OARD OF DIRECTORS

VOLUME 43 • ISSUE 2

PRESIDENT'S MESSAGE



Believe it or not, we are already halfway through the year, and only four months away from our annual meeting in San Antonio! Preparations are well under way. I was privileged to join Beth, CC, Veronica Hargrove, Ann Marie Gordon, and Frank Wallace in San Antonio for a site visit in April. I'm very excited about the hotel and meeting facilities, and of course, being a Texan, I'm excited about showcasing San Antonio, the state's oldest city, a place I often visit and which I consider to be the heart of Texas, or perhaps more appropriately, el corazon de Texas!

For those unfamiliar with San Antonio, it has a distinctly different flavor than the other major cities in Texas. It is a city steeped in tradition and Texas history, yet retains and celebrates its Mexican heritage. In fact, we will be meeting about two blocks from the Alamo, a revered Texas treasure, and on Wednesday night we will be participating in A Night in Old San Antonio (NIOSA), celebrating the city's diverse cultural legacy. I was fortunate to be able to attend the yearly public NIOSA while in San Antonio in April. The city came out in force to join in the festivities. However, a more intimate version of NIOSA will be held exclusively for our meeting attendees.

SOF Awa

ERA Cas

Suf

step out of the door of the hotel onto the famed San Antonio Riverwalk and in less than five minutes be among scores of restaurants, bars, shops, and other assorted attractions. In October, San Antonio averages a daily maximum temperature between 80 and 84 degrees Fahrenheit (27 to 29 degrees Celsius) and the minimum temperature usually falls between 58 and 63 degrees Fahrenheit (14 to 17 degrees Celsius), with only about four days of rain.

Of course, let's not forget why we are there in the first place. Besides three days of platform and poster presentations, there will be 12 workshops from which to choose, along with plenary speakers, YFT, Elmer Gordon Open Forum, visiting with the vendors, and other opportunities to network and learn.

Our Journal of Analytical Toxicology Special Editor, Kayla Ellefesen informs me that special SOFT edition of JAT is on track; with a large number of intriguing papers being submitted.

On another front, I hope you received and completed SOFT's survey. The survey was professionally developed and was sent to 3,919 email addresses, comprised of current members; people who are no longer members but had a membership in the past five years; and nonmembers who attended the meeting in the past five years. We want to know who you are and what you think so we can continue to be innovative and relevant to you.

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Additionally, any day of the week you can

T 2019 Meeting Update	2
ards Committee	3-5
Donors	6
e Notes	7
etanil	8

Continuing Education Opportunities9

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PAGE 1

SAN ANTONIO, TX • OCTOBER 13-18, 2019

The 2019 SOFT annual meeting is rapidly approaching! The San Antonio planning committee has been busy working out all of the details. We are happy to share that we have many interesting workshops scheduled. You can view the workshops HERE. Workshops are scheduled for Monday October 14th and Tuesday October 15th. REGISTRATION and the HOTEL ROOM BLOCK are both also open, please visit the SOFT website to view all available meeting information.

SOFT 2019 MEETING UPDATE

We are also pleased to announce that we will have a plenary speaker presentation by Silas W. Smith, MD, FACEP, FACMT, of the New York University School of Medicine, Ronald O. Perelman Department of Emergency Medicine. Dr. Smith's appointments also include the JoAnn G. and Kenneth Wellner Clinical Associate Professor of Emergency Medicine and Section Chief Quality, Safety, and Practice Innovation as well as Associate Director, Fellowship in Medical Toxicology New York City Poison Control Center New York, New York. Dr. Smith is author and co-author of numerous peer-reviewed journal articles as well as several chapters in Goldfrank's Toxicologic Emergencies. SOFT and the American College of Medical Toxicology (ACMT) have a history of collaborative relationships and we are honored and grateful Dr. Smith will be sharing his time with us at the SOFT annual meeting.

Look forward to seeing everyone in October!

-Brad & Veronica







See you in San Antonio!





Brad Hall, Ph.D., F-ABFT



Veronica Hargrove, Ph.D., F-ABFT

Scientific Program Chairs
Peter Stout Ph.D., F-ABFT
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Registration Deadline to Avoid Late Fee Thursday, August 22, 2019

Registration Deadline to Avoid On-Site Fee • Sunday, September 29, 2019

SOFT 2019 October 13-18, 2019

The SOFT Awards Committee is pleased to announce the 2019 winners of the Educational Research Award (ERA) and Young Scientist Meeting Award (YSMA). Congratulations to this year's winners!

- Educations Research Award (ERA): Tiara Evans, Victoria Mei, and Michael Truver
- Young Scientist Meeting Award (YSMA): Jacob Samuel

Award winners receive basic meeting registration and a \$2,000 stipend to be used to cover the cost of travel expenses to the Annual Meeting so they Antonio, TX. Also, be sure to attend the business meeting to see the winners receive their awards. We had an outstanding applicant pool, with the most applications ever received in a single year! Thank you to all who submitted applications to this vear's committee!

can present their research. We look forward to seeing their presentations at this year's meeting in San

Congratulations on winning this year's ERA award! How did it feel when you found out that you had won? I was

When/how did you first learn about SOFT's award program? My advisor, Dr. Madeleine Swortwood,

Can you briefly explain what your submission was about? I was fortunate enough to travel to Sweden this

What did you hope to achieve when you decided to enter a submission to the awards program? I hoped that

What does it mean to you to receive this award? I am

How did you become interested in forensic toxicology? What advice would you give to future award applicants?

Where do you hope to be in 5 years?

What continuing education are you currently

participating in/taking! I am currently completing my doctoral degree in forensic science at Sam Houston State

Tell us about a teacher/mentor that had an impact on you or set you on your present career path? Dr. Sarah

How would you use being the recipient of this award to influence others and how would it impact your career? I

How do you think the SOFT Awards Program impacts

students in Forensic Toxicology?

I think the SOFT Award Program has a strong impact on students in Forensic Toxicology. It allows them to present



Awards Committee Chair



Erin A. Spargo, Ph.D., F-ABFT erin.spargo@dallascounty.org

Committee Members: Erin Karschner, Ph.D. Dani Mata, M.S. Jason Hudson, Ph.D. Mary Jones, B.S. Dayong Lee, Ph.D. Peter Stout, Ph.D.



Congratulations on winning this year's ERA/YSMA award! How did it feel when you found out that you had or set you on your present career path? The mentor tha When/how did you first learn about SOFT's award program? I had first learned about the award program arlier this year when my mentors, Dr. Gail Cooper and

Can you briefly explain what your submission was

about? My submission was about the development and validation of a quantitation method for the simultaneous

What does it mean to you to receive this award?

How did you become interested in forensic toxicology?

had the biggest impact on my present career path is Dr. Marta Concheiro, who is an amazing woman and I am

How would you use being the recipient of this award to influence others and how would it impact your career?

Being the recipient of this award, I would encourage others to also conduct a research that they show interest in and

How do you think the SOFT Awards Program impacts

students in Forensic Toxicology? The SOFT Awards Program greatly impacts students in Forensic Toxicology because this grant provides the financial support that



Victoria <mark>Mei, M</mark>S John Jay College of Criminal Justice

Just like most people who doubt themselves, I didn't think that I was going to win the award. So, when I got the email that I won. I was so shocked and excited! I called my mom to tell her that I got it and she didn't answer, so I just kept calling people until someone answered because I couldn't contain my excitement. t learn about SOFT's award program?

I learned about SOFT's award program at my internship at

OCME. My supervisor made an announcement that deadlines were approaching, and she encouraged me to apply because she said that she won the award previously and received a lot of job offers from it.

My submission was about my method on the detection of prevalent synthetic cannabinoids in the DC area, using a liquid chromatograph-time of flight-mass spectrometer (LC-QTOF). It included optimization of sample preparation and instrumental parameters.

to achieve when you decided to enter a

When applying for the award, my hope was to just put myself out there and prove to myself that what I'm doing matters. I also wanted to get more practice in writing scientific pieces because my goal is to publish an article on my project too.

n to you to receive this award? It means a lot for me to receive this award. Graduating from graduate school and entering the forensic toxicology world is a new journey in my life, and I feel like this is a great way to start

How would you use being the recipient of this award to

would use being the recipient of this award to encourage all toxicologists and upcoming forensic scientists to step outside their boundaries and reach for their goals. Being a scientist is so much more than just handling casework, it also includes making a difference in your field and the

In 5 years, I hope to still love what I'm doing and be just as passionate about it as I was when I first entered the field.

present career path? It's hard for me to select one teacher/mentor that had an impact on my career path. During my internship at OCME, everyone was always helpful and supportive, so I truly feel that the entire forensic toxicology department helped to shape me in becoming a better forensic toxicologist. I gained so much knowledge while I was there, and I truly feel that I was a much better scientist leaving there than I was when I first started. However, Dr. Tolliver, my supervisor, also took on a big role in giving me constant guidance throughout my internship in terms of completing my project, applying for jobs, and even applying for this award. Bryan Ruggery, forensic toxicologist, also played a huge role in helping me throughout the project and giving me guidance and advice on basic scientific principles as well as understanding the work the work that I was doing.

ould you give to future award applicants

Some advice that I would give to future award applicants is to get feedback from as many people as you can. If one person doesn't feel you deserve it someone else will, and that's all you need. Also, everyone has a different perspective. So, while something may make sense to you, it may not translate over to someone else. Allowing other people's eyes to see your work and give their suggestions will allow the completed product to be top notch.



Awards Committee Chair



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SOFT 2019 YSMA WINNER

Excited and surprised as I was just checking my email in the morning, not really on the lookout for a response.

Every year, the Miami-Dade Medical Examiner (MDME) sends people to SOFT and some apply to (and sometimes receive) awards so mostly just through talking to my coworkers about SOFT, their experiences and what it entails.

comparison of various spectrophotometric methods on the determination of % Carboxyhemoglobin specifically in the context of testing affected (decomposed, exposed to heat/fire etc.) post-mortem blood samples.

validation that there is outside interest in this idea; being somewhat new to this field, I am aware of larger trends that are of concern to most labs but I was unaware of whether laboratories were particularly interested in hearing about carbon monoxide testing by spectrophotometry.

was always interested in forensics and, as such, I took a forensic analytical chemistry class in college. I really enjoyed how practical research and applications were in addition to learning about instrumentation more in-depth which convinced me to pursue it further.

Where do you hope to be in 5 years? Touring the country

with my band. How do you think the SOFT Awards Pro

students in Forensic Toxicology? I think it is extra motivation to do more work for your project and potentially think harder and more creatively about what kind of projects would be both unique and practically useful to a toxicology lab.

How would you use being the recipient of this award to

carear: Since I started my career in the field somewhat recently, hopefully it shows newer toxicologists that they can pursue research projects while balancing casework and that they should not be hesitant in trying to get there work out there whether that means publishing, making up a poster or presenting.

th? Professor Sabra

Botch-Jones at the Biomedical Forensic Sciences program at Boston University. A lot of the opportunities I had available to me there were through her hard work and the connections she had built up. Additionally, I always really loved that whenever I would ask a question regarding toxicology or drug chemistry she would always respond with genuine enthusiasm and a plethora of resources which really encouraged any curiosity I had about the subject.

While there may be obvious trends in research in this field due to where instrumentation has progressed and common issues most every lab is facing, there can still be compelling research done in more niche areas which may additionally make a project stand out. I really value the background research portion of a project for this reason as, especially with some of these niche areas, it can feel like ideas for testing have been exhausted. However, in the background research phase, really going out of the way to read many papers from different fields/perspectives on the issue and entertaining the idea of what the project would be like if we tried this more outside-the-box approach can be really valuable. Not every idea is feasible but at a minimum it can give a broader understanding of the issue, what is available, the ideal solution for the context and, potentially, new ideas to pursue.



Jacob Sa<mark>muel,</mark> MS Miami-Dade Medical Examiner

"Education is the most powerful weapon you can use to change the world."-Nelson Mandela

As niche as our field is, we see toxicologists working across many different industries in today's world. Some of our colleagues have found employment with private labs, many are working in government labs at the local, state or federal level, others have taken on the role of consultant and we also have several toxicologists that have found a home as professors in the education system. Our field touches so many areas of our economy, government, communities, and legal system, making it a truly unique field to be part of.

We may be spread out across the country and working in different industries, but we all have one thing in common that will carry on with us throughout our careers, our education. We all started in the same place, as a young student seeking knowledge, listening to the wise words of professors, and searching for a mentor to take us under their wing. Some of us were lucky enough to have found these things early on in our careers and some of us have had to wait patiently. We may not always agree on all aspects of toxicology but it's important to acknowledge that supporting and mentoring young toxicologists is imperative to the future success of our industry. Time and time again we have seen the rapid changes in our field and how they impact our communities, often for worse. As Nelson Mandela wisely said, "Education is the most powerful weapon you can use to change the world." Investing in our younger toxicologists now will be the change we all want for the future of our industry, our communities, and our government.

Many factors can contribute to the success of a student but one form of support that can have a tremendous impact on the future of a young toxicologists is a monetary donation that supports conference attendance. SOFT has long focused on supporting our community of young forensic toxicologists and we are happy to announce that we have implemented a new donation opportunity to help to continue to support the ERA and YSMA fund. Previously, members could choose to donate to the SOFT Awards fund but were only able to do this during annual dues payment. We have added a "Donate" button to the SOFT Awards Page that will allow for anyone to contribute to this fund at any point in the year. Donations will help sustain these awards for future students and young toxicologists.

We would like to thank all of our wonderful members that have already donated to the Awards fund this year. Your support of the Awards program, SOFT, and our industry is greatly appreciated!

DONATE NOW!

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Thank you ERA Donors

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Case Notes



Submitted by: Matthew T. Barnhill, Jr., Ph.D., F-ABFT Fairhope, AL mbarnhilljr@gmail.com

Case Study: Postmortem Distribution of Tramadol in a Decomposed Overdose Victim Michael Fagiola, M.S.; Nassau County Medical Examiner, East Meadow, NY

Tramadol is a synthetic opioid used in the treatment of moderate-to-severe pain, and used extensively because of its lower side-effect profile compared to other opioids. It is also considered a serotonin-norepinephrine reuptake inhibitor and has been investigated as an off-label adjunct in the treatment of major depression disorder. Its monoaminergic actions may be due, in part, to structural similarities with venlafaxine. Tramadol may be taken orally and undergoes extensive phase I metabolism via the cytochrome P450 system. In particular, metabolism through the 2D6 isozyme yields the active metabolite O-desmethyltramadol, and metabolism through 2B6 and 3A4 yields the inactive metabolite N-desmethyltramadol. Subsequent phase II metabolism yields several glucuronide conjugates, the excretion of which may be reduced in cases hepatic or renal insufficiency. The half-life of tramadol varies from 4.3 to 6.7 hours, and its volume of distribution is >1 L/kg.

Typical doses range from 50 to 150 mg/ day, with therapeutic concentrations reported to range between 0.1 and 0.8 mg/L. Toxic concentrations vary and have been reported from 0.01 to 23 mg/L, while lethal concentrations consistent with acute ingestion have been reported to be >15 mg/L. This considerable overlap of reported therapeutic, toxic, and lethal concentrations may depend on several factors including (but not limited to): the concomitant ingestion of other drugs, tolerance, the route of administration, the overall health status of the individual, and, especially in postmortem casework, the extent of postmortem redistribution (PMR). Tramadol has been shown to demonstrate PMR owing to its high degree of lipophilicity and alkaline character, and resultant tissue concentrations may be several-fold higher than blood concentrations. PMR of tramadol may also lead to a variance in measured blood concentrations taken from different draw sites, as is the case with cardiac/central blood versus femoral/peripheral blood. This variation in blood concentrations may lead to misinterpretation. Presented is a brief case review highlighting the postmortem distribution of tramadol in a decomposed overdose victim.

Case History

The decedent was a 47-year old male with a history of head and neck cancer. He was found unresponsive in his home by a relative and was pronounced at the scene by emergency medical personnel and exhibited signs of advanced decomposition. Our analysis of tramadol in femoral blood revealed a concentration of

35.2 mg/L. Based on the femoral blood concentration, the advanced state of decomposition of the decedent, and a high probability of PMR, a full distribution was performed. *O*-desmethyltramadol was not analyzed for this case.

sive medical history, parent-to-metabolite ratios, and a suitable urine specimen makes it difficult fully ascertain acute versus chronic ingestion.

Discussion

Tissue site	Tramadol concentration	
Femoral blood (mg/L)	35.2	
Cardiac blood (mg/L)	69.7	
Liver (mg/kg)	82.2	
Brain (mg/kg)	55.8	
Stomach contents (mg/total)	489	

as liver, brain, and stomach contents were analyzed for tramadol, which revealed potentially toxic concentrations of the drug. General symptoms of opioid toxicity can include central nervous system depression, respiratory depression, and unconsciousness, while tramadol's actions on biogenic amines might also lead to other adverse effects including hypertension, agitation, and seizures. Internal examination of fatal opioid overdoses often reveals significant pulmonary and cerebral edema, though the lack of any apparent autopsy findings in this case may be due to the decedent being found in the advanced stages of decomposition. Blood results involving tramadol may be subject to PMR, and toxicologic interpretation of blood concentrations alone could lead to misinterpretation and should be avoided, particularly in cases involving an extended postmortem interval. Blood-tramadol concentrations >15 mg/L and tissue concentrations >50 mg/kg are considered to be an indication of acute ingestion, which is consistent with the findings of this case. The cardiac-to-femoral ratio (C/F; 1.98) in addition to the tissue-to-femoral ratios (T/F; 1.58 L/kg for brain and 2.33 L/kg for liver also supports this. However, it should be noted that the C/F and T/F ratios for any drug may only be indicative of site location differences between the two tissues, and may or may not be a full representation of an acute ingestion or PMR. Evaluation of parent-to-metabolite ratios, in particular with O-desmethyltramadol, may provide supporting evidence of an acute ingestion, however this metabolite is not included in our analysis. The cause

of death was attributed to tramadol in-

toxication, but the lack of a comprehen-

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Sufentanil



Submitted by: Sherri Kacinko, Ph.D., F-ABFT Williow Grove, PA Sherri.Kacinko@NMSLABS.COM

Submitted by Jolene Bierly NMS Labs, Willow Grove, PA Jolene.Bierly@nmslabs.com

The Food and Drug Administration (FDA) garnered praise and criticism when it approved a sublingual form of sufentanil (DSUVIA) in November of 2018. Those in favor cited a need for alternatives to intravenous (IV) pain medications for use when access to IV sites are limited (i.e., burn patients, elderly, obese). While others raised concerns about the potential for abuse and diversion in the midst of an opioid epidemic. DSUVIA is a sublingual form of sufentanil that is produced by AcelRx Pharmaceuticals. The approved formulation includes a single 30 mcg/ mL tablet that is dispensed from a single-dose applicator (1). According to the manufacturer, each applicator is packaged in its own sealed, tamper-evident pouch and will only be available in medical settings. No retail pharmacies will carry or dispense this formulation (2).



Figure 1: Sublingual Sufentanil (DSUVIA) Applicator

So, what is sufentanil? Sufentanil is a synthetic opioid with approximately 5-10 times the potency of fentanyl. It has been used medicinally since the 1970's as an analgesic or anesthetic in various surgeries. It gained popularity among the medical community because it has no active metabolites and provides rapid analgesia. The effects of sufentanil, like other opioids, include pain relief, sedation, and respiratory depression. In clinical trials, average maximum concentrations of 40.6 pg/mL and 63.1 pg/ mL were achieved at approximately one hour from single doses of 15 µg and 30 μg, respectively (3,4). Drug accumulation was observed during multi-dose studies with concentrations increased by approximately 2.4-fold compared to single-dose results (4).

While the new formulation is not intended to be available outside of a hospital setting, toxicology and drug chemistry laboratories should remain vigilant. Since a single sublingual dose of sufentanil can remain in the blood for several hours, it may be present in the blood after an individual has been discharged from the hospital. Additionally, multiple instances of drug diversion and abuse by healthcare professionals has been documented in the past. The good news is that multiple analytical methods for the detection and quantitation of sufentanil have been published utilizing various technology. These methods have primarily been used in pharmacokinetic research and therapeutic drug monitoring laboratories but they are easily adaptable to forensic casework. With the FDA releasing plans for the development of new pain management drugs in 2019, this may be one of multiple approvals to come over the next few years (5).

Table 1: Chemical Characteristics of Sufentanil

Nomenclature	N-[4-(methoxymethyl)-1-[2-		
Nomenciature			
	(2-thienyl)ethyl]-4-		
	piperidinyl]N-phenyl-		
	propanamide		
Formula	C22H30N2O2S		
Molecular	386.6 g/mol		
Weight			
Exact Mass	386.2 g/mol		
pKa	8.01		
Structure	S N N		

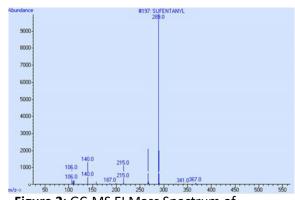


Figure 2: GC-MS EI Mass Spectrum of Sufentanil acquired using an Agilent by scan acquisition (70 eV)

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Continuing Education Opportunities



2020 AAFS Annual Meeting Information February 17-22, 2020 Anaheim Convention Center Anaheim, CA Submitted by: Bill Johnson, B.A., D-ABFT-FT

It's difficult to believe three months have passed since our incredibly successful 2019 AAFS Annual Meeting in Baltimore, MD. Our sincerest thanks to all the Toxicology Section officers, chairs, co-chairs, moderators, abstract reviewers, and volunteers for your efforts. Great meetings are impossible without the dedication of so many individuals!

Preparations are well underway for another exciting program at the 2020 Annual Meeting in Anaheim,

CA, where the chosen theme is "Crossing Borders."

We are looking forward to a vast array of quality workshops, scientific sessions, breakfasts, and luncheons next year and will also continue the traditional special sessions on Drugs and Driving, Postmortem Pediatric Toxicology and our joint session with the Pathology/Biology Section.

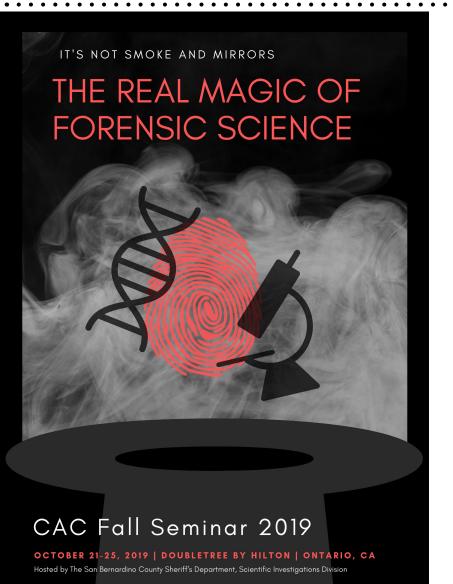
If you haven't already, we encourage you to consider abstract submissions and/or identify workshop proposals — now is the time to start! The shared <code>August 1st deadline</code> will rapidly approach; please don't delay in contacting section Program Chair <code>Sabra Botch-Jones (sabraj@bu.edu)</code> or co-chair <code>Laureen Marinetti</code> (<code>Imarinetti@redwoodtoxicology.com</code>) with your workshop suggestions and other program ideas. You can use the following link to participate in a survey to gauge your willingness to participate:

http://tinyurl.com/AAFS-TOX-2020

Moderators and volunteers play a pivotal role in the success of the annual meeting, and both activities count as service to the Academy for the October 1 deadline for membership and promotion submissions. Volunteering is also an excellent way for newcomers to get engaged and meet people, so please encourage your colleagues and students to participate and contact Sabra Botch-Jones (sabraj@bu.edu) if you're interested in this opportunity.

Please note another August 1 deadline: nominations for section awards. These awards remain a wonderful way to recognize your fellow colleagues for their contributions and dedication to our field. Contact the Chair of the Toxicology Section Awards and Scholarship Committee, Timothy Rohrig (trohrig@sedgwick.gov), with your nominations.

Mark your calendars now for the AAFS 72nd Annual Scientific Meeting, February 17 - 22, 2020, in Anaheim, CA.







CAC Fall Seminar 2019 October 21-25, 2019 Doubletree by Hilton Ontario, CA

The San Bernardino Sheriff's Crime Lab will be hosting the California Association of Criminalists Fall Seminar this year on October 21-25 at the DoubleTree in Ontario, CA. The program will offer several workshops and speakers.

Future updates to the seminar workshop and speaker schedule will be posted HERE.



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May 1 for June Issue

August 1 for September Issue

November 1 for December Issue

TOXTALK Deadlines for Contributions

Year	Location	Dates	Host(s)
2019	Grand Hyatt San Antonio, San Antonio, TX	October 13–18, 2019	Veronica Hargrove and Brad Hall
2020	Marriott Marquis San Diego Marina, San Diego, CA	September 21–25, 2020	Denice Teem and Dani Mata
2021	Gaylord Opryland, Nashville, TN	September 26–October 1, 2021	Jennifer Colby and Erin Karschner
2022	Huntington Convention Center, Cleveland, OH	October 30-November 4, 2022	Doug Rohde
2023	Gaylord Rockies, Denver, CO	October 29–November 3, 2023	TBD

FUTURE SOFT MEETINGS

Awards
ConEd Workshops
Designer Drugs
Drugs & Driving
Drug Facilitated Crimes
Ethics
Finance
IT

Erin Spargo, Ph.D., F-ABFT
Robert D. Johnson, Ph.D., F-ABFT
Dani Mata, D-ABFT-FT
Curt E. Harper, Ph.D., F-ABFT
Laureen Marinetti, Ph.D., M.S., F-ABFT
Jennifer Limoges, M.S., DABC
Robert Sears, M.S., F-ABFT
Matthew Juhascik, Ph.D., F-ABFT

JAT Special Issue
Meeting Resource
Membership
Nominating
Policy & Procedures
Publications
YFT

Kayla N. Ellefsen, Ph.D.
Sumandeep Rana, Ph.D.
Amy Miles, B.S.
Michelle Peace, Ph.D.
Amy Miles, B.S.
Matt Slwason, Ph.D.
Kim Samano, Ph.D.

2019 SOFT COMMITTEE CHARIS

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