of interested students, and encourage them to submit their applications to attend this unique learning opportunity.

For further information refer to the S.O.F.T. web site: [http://www.soft-tox.org/docs/SOFT%202007%20SEP%20Application.pdf] or contact Program Chair:

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Fax 828-265-3606



## PRESIDENT'S MESSAGE

### BY DIANA WILKINS, PH.D.

Summer is almost over and there are many exciting events and activities approaching!

Only a few more weeks remain until the 2007 SOFT Annual Meeting at the Sheraton Imperial Hotel in Chapel Hill, N.C. Our local meeting co-hosts, Jeri Ropero-Miller and Ruth Winecker, along with their incredible local team have put together a program that promises to be both informative and fun. If you haven't registered already, it isn't too late to attend and join your colleagues at this meeting. The workshops, scientific sessions, and social activities promise to make this a great meeting!

This past quarter, S.O.F.T.'s Ad Hoc Committee for Long-Term Strategic Planning has continued to review and develop recommendations for the future

growth of the organization. Chaired by Dr. Brad Helper, this important committee will be able to report to the membership on their progress at the 2007 Annual Meeting. Please be sure to come to the Business Meeting so that you can be updated on all the latest information and participate in planning for S.O.F.T.'s future!

In keeping with tradition, the joint SOFT/JAT special issue of the *Journal of Analytical Toxicology* will soon be available. This issue presents current information on some of the most relevant topics to the practice of forensic toxicology. Emerging trends and novel research in the areas of analytical, post-mortem and human performance toxicology, as well as case studies of particular interest

to forensic toxicologists, are included in this valuable resource. Dr. Sarah Kerrigan (Guest Editor) and her team of reviewers, as well as submitting authors, have done an outstanding job in helping to create this special publication.

Please also continue to submit your news items and articles for ToxTalk to our Interim- and Section Editors, Yale Caplan, Vickie Watts, Dan Anderson, Matthew Barnhill, Dwain Fuller, and Don Kippenberger. Thanks to all of the many S.O.F.T. members who continue to help create this outstanding resource for the membership.

Looking forward to seeing everyone at the October meeting!

Diana

## EXHIBIT & SPONSOR UPDATE

Each year the list of companies exhibiting and sponsoring at our annual meeting becomes more and more impressive. The financial commitment from exhibitors is absolutely essential in keeping meeting registration fees low. The exhibit booths for this year's S.O.F.T. meeting in N.C. sold out in an astoundingly short period of time. This year's remarkable list of exhibitors include the following companies:

Agilent Technologies  
AIT Laboratories  
Alternative Biomedical Solutions  
American Solutions for Business  
Applied Biosystems  
Axiom Diagnostics  
Biochemical Diagnostics, Inc./Hamilton  
Biotage  
Branan Medical Corporation  
Bruker Daltonics  
Campbell Science Corporation  
Capitol Vial, Inc.  
Cerilliant Corporation  
ChemWare, Inc.  
CMI, Inc.

Common Cents Systems,  
Dade Behring, Inc.  
Data Unlimited International, Inc.  
domnick hunter, Inc. (a division of  
Parker-Hannifin Corporation)  
DPX Labs, LLC  
EccoTrax, Inc.  
Excalibur Lab Specialists, Inc.  
Express Diagnostics International  
Forensic Magazine  
GBF, Inc.  
Gentech Scientific, Inc.  
GERSTEL, Inc.  
Hamilton/Biochemical Diagnostics, Inc.  
Immunalysis Corporation  
Instant Technologies  
International Diagnostic Systems Corp.  
Journal of Analytical Toxicology  
JEOL USA, Inc.  
JusticeTrax, Inc.  
Laboratory Corporation of America  
Leap Technologies  
Lin-Zhi International, Inc.  
Lipomed, Inc.  
Microgenics Corporation  
MicroLiter Analytical Supplies, Inc.

Neogen Corporation  
NMS Labs  
OraSure Technologies, Inc.  
Orochem Technologies  
PerkinElmer Life & Analytical Sciences  
Quality Assurance Services  
Randox Laboratories  
Regis Technologies  
Restek Corporation  
Roche Diagnostics Corporation  
Rudolph Research Analytical  
Sciteck Diagnostics, Inc.  
SGE, Inc.  
Shamrock Glass Company, Inc.  
Shimadzu Scientific Instruments, Inc.  
SPEware Corporation  
Standard Register  
Thermo Scientific  
United Chemical Technologies, Inc.  
UTAK Labs, Inc.  
Varian, Inc.  
Venture Labs, Inc.  
VertiQ Software, LLC  
Waters Corporation

(as of 9-1-07)



## S.O.F.T. 2007 ANNUAL MEETING RALEIGH-DURHAM-CHAPEL HILL

October 15-19, 2007

Co-Hosts: Jeri Roper-Miller / Ruth Winecker

Site: Sheraton Imperial Hotel, Durham, North Carolina



### PRELIMINARY PROGRAM

#### Saturday, October 13, 2007

- Satellite Organizational Meetings

#### Sunday, October 14, 2007

- Registration Opens  
(9:00 am—6:00 pm)
- NLCP Inspector Training  
(2:00 pm—6:00 pm)

#### Monday, October 15, 2007

- Continental Breakfast  
(7:00 am—8:30 am)
- Registration (7:00 am—6:00 pm)
- SOFT Board Meeting  
(7:00 am—1:00 pm)
- ABFT Exam Committee  
(7:00 am—noon)
- Workshops 1, 2, 3  
(8:00 am—5:00 pm)
- SOFT Student Enrichment Program  
(8:00 am—5:00 pm)
- Workshop 4 (8:00 am—noon)
- Sunshine/Rieders Silent Auction  
(opens Monday noon, closes  
Thursday at noon)
- Workshop 5 (1:00 pm—5:00 pm)
- FTCB Board Meeting  
(5:00 pm—6:00 pm)
- SOFT / AAFS Drugs & Driving  
(5:00 pm—6:30 pm)
- Dinner—on your own
- Roche Hospitality  
(8:00 pm—10:00 pm)
- Applied Bioscience Hospitality  
(8:00 pm—10:00 pm)

#### Tuesday, October 16, 2007

- Continental Breakfast  
(7:00 am—8:30 am)
- Registration (7:00 am—6:00 pm)
- Sunshine/Rieders Silent Auction  
(all day)

#### Tuesday, October 16, 2007 continued

- Workshop 8 (8:00 am—noon)
- Workshops 6, 7 (8:00 am—5:00 pm)
- ABFT Examination  
(8:00 am—noon)
- ABFT Accreditation Committee  
(8:00 am—noon)
- ABFT Board Meeting  
(noon—6 pm)
- Exhibits Set-up (noon—5:00 pm)
- Exhibits Open (6:30 pm—8:00 pm)
- Welcoming Reception in Exhibit  
Hall (6:30 pm—8:00 pm)
- Elmer Gordon Forum  
(8:00 pm—10:00 pm)
- Nite Owl Reception  
hosted by Cerilliant  
(10:00 pm—midnight)

#### Wednesday, October 17, 2007

- Continental Breakfast  
(7:00 am—8:30 am)
- Registration (7:00 am—5:30 pm)
- Sunshine/Rieders Silent Auction  
(all day)
- AAFS Steering (7:30 am—noon)
- Scientific Session #1  
(8:30 am—10:00 am)
- Exhibits Open (8:30 am—3:30 pm)
- Poster Session #1 (10:30 am—noon)
- Lunch w/ Exhibitors  
(noon—1:30 pm)
- DFSA Committee Meeting  
(noon—1:30 pm)
- Scientific Session #2  
(1:30 pm—3:00 pm)
- SOFT Business Meeting  
(3:30 pm—5:00 pm)
- Exhibitor's Happy Hour  
(5:00 pm—6:30 pm)
- Historic Tobacco Campus with  
Music on the Lawn  
(6:30 pm—10:30 pm)

#### Thursday, October 18, 2007

- SOFT Fun Run/Walk  
(6:30 am—8:00 am)
- Continental Breakfast  
(7:00 am—8:30 am)
- Registration (7:00 am—5:00 pm)
- Sunshine/Rieders Silent Auction  
(winning bids posted at noon)
- Exhibitor Feedback Meeting  
(8:00 am—9:00 am)
- Scientific Session #3  
(8:30 am—10:00 am)
- Exhibits Open (9:00 am—1:30 pm)
- Poster Session #2  
(10:30 am—noon)
- Lunch w/ Exhibitors  
(noon—1:30 pm)
- Scientific Session #4  
(1:30 pm—3:00 pm)
- Exhibits Breakdown  
(1:30 pm—5:30 pm)
- Poster Session #3  
(3:30 pm—5:00 pm)
- ABFT Certificate Reception  
(5:00 pm—6:00 pm)
- President's Reception  
(6:30 pm—10:30 pm)

#### Friday, October 19, 2007

- Continental Breakfast  
(7:30 am—9:00 am)
- Registration (8:00 am—11:00 am)
- Sunshine/Rieders Silent Auction  
claim merchandise before  
11:00 am
- Closing Scientific Session #5  
(9:00 am—11:00 am)
- NSC Committee on Alcohol &  
Drugs (11:30 pm—1:30 pm)



## NOMINATING COMMITTEE OFFERS 2008 SLATE

President: Christine Moore, Ph.D  
 Vice President: Anthony Costantino, Ph.D.  
 Secretary: Sarah Kerrigan, Ph.D.  
 Directors: Peter Stout, Ph.D.,  
 Dan Anderson, M.S.  
 Dwain Fuller, B.S.

The 2007 SOFT Nominating Committee, consisting of Timothy Rohrig (Chair), Jennifer Limoges, and Rod McCutcheon, respectfully submit the following slate for consideration by the membership for 2008.

The President and Vice President serve one year terms while the Treasurer and Secretary serve two year terms, which expire in alternate years. The five additional Directors are elected for three year terms. If a director cannot serve his/her entire term, an interim director shall be named by the Board to serve the remaining term. All officers are also directors.

### **President: (one year term)**

#### **Christine Moore Ph.D. ◆**

Dr. Christine Moore is currently the Vice President of Toxicology Research and Development for Immunalysis Corporation, a company specializing in the manufacture and distribution of microplate systems for testing drugs of abuse.

Dr. Moore has a Bachelor of Science (Honors) degree in Applied Chemistry from the University of Salford, England (1985), a Master of Science degree in Forensic Science from the University of Strathclyde, Scotland (1986), and a Ph.D. in Forensic Toxicology from the University of Glasgow, Scotland (1989). Additionally, she is Board Certified in Toxicological Chemistry by the American Board of Clinical Chemistry (DABCC), and is a Fellow of the Royal Society of Chemistry and the American Academy of Forensic Sciences.

Dr. Moore is currently the Vice-President of the Society of Forensic Toxicologists (SOFT) and VP of the Society of Hair Testing. She is a member of the International Association of Forensic Toxicologists (TIAFT), the American Association of Clinical Chemistry (AACC), the Research Society on Alcoholism (RSA), the California Association of Toxicologists (CAT), and the International Council on Alcohol, Drugs and Traffic Safety (ICADTS). Additionally, she is Past-President of the Mid-West Association for Toxicology and Therapeutic Drug Monitoring (MATT) and is past Chair of the Toxicology Section of the American Academy of Forensic Sciences.

She currently has over 85 peer-reviewed publications regarding the analysis of drugs in biological matrices.

### **Vice-President: (one year term)**

#### **Anthony Costantino, Ph.D. ◆**

Dr. Anthony G. Costantino, is Vice President of Laboratory Operations at NMS Labs in Willow Grove, Pennsylvania. NMS is a testing laboratory whose primary focus is analytical services serving both forensic and clinical toxicology. The laboratory services clinical reference laboratories, medical examiners, coroners, police departments and pharmaceutical companies for toxicology analyses. Prior to coming to NMS in 2002, Dr. Costantino was the Sr. Vice President of Toxicology at American Medical Laboratories, Inc. in Chantilly, VA. There he was responsible for the SAMHSA laboratory as well as the Clinical Toxicology and Industrial Hygiene Laboratories.

He received his Ph.D. in Forensic Toxicology from the University of Maryland in Baltimore, an MS in Pharmacology and Toxicology, as well as a BS in Pharmacy from Duquesne University in Pittsburgh, PA. His research interests have included postmortem redistribution of drugs and their metabolites, and more recently has been involved with the study of the ethanol metabolite, ethylglucuronide.

Dr. Costantino is an inspector for the National Laboratory Certification Program and has also been active as an inspector for the College of American Pathologists Forensic Urine Drug Testing Program. He has been a member of the AACC and the TDM/Tox Division since 1984 and has served as the editor of the division newsletter "Therapeutics and Toxins News". He has been active in the Society of Forensic Toxicology since 1985 and has served on the Board of Directors from 2002-2004 and as Secretary since 2006. He is also a Fellow of the American Academy of Forensic Sciences and is a Diplomate of the American Board of Forensic Toxicology.

### **Secretary: (two year term)**

#### **Sarah Kerrigan, Ph.D. ◆**

Dr. Sarah Kerrigan is an Associate Professor and Director of the Forensic Science Program in the College of Criminal Justice at Sam Houston State University. She received a BS degree in Chemistry, Analytical Chemistry and Toxicology from the University of Hull in England. She conducted her postgraduate work in toxicology at the University of British Columbia in Vancouver, Canada where she received her Ph.D. She received her initial training in forensic toxicology in 1990 at the Metropolitan Police Forensic Science Laboratory in London, England. Between 2001 and 2004 she served as Chief of the Toxicology Bureau for the New Mexico Department of Health, Scientific Laboratory Division where she was responsible for the blood and breath alcohol program in addition to forensic drug and alcohol related medical examiner and criminal casework statewide. Dr. Kerrigan was an Adjunct Professor in the Pathology Department of the School of Medicine at the University of New Mexico at that time. Prior to this, she worked at the California Department of Justice Toxicology Laboratory in Sacramento, CA. Over a period of six years Dr. Kerrigan served on the Board of Directors of the California Association of Toxicologists where she held a variety of elected positions, including President (2004-2005). She served on several SOFT committees including Continuing Education (1999-2002), Membership (2004-2005), Drug-Facilitated Sexual Assault (2000-present) and the joint SOFT/AAFS Drugs and Driving Committee, where she currently serves as Chair. Dr. Kerrigan was elected to the SOFT Board of Directors in 2006.

Dr. Kerrigan has been a contributing author in several toxicology textbooks and has published research in peer reviewed journals. In 2002 she joined the faculty of the National Judicial College in

Reno, NV. She is a member of the Editorial Advisory Board of the Journal of Analytical Toxicology and past Chair of the Editorial Advisory Board for Clinical and Forensic Toxicology News, an AACCC publication (2001-2005). Dr. Kerrigan works closely with attorneys, law enforcement and the judiciary on traffic safety issues. She was recognized for her dedication, perseverance and commitment to these efforts by the New Mexico Department of Transportation in 2002. Dr. Kerrigan received the Outstanding DRE Program Innovation award from the IACP/CANDID in 2003 and was the recipient of the Irving Sunshine Toxicology Award from the American Academy of Forensic Sciences in 2002.

**Director:** (three year term)

**Peter Stout, Ph.D.** ♦

Peter R. Stout has a Ph.D. in Toxicology from the University of Colorado Health Sciences Center. He is board certified as a Diplomate of the American Board of Forensic Toxicology. Dr. Stout has extensive experience in the management of both military and civilian forensic urine drug testing laboratories. Dr. Stout served as a Lieutenant in the United States Navy and was the Executive Officer and Technical Director for the Navy Drug Screening Laboratory in Jacksonville, FL. He was a Responsible Person for a SAMHSA/HHS-certified forensic urine drug testing laboratory and as director he oversaw the processing of controlled substances cases and provided all of the testimony support requested for these cases. He also supervised the processing of workplace drug testing, postmortem toxicology sports performance testing and litigation support. Currently, Dr. Stout is the project leader for the National Laboratory Certification Program, Pilot Oral Fluid PT program and co-director of Web based Continuing Education in the Forensic Sciences, and Forensic Toxicology Research Program. Dr. Stout maintains active leadership roles in professional scientific organizations and is a member of SOFT and a Fellow in AAFS. He also has more than 25 peer reviewed publications in toxicology.

**Director:** (three year term)

**Dan Anderson, M.S.** ♦

Dan Anderson has been a Toxicologist for over 17 years and is currently the Supervising Criminalist/Toxicologist in the Forensic Science Laboratories of the

Los Angeles County Department of Coroner in Los Angeles, CA, a position he has held since 1995. Previously, Dan was employed with the Los Angeles Coroner (1990-1994) and the Ventura County Sheriff's Department (1994-1995) as a Criminalist/Toxicologist. He was an adjunct professor at California State University-Los Angeles (2001-2005) where he taught the subject of Forensic Toxicology to students obtaining their Master's Degree and served as an instructor at the California Criminalistics Institute in Sacramento, CA (2002). Dan received a BS Degree from Colorado State University in Fort Collins, CO in 1988 and a MS in Forensic Science from the University of New Haven in West Haven, CT in 1990.

Mr. Anderson has held affiliations with several professional organizations including the California Association of Toxicologists (CAT), American Academy of Forensic Sciences (AAFS), California Association of Criminalists (CAC), and Society of Forensic Toxicologists (SOFT). He has been very active in the organizations including hosting seminars for CAT (2000 & 2006) and CAC (2002), a ToxTalk associate editor for SOFT since 2001, SOFT's Budget, Finance and Audit committee, SOFT's Membership Committee, CAC Toxicology Study group Chair (1995-1997), CAT Quality Assurance Coordinator (2000-2007), CAT New Drugs Chair (2002-present), and CAT President (2005-2006). Dan is a Diplomate of the American Board of Criminalistics (1998) and has recently been certified (February, 2007) as a Forensic Toxicology Specialist by the American Board of Forensic Toxicology (ABFT).

Mr. Anderson has given many platform presentations, posters, and published articles in forensic toxicology whose topics include Fentanyl (Duragesic® Patch), GHB, Oxycontin®, Mirtazapine, Quetiapine, and Duloxetine. He has served as a reviewer for the Journal of Analytical Toxicology (JAT) since 2000, has reviewed articles for the Forensic Science International, and was recently appointed the Workshop Coordinator for the SOFT Phoenix, AZ -2008 meeting.

As a firm believer of becoming involved and promoting research within your own laboratory, Dan has been successful in having three members of his

scientific staff awarded SOFT's Young Scientist Meeting Award (2004, 2006, 2007) and two members awarded the AAFS Regional Award (2001 & 2005).

**Director:** (three year term)

**Dwain Fuller, B.S.** ♦

Dwain Fuller is a member of the faculty at the University of Texas Southwestern Medical Center at Dallas where he serves as the Acting Technical Director for the toxicology laboratory at the Veterans Affairs North Texas Health Care System. Mr. Fuller has a BS in Chemistry from the University of Oklahoma. He began his career in forensic toxicology in 1984 as a bench chemist for the Office of the Chief Medical Examiner for the State of Oklahoma. In 1987 he moved to Reno, Nevada to accept a position as the Assistant Director of Toxicology with Sierra Nevada Laboratories, Inc., a private laboratory that provided forensic toxicology services primarily to Northern Nevada law enforcement and coroner's offices. Mr. Fuller was instrumental in bringing Sierra Nevada Laboratories, Inc. to SAMHSA certification. Through a series of corporate purchases and mergers, Sierra Nevada Laboratories, Inc. became a Laboratory Corporation of America laboratory. In 1993, Mr. Fuller was promoted to the Director of Toxicology, and became the Responsible Person (RP) for the SAMHSA lab, positions he held until accepting his present assignment in 1998.

Mr. Fuller is certified as a Diplomate of the Forensic Toxicologist Certification Board and as a Toxicological Chemist by the National Registry of Certified Chemists. He is a member of the Society of Forensic Toxicologists, the American Academy of Forensic Sciences, and the Southwestern Association of Toxicologists. He has served on the Committee for Testing for Intoxication for the State of Nevada and as a panel member on the Governor's Conference on Safety for the State of Nevada. He has also served as a faculty member for numerous courses for the National Judicial College in Reno, Nevada and has served on various committees for the Society of Forensic Toxicologists and as a reviewer for several of the special SOFT editions of the Journal of Analytical Toxicology. He is currently the Section Editor of the Drugs in the News for ToxTalk, the quarterly publication of the Society of Forensic Toxicologists.





## DRUGS IN THE NEWS

Submitted by Section Editor, Dwain Fuller, BS, D-FTCB, TC-NRCC



### CHEESE

In 2005, “Cheese” emerged as a major problem in the Dallas, Texas area where at least 21 deaths have been attributed to its use, most of the victims being teenagers.

The death of Karla Becerra, an 18-year-old woman, attributed by police to snorting “cheese” and drinking alcohol, was one of the earliest published cases. A senior at L. G. Pinkston High School, Becerra was found dead by her father in their West Dallas home on April 24, 2006. On November 1 of that year, 17-year-old Keith “Tooter” Witherspoon died in nearby Mesquite. The following month *The Dallas Morning News* profiled Witherspoon as “the first Dallas-area youth publicly known to have died of a heroin overdose since the “cheese” concerns were raised.” The death was also notable because Mesquite is located southeast of Dallas, indicating the problem had moved beyond its origins in the northwest quadrant of the city.

Oscar Gutierrez, a 15-year old eighth grader at Dallas' Marsh Middle School, died February 18, 2007, of a “cheese” overdose, the first middle-school death in published accounts. Gutierrez' brother, who tried to wake him during that morning, stated that the boy had overdosed on “cheese” on a previous occasion. Community rallies followed Gutierrez' death as parents and others urged the police and school district to become more active in fighting what was viewed as a growing problem.

Another death, on March 31<sup>st</sup>, the following month, of Fernando Cortez Jr., a Molina High School student, also led to community activism. Cortez's father said his son was at a Dallas party where he was given drugs. Initially this death was linked to “cheese” heroin on the father's comments in press reports.

Although the Dallas school district would not comment on the death, two DISD security officers attended the funeral, where they spoke to Fernando Cortez, Sr., and his wife. Cortez Sr., a

minister, insisted at the time that his son had not tried drugs before and recommended that all parents watch their children closely. On April 24, the same day that results of Cortez' toxicology tests were announced, the department also announced that his sister's 19-year-old boyfriend would be charged with murder for having mixed the drugs for the younger boy. The father went on to become a speaker at community meetings within the school system.

On April 18, 2007, the body of 18-year-old Keridma “Katy” Godina was found on a porch in Balch Springs, a Dallas suburb, the day after her death, which was later determined to be caused by “cheese” heroin.

In April 2007, *The Dallas Morning News* published the results of a lengthy analysis of autopsy results between 2005 and 2007, conducted in concert with the Dallas County medical examiner's office, which suggested that as many as 17 deaths among adolescents during that period were attributable to “cheese” heroin. (This figure did not include the March 31 death because the toxicology results for that case were not yet back at the publication of the county-wide analysis.) The conclusion was based in part on the presence of both heroin and diphenhydramine in the blood of the deceased; additionally, the families of 11 victims confirmed the deceased had abused “cheese” heroin.

In mid-May, two more teen deaths — one in January and another in April — were declared by the Dallas County medical examiner's office to be connected to “cheese” heroin, based on toxicology tests. This brought the total of “cheese”-related deaths among those 18 and under in Dallas County to 21 confirmed cases in all.

“Cheese” is the street name for a mixture of heroin and Tylenol PM, which is an OTC compounding of acetaminophen and diphenhydramine. Compared with black-tar heroin which typically has a heroin concentration of 30 – 34%, “cheese” typically contains only 2 – 8%

heroin. “Cheese” is usually snorted, unlike heroin which is most often injected. This along with the fact that one “hit” of “cheese”, one tenth of a gram, sells for two dollars, may account for some of the appeal to teens. While the origin is uncertain, the name probably derives from the fact that the finished product resembles Parmesan cheese.

The apparent lethality of this mixture of heroin and Tylenol PM is a subject of much controversy and may be the result of several factors: First, one cannot discount the ability of the news media to make something appear to be pandemic when it is a reasonably confined occurrence. This is evidenced by the “Summer of the Shark” phenomenon in 2001, when a bull shark bit off the arm of an 8-year-old on a Florida beach. The media picked up on the story and overnight shark sightings became international news, culminating with the cover of Time magazine heralding it as the “Summer of the Shark”. In fact, there were 13 fewer attacks worldwide than the year before, and that same year, only four human deaths were linked to shark bites compared to 13 in 2000. Secondly, one must remember that “cheese” is inexpensive and is being used by a population likely to be relatively naive in respect to opiate use, both intellectually and pharmacologically. These factors notwithstanding, there may in fact be a greater lethality associated with this mixture than that of the heroin itself. While much attention in the media seems to have been focused on the acetaminophen in the “cheese” mixture, it is, of course, the diphenhydramine that is of more concern. Diphenhydramine is an antihistamine with CNS depressing properties; this alone would suggest an additive effect to the symptoms of opiate intoxication. However, it has long been this author's opinion that the diphenhydramine in the “cheese” mixture potentiates the effects of the heroin, thus increasing its lethality. Those of us who have been around awhile will remember “T's and Blues”, which was the

## DRUGS IN THE NEWS (CONTINUED)

street name for the co-administration of pentazocine, an opioid, and tripeleonnamine, an antihistamine. The action of the tripeleonnamine was to potentiate the effects of the pentazocine. Furthermore, we are all familiar with the common clinical use of hydroxyzine, an antihistamine, to potentiate meperidine, an opioid. My opinion in this matter is not without basis, as evidenced by scholarly articles describing the potentiation capabilities of antihistamines including diphenhydramine as far back as 1982. Some of these may be found in the references that follow.

Regardless of its lethality, either real or imagined, "cheese" is making news in North Texas, and as these things tend to do, "cheese" will likely become an issue across the country.

### References:

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## WELCOME NEW S.O.F.T. MEMBERS

The 2007 Membership Committee has been an active group, reviewing over 52 applications for membership so far this year! Recognition is conveyed to associates of this very hard working committee: Anthony Costantino (Chair), Peter Stout, Jennifer Limoges, and Rebecca Jufer - Phipps. As of this writing, our membership roster stands at 880!

Welcome to our newest members of S.O.F.T. listed here. Many of these scientists will attend our annual meeting for the first time in October and will no doubt experience not only an amazing scientific program but also have the time of their life!

Eric Alexy  
Keith Anding  
Eric Baker  
Ciena Bayard  
Sabra Botch  
Toni Broome  
Joe Ellington  
Timothy Fassette  
Veronica Ferguson  
Tom Freijo  
Kathryn Fuller  
Lana Goodson  
Waseem Gul  
David Gummin  
Jenifer Hall

Melissa Hancock  
Linda Harty  
Rachel Irving  
Subbarao Kala  
Moss Kent  
Amy Kinkennon  
Sean Kocur  
Elena Kuzmina-Kok  
Wanda Marley  
Meredith Meaders  
Jessica Mehan  
Patrick Minno  
Timothy Murphy  
Donna Nemeth  
David Nemeth

Kenneth Olejar, Jr.  
Michelle Paladino  
Jean-Paul Palmentier  
Cody Peer  
Alyssa Pursell  
Sunny Rodhey  
Patricia Schantz  
Michael Scott-Ham  
Rana Sumandeeep  
Kristina Takeshita  
Sarah Urfer  
Joseph Watson  
Jeremy Weis  
Ann Yang  
Michael Zumwalt

## SUNSHINE / RIEDERS SILENT AUCTION II

The passing in 2006 of two prominent leaders in the forensic toxicology field, Dr. Fredric Rieders and Dr. Irving Sunshine, prompted a silent auction memorial event at last year's annual meeting in Austin that was entertaining and enjoyable for all.

To carry on their lifelong commitments of encouraging education in the forensic toxicology field, S.O.F.T. meeting organizers have decided to turn the Sunshine / Rieders Silent Auction event into an

annual tradition. The silent auction will keep the Sunshine and Rieders names alive and fund student enrichment programs into the future.

The 2007 meeting in Raleigh, North Carolina will present the Sunshine / Rieders Silent Auction II. Our generous exhibitors have each agreed to donate an item for auction. Contributions from individuals are also encouraged and will be accepted through the registration desk on-site. One hundred percent of the proceeds

will be used to encourage academic training and research in areas related to forensic toxicology.

Article layout, digital mechanics, grammatical editing, and graphic assistance for ToxTalk provided by volunteer students, David Watts and Kayla Fulmer.

## CASE NOTES

Submitted by Section Editor, Matthew Barnhill, Ph.D.

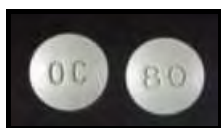
Please send interesting "Case Notes" to Section Editor, Matthew Barnhill, Ph.D. at mbarnhilljr@worldnet.att.net

### CASE NOTES: #1 MIXED PRESCRIPTION DRUG DEATH

George F. Jackson, Ph.D., William A. Dunn, M.S., Zhongxue Hua, M.D., Ph.D., E.H.A. Institute of Forensic Science  
State Toxicology Laboratory and Regional Medical Examiner's Office, Newark, NJ

This laboratory has been detecting an increase in the prevalence of multiple prescribed opioid compounds in drug related postmortem cases. In most of our cases, the decedents have a history of taking prescription medications for pain relief.

We present a case of post-mortem analysis of a 36 year old single white male who consumed Oxycontin, Xanax and Actiq (fentanyl lollipop).

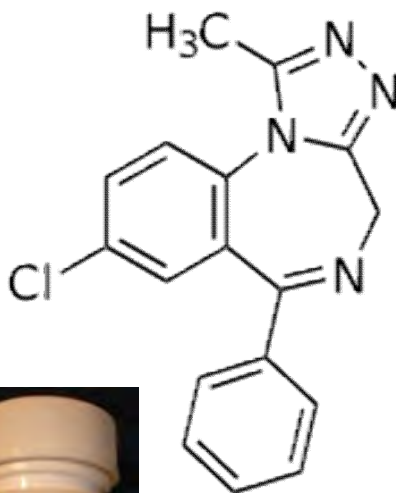


Oxycontin tablets in varying strengths.



The decedent had morbid obesity (BMI of 46) with a long history of lower back pain for at least 6 years. His clinical work-up for his lower back pain was inconclusive, although a spinal surgery for disc fusion was suggested at one point. He was known to visit various pain clinics and acquired prescription Actiq for at least 18 months. Per multiple co-workers, he demonstrated a typical pattern of opioid compound addiction which interfered with his job performance significantly. During his last year, he was admitted twice to a local rehabilitation center for his addition to Oxycontin and Xanax. Of note, per multiple co-workers and family members, the decedent had no prior suicidal ideation or attempts.

The decedent was discovered in his residence with early decomposition after failing to report to work as an accountant. Scene investigation found a fentanyl lollipop inside his shirt pocket as well as crushed pill fragments scattered on the floor and table. Multiple bottles of prescription oxycodone and alprazolam, some empty and others nearly full, were located at the scene. Autopsy revealed hypertensive cardiovascular disease and focal bronchopneumonia, and both were not considered to be medically significant. Comprehensive analysis was performed on various postmortem tissues, including femoral blood, urine, bile, vitreous fluid, stomach content, brain, liver, kidney, lung and spleen.



The chemical structure of Alprazolam and the pharmaceutical packaging of the 2mg tablets.



Actiq, the oral delivery system of fentanyl citrate comes in different flavors and strengths of lollipops.

All submitted tissues were subject to standard analytical screening and mass spectrometry confirmation protocols. Positive findings of the analysis are as follows:

Blood	
Oxycodone	1.86mg/L
Oxymorphone	0.072 mg/L
Fentanyl	64 mcg/L
Liver	
Oxycodone	1.83 mg/Kg
Oxymorphone	0.12 mg/Kg
Fentanyl	96 mcg/Kg
Stomach Contents	
Total weight received:	244 gms
Oxycodone	147 mg/Kg
Oxymorphon	0.62 mg/Kg
Fentanyl	3648 mcg/Kg
Urine	
Oxycodone	5.82 mg/L
Oxymorphone	0.36 mg/L
Fentanyl	890 mcg/L
a-hydroxyalprazolam	1.60 mg/L
Alprazolam	0.35 mg/L



## CASE NOTES: #2

# MEDICAL MISADVENTURE: STEROID INDUCED TOXICITY AND ASSOCIATED PSYCHOSIS – A CASE STUDY

**Michael Robertson, Ph.D.**, Senior Consultant, Forensic Toxicologist,  
Independent Forensic Consulting ([www.ifcforensics.com.au](http://www.ifcforensics.com.au)) Victoria, Australia

This case involves a middle-aged, Caucasian female with no prior history of psychiatric illness. In early February 2005, following an injury to her back, this individual first sought medical attention at her local general practitioner. As a result of this consultation she was administered an epidural injection (triamcinalone), and was prescribed Panadeine Forte (codeine and acetaminophen), Voltaren (diclofenac), diazepam and sent home.

A few days later (February 8<sup>th</sup>) and without significant relief from the pain, she was admitted into hospital for further treatment of back pain and whilst an inpatient received acetaminophen, diclofenac, diazepam, amitriptyline (Tryptanol), morphine and metoprolol.

On the same day she was also started on a regime of dexamethasone, presumably to reduce inflammation however the exact reasons remain unclear and were not documented in the medical records.

Her prescribed regime of dexamethasone during her stay in hospital was as follows:

February 8<sup>th</sup> until February 13<sup>th</sup> –  
4 mg orally, four times a day  
i.e. 16 mg per day

February 14<sup>th</sup> until February 18<sup>th</sup> –  
3 mg orally, four times a day  
i.e. 12 mg per day

On February 14<sup>th</sup> she was released from the hospital, however, in the hours prior to her discharge she began exhibiting signs of irrational behavior. She was observed to be pacing around the ward, teary, vague, and when picked up from hospital was fearful and did not want to enter her friend's car, making statements such as 'everything is wrong' and repeatedly calling out 'Dad'. In the days following, this irrational behavior progressed further into paranoia, agitation, disorganized speech and thought and ultimately psychoses prompting re-admission into a second hospital on February 18<sup>th</sup>. Upon admission

into the second hospital she was assessed as being acutely psychotic. This was suspected to be dexamethasone-related at which point dexamethasone was withdrawn and replaced with the anti-psychotic medication chlorpromazine. She remained in the hospital for psychiatric treatment until 5<sup>th</sup> March at which time her psychotic behavior had improved significantly and she was subsequently released.

Corticosteroids are often used in the treatment of pulmonary diseases such as COPD, multiple-sclerosis, allergies (e.g. asthma), rheumatoid arthritis together with many other conditions. Dexamethasone is a potent synthetic corticosteroid with both anti-inflammatory and immunosuppressive actions. The prescribing directions for oral dexamethasone in non-life threatening conditions are 0.5 mg to 10 mg per day with an ideal maintenance dose of 0.5 to 1 mg daily. Dexamethasone is fat soluble and hence has a large volume of distribution (Vd) and a long biological half life (up to 50 hours) and therefore tends to accumulate within the body if given chronically. As a result, adverse reactions following chronic therapy may take many days or weeks to resolve upon cessation of therapy. Adverse reactions of dexamethasone taken orally include but are not limited to adrenocortical insufficiency, immunosuppression, cardiovascular, gastrointestinal, musculoskeletal and neuro-psychiatric reactions.

Corticosteroid-induced neuro-psychiatric reactions have been documented in patients being treated with a range of corticosteroids including dexamethasone, cortisone, prednisolone and methylprednisolone. The likelihood and magnitude of these reactions are known to be dose related and usually occurs in the first 10 days of treatment<sup>3</sup>. They tend to occur more often in women than men, presenting often as either an acute manic or depressive episode, accompanied by delusions and/or hallucinations<sup>2</sup>. In the majority of cases the neuro-

psychiatric adverse reactions resolve upon cessation of therapy<sup>2,5</sup>.

In this case study the patient was initially prescribed 16 mg per day for 6 days before being reduced to 12 mg per day for another 5 days, a dose significantly higher than the recommended highest dose the reasons for which are unclear. The consequence of such high doses is an increase in both the likelihood and magnitude of adverse events. This individual was first observed to be demonstrating 'unusual' behavior 6 days after starting the dexamethasone treatment. Her mental state further deteriorated whilst at home in the days following release from the hospital. She was re-admitted to the hospital, assessed as acutely psychotic and her dexamethasone medication withdrawn and replaced with the anti-psychotic medication with subsequent resolution of her psychotic behavior.

Although biological samples were not available for analysis in this case study, it is clear from the treatment history, progression of symptoms and resolution of symptoms upon withdrawal of dexamethasone, that this was indeed a case of dexamethasone induced neuro-psychiatric adverse reactions. This case study highlights the need for toxicologists to be aware of these types of psychotic-reactions in patients being treated with corticosteroids, particularly if co-administered with antidepressants and other medications with the potential to cause psychoses.

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## NEW DRUG

# HYDROXOCOBALAMIN (CYANOKIT<sup>®</sup>)

*Submitted by Section Editor, Dan Anderson, M.S.*

**Joseph E. Manno, Ph.D.**, Professor-Dept. Emergency Medicine/Clinical Toxicology,  
L.S.U. Health Sciences Center, Shreveport, Louisiana 71130-3932

Cyanokit<sup>®</sup> (hydroxocobalamin for Injection, 5g) has recently been approved by the FDA for the treatment of Cyanide poisoning in a non-hospital setting. Cyanokit<sup>®</sup> is marketed by Bound Tree Medical (www.boundtree.com) at a list price of \$795.00/unit.

The drug has been used in Europe for over 10 years and is a life saving antidote for cyanide poisoning when administered rapidly after exposure<sup>2</sup>. In animal studies, the drug reduced the cyanide level by 55% by the end of a 15 minute infusion<sup>3</sup>. Because it is supplied as a lyophilized powder with a shelf life of 30 months, it can also be stockpiled for use in terror related mass attacks<sup>1</sup>. The very low toxicity of hydroxocobalamin allows it to be administered by paramedics at the scene and it will consequently help save many lives of victims of fire related cyanide poisoning. Its most common adverse reactions are mild and include chromaturia (red-colored urine), erythema, rash, increased blood pressure, nausea, headache, injection site reactions and decreased lymphocyte percent<sup>4</sup>. When injected into a cyanide poisoned patient, hydroxocobalamin will combine with Cyanide to form Cyanocobalamin (Vitamin B12). This chelation limits the toxicity of cyanide by preventing it from combining with cytochrome *a3* and the subsequent interference with cellular respiration and death. This hydroxocobalamin - cyanide reaction occurs within several minutes<sup>5</sup>. During eight years of use in Paris, France, prehospital administration of hydroxocobalamin for smoke inhalation-associated cyanide poisoning resulted in the survival of 30 out of 101 (41.7%) patients administered the drug<sup>2</sup>. The low risk/benefit of hydroxocobalamin suggest its beneficial use for fire victims suspected of cyanide inhalation. However, it apparently may not reverse the toxicity of tissue bound cyanide or subsequent death from tissue anoxia and/or metabolic acidosis in all cases<sup>1,5</sup>.

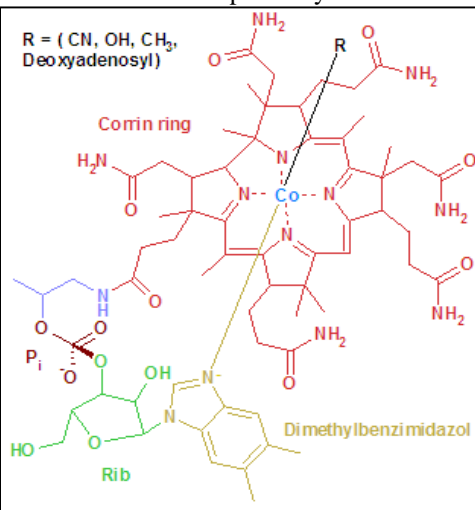
The chemical structure of hydroxocobalamin and Cyanocobalamin are shown in Figure 1. Although hydroxocobalamin has been shown to be a life saving

antidote for fire victims when administered at the scene, all victims do not survive if enough cyanide has left the blood and is bound to tissue where it produces its toxicity<sup>2,5</sup>. Consequently, for hydroxocobalamin treated non-survivors, there are several factors that will likely complicate the interpretation of death causation by Forensic Pathologists and Toxicologists. These factors are listed below.

**Physical Chemistry:** Hydroxocobalamin is red in color and its administration can cause the person to take on a red color. It absorbs light with a peak at 352 and 532 nm and has been shown that it interferes with cooximetry measurements of COHb, MetHb and HbO<sub>2</sub><sup>6</sup>.

**Pharmacokinetics:** Hydroxocobalamin in smoke inhalation victims has the following pharmacokinetics:

- Volume of Distribution: 0.45 L/Kg – suggests that it is distributed extracellularly and would not be expected to rapidly remove cyanide already bound to tissue cytochrome.
- Distribution half-life: 1.86h
- Elimination half-life: 26.2 hrs.
- Renal and total body clearance is 0.31 and 0.83 L/h respectively.



**Figure 1:** When R is CN, compound is Vitamin B12 (cyanocobalamin); When R is OH, compound is Hydroxocobalamin (active component of Cyanokit<sup>®</sup>).

Since Cyanide would be sequestered in blood, levels would be high, but would not reflect what was actually in tissue. Homogenizing tissue also would not be acceptable for determining true intracellular cyanide levels.<sup>7</sup>

**Clinical Chemistry:** Hydroxocobalamin also interferes with clinical chemistry laboratory values of aspartate aminotransferase, total bilirubin, creatinine, magnesium and iron<sup>8</sup>.

Despite these potential complications, it should be pointed out that simply drawing one tube of blood before hydroxocobalamin administration would eliminate these problems. Such a protocol might be implemented with the Paramedic medical director since the drug is administered intravenously and withdrawing a single tube of blood would not delay treatment significantly<sup>1</sup>.

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## MEMBER NEWS

## Yale H. Caplan and Alphonse Poklis—Two Marylanders Honored

Two University of Maryland School of Pharmacy graduates turned toxicologists were recently honored in the school's magazine, *Capsule*. Yale H. Caplan and Alphonse Poklis were featured in an article entitled "Using Forensic Tools to Solve Tough Puzzles in Toxicology" that is excerpted below.

The ability to think critically is a crucial component of any science education. For the two alumni the development of that ability led them to careers far off the beaten path. Through the field of forensic toxicology—developing drug and alcohol tests and procedures to determine the cause or causes of death—Yale H. Caplan, Ph.D. '68, BSP '63, has spent most of his career solving pharmacological puzzles. Following Caplan's forensic footsteps a few years later, was Alphonse Poklis, Ph.D. '74, BSP '69, -- both became nationally renowned toxicologists, educators, and consultants.

When Caplan and Poklis received their doctoral degrees, the field of forensic toxicology was focused primarily on postmortem toxicology. In the Office of the Chief Medical Examiner, it was Caplan's job to identify poisons—everything from industrial chemicals to illegal drugs—in the bodies of the deceased through toxicological testing of blood, urine, hair, and tissue samples,



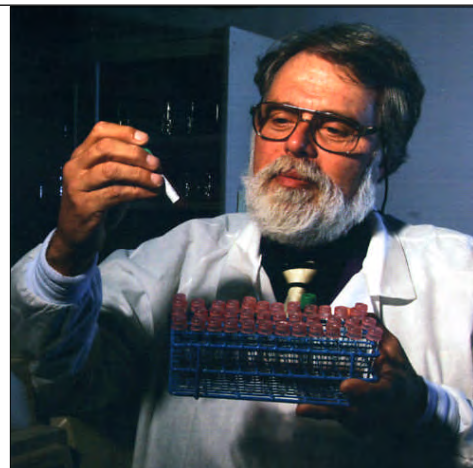
Yale H. Caplan, Ph.D. is a nationally renowned toxicology consultant.

and to confer with the medical examiners in determining the cause of death. In many cases, Caplan would comb through case histories to determine whether drugs and alcohol were involved. He worked under Henry Freimuth, a pioneer in the field. But at age 32, just five years after he started as an assistant toxicologist, he was made Chief Toxicologist, a position he kept until moving to a private laboratory in 1991. "Pharmacy, chemistry, biology—I have used them all. It was a comprehensive education that provided a high-reaching ladder of opportunity," he says.

It is the same ladder that Poklis climbed to become a forensic toxicologist who consults and lectures on toxicology issues for organizations that include the FBI Academy. These days, Poklis is a professor of pathology at Virginia Commonwealth University (VCU) and affiliate professor for forensic science, chemistry, and pharmacology. Like Caplan, Poklis studied toxicology at the OCME in Baltimore under Freimuth and received his doctorate degree in forensic toxicology in 1974 from the University of Maryland. He spent a large part of his career in state offices of the medical examiner in Delaware, North Dakota, and Missouri, analyzing medical evidence in homicide cases and testifying in court.

A rash of homicides in St. Louis in the mid-1970's landed Poklis on the witness stand in a number of cases, including arsenic and thallium poisonings. By looking at emergency room records in one Los Angeles case, Poklis was able to determine how and where a woman continuously poisoned her husband with oleander, and eventually killed him with a lethal dose of antifreeze.

The key to giving testimony is making science understood says Caplan. He took that approach 20 years ago when he was put in charge of determining how Len Bias, the Univer-



Alphonse Poklis, Ph.D. is a professor of pathology at the VCU Medical Center Toxicology Laboratory.

sity of Maryland basketball star died. The death called one of sports' most shocking tragedies, spurred a flurry of controversy. "Everyone wanted to find an alternative to the idea that Bias inhaled cocaine," says Caplan. An empty soda can found at the death scene and trace amounts of cocaine in Bias' stomach gave rise to speculation that he was given cocaine without his knowledge. However, tests on the can found no trace of the drug while cocaine was found on a straw. Caplan determined that the amount of cocaine found in Bias' stomach was consistent with what could have been deposited simply by inhaling the drug.

"It's a matter of understanding the science and letting the science tell the truth," Caplan says.

Poklis, who runs the VCU medical center toxicology laboratory, considers himself lucky to have been able to mix research with practice and teaching.

"I love working with young people," said Poklis. "They keep you young."

Caplan agrees. "They are your legacy," he says. "The students are the major contribution; you really live on through them."

*The Capsule, Fall 2006*



**Society of Forensic Toxicologists, Inc.**

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ToxTalk Deadlines for Contributions:

**February 1** for March Issue

**May 1** for June Issue

**August 1** for September Issue

**November 1** for December Issue

**ToxTalk is the official publication of the Society of Forensic Toxicologists, Inc., mailed quarterly (bulk mail) to its members. It is each member's responsibility to report changes of address to the SOFT Administrative Office. Non-members may receive ToxTalk for \$15 per calendar year. Checks payable to SOFT may be mailed to the SOFT Administrative Office. To submit articles or address ToxTalk issues please email to [ToxTalk@soft-tox.org](mailto:ToxTalk@soft-tox.org).**

**Future S.O.F.T. Meeting Info**

- 2007:** Chapel Hill, NC.....Oct. 15-19, 2007..... Jeri Ropero-Miller, Ruth Winecker
- 2008:** Phoenix, AZ.....Oct. 27-31, 2008.....Vickie Watts, Norman Wade
- 2009:** Oklahoma City, OK.....Oct. 18-23, 2009.....Phil Kemp
- 2010:** Richmond, VA.....Michelle Peace, Lisa Tarnai Moak
- 2011:** San Francisco, CA.....Nikolas Lemos
- 2012:** Boston, MA.....Michael Wagner

**S.O.F.T. 2008: PHOENIX, ARIZONA**



October is the best time of the year to be in Phoenix. High temperatures are in the 70's. Golf courses are prime, lakes and forests are only an hour drive away. Idle hours can be spent in casinos, horseback riding, at the racecar track, or simply lounging around the pool.

The 2008 SOFT Annual Meeting will be held at the Pointe South Mountain Resort, a luxury facility located at the base of the South Mountain Preserve; also the perfect location for the hiking / biking adventurer. Since every reservation at the resort is a two room suite, why not make plans to bring the whole family and restructure the confer-



ence into a fun vacation for all. There are nearby zoos, parks, museums, theatres, shopping malls, sport stadiums, even hot air balloon rides. The scientific sessions, workshops, exhibits, and meetings will be the reason you visit Phoenix, but the Arizona lifestyle is what will make your stay memorable. There will be no need for neckties!

**We're on the Web!**

[www.soft-tox.org](http://www.soft-tox.org)

**S.O.F.T. 2009: OKLAHOMA CITY**

October 2009 will take S.O.F.T. members to America's heartland. Oklahoma City is proud of it's plentiful medical schools, mild climate, and beautiful urban parks.



Oklahoma City Meeting Host, Philip Kemp

is putting together another entertaining and educational conference for SOFT members to experience.

**2007 S.O.F.T. COMMITTEE CHAIRS**

Committee

Committee Chair

- Nominating.....Timothy Rohrig, Ph.D., DABFT
- Membership.....Anthony Costantino, Ph.D., DABFT
- Budget, Finance, and Audit.....Robert Turk, Ph.D., DABFT
- ToxTalk Co-Editors.....Yale Caplan, Ph.D., DABFT  
Vickie Watts, M.S.
- ByLaws.....Yale Caplan, Ph.D., DABFT
- Publications (JAT Special Issue) .....Sarah Kerrigan, Ph.D.
- Awards.....Philip Kemp, Ph.D., DABFT
- Drugs & Driving.....Sarah Kerrigan, Ph.D.
- Meeting Resource.....Christine Moore, Ph.D., DABCC
- Laboratory Guidelines.....W. Lee Hearn, Ph.D.
- Policy and Procedure.....William Anderson, Ph.D.
- SOFT Internet Web-Site.....Bruce Goldberger, Ph.D., DABFT
- Continuing Education.....Ann Marie Gordon, M.S.
- Ethics.....Aaron Jacobs, Ph.D.
- Drug Facilitated Rape & Sexual Assault.....Marc LeBeau, Ph.D.
- MS/MS Guidelines.....John Cody, Ph.D.

