Just Improving Forensic Toxicology Testing in DC Podcast Transcript

Introduction [00:00:01] RTI International's justice practice area presents Just Science. Welcome to Just Science, a podcast for justice professionals and anyone interested in learning more about public health, innovative technology, current research, and actionable strategies to improve the criminal justice system. In episode one of our Community Based Solutions for Substance Use Challenges season just sat down with Doctor Samantha Tolliver, Chief Toxicologist for the District of Columbia Office of the Chief Medical Examiner, or DC OCME, to discuss how their agency uses their Bureau of Justice Assistances Comprehensive Opioid Stimulant and Substance Use Program, or COSSUP, funding to improve their drug testing and analysis processes. For forensic toxicologists, it is important to be able to quickly and accurately identify which substances have contributed to an accidental overdose, so that they can monitor emerging drug trends in the area. The DC OCMEs COSSUP funding has allowed their office to use reference labs to reduce their casework and focus on adopting new methods for drug testing and analysis. Listen along as Doctor Tolliver discusses challenges faced by forensic toxicologists in keeping up with drug trends, the benefits of adopting technology such as high resolution mass spectrometry, and how improving drug testing methods can contribute to broader community overdose prevention efforts. This Just Science season is supported in part by RTI Award number 15NIJ-21-GK-02192-MUMU, awarded by the National Institute of Justice and by RTI Award number 15PBJA-23-GK-02250-COAP awarded by the Bureau of Justice Assistance. Both are agencies within the Office of Justice Programs, U.S. Department of Justice. Here's your host, Doctor Lawrence Mullen.

Lawrence Mullen [00:01:57] Hello and welcome to Just Science. I'm your host, Doctor Lawrence Mullen, with the Forensic Technology Center of Excellence, a program of the National Institute of Justice. In order to reduce overdose deaths, promote public safety, and support access to services. This season is in collaboration with the Bureau of Justice Assistance Comprehensive Opioid Stimulant and Substance Use Program, also known as COSSUP, which provides funding to respond to illicit substance use and misuse. COSSUP supports the development of comprehensive state, local, or tribal driven responses to the use and misuse of opioids, stimulants, and other substances that expand access to treatment and recovery support services across the criminal justice system. We are here today to talk with our COSSUP grantee, the District of Columbia, or DC, the DC Office of the Chief Medical Examiner, who was awarded a COSSUP grant in 2020 to implement their COSSUP of project to update the Toxicology Division's drug identification and tracking procedures. Here to help us with this discussion from the DC OCME is Chief Toxicologist Doctor Samantha Tolliver. Welcome, Doctor Tolliver.

Samantha Tolliver [00:03:08] Hi, Lawrence. Thank you for having me.

Lawrence Mullen [00:03:10] Can you tell the listeners about your background and maybe what led you to your current involvement in the COSSUP Project?

Samantha Tolliver [00:03:16] Sure. I'm originally from the great state of West Virginia. I hold a bachelor's degree from West Virginia State University. A master's degree from Florida International University. My doctoral degree is also from Florida International University. I've been employed by the Office of the Chief Medical Examiner, or OCME, in Washington DC for ten years. I currently hold the position of Chief Toxicologist. In terms of the COSSUP on the programmatic administrator. And so I make sure that we stay on track and we meet all of our goals.

Lawrence Mullen [00:03:44] So can you tell us what is the role of a forensic toxicologist and how that role fits into DCs approach to the overdose epidemic?

Samantha Tolliver [00:03:53] It's a great question. So I'm a firm believer that the role of a forensic toxicologist is to be a resource. Call us, email us, ask us questions. Some of what we do includes providing timely toxicological results, interpret findings and research drug trends. Being curious, as well as well-versed in a broad range of topics comes with the position, and we all pretty much enjoy that part of it. Specific to DC, the district took a multi-agency, multidisciplinary approach, and so they formed a working group that included district agencies including DC health and DC Behavioral Health, as well as law enforcement and community outreach organizations. And then more specifically, in terms of the toxicology laboratory, we did two things. We we both received and provided data. So in terms of providing data, what we did was provide a timely information about what drugs or drug combinations were being detected. We could clearly see the trends of change. We could see that heroin was obviously being replaced with fentanyl, and that the emergence of fentanyl analogs, which had at one point been an issue, really began to disappear by the end of 2020. And in terms of receiving data intelligence from law enforcement and seized drug laboratories, it's really helpful. It's great for us to know what's being detected in actual materials, because that's really ultimately going to show up in our toxicological casework.

Lawrence Mullen [00:05:10] Interesting. So we heard some talk there about fentanyl, as we know that that's not even a trend anymore, but it's just more factual and present. Can you explain to us some of the challenges associated with keeping up with the emerging drug trends?

Samantha Tolliver [00:05:22] As new drugs emerge you know, one of the things a laboratory has to do is purchase standards. And I say standards because, generally multiple analogs emerge at or around the same time. So one of the things that we've learned over the years is that it's best to develop both screening and confirmation methods at the same time. However, human resources can obviously be a limiting factor in that process. So I have to say that grant funding that we receive really helped to decrease some of those challenges. And we were able to hire a toxicologist to help us, we were able to purchase drug standards. And while we were getting our methods developed and validated, we also had funds that we could put towards reference lab testing. And so that reference laboratory piece was extremely helpful in terms of helping us to manage our caseload and keep our turnaround times appropriate.

Lawrence Mullen [00:06:11] Can you tell us more about how you identify the need for federal funding in the Toxicology Division of the DC office of the Chief Medical Examiner, and why you applied for the COSSUP grant?

Samantha Tolliver [00:06:22] You know, it's the responsibility of the medical examiner to determine cause and manner of death. So there's five manners, which include accident, homicide, natural, suicide, and undetermined. And generally, in a healthy society, what you see is that the majority of cases are going to be classified as natural or meaning natural disease. And through 2016, that was the case in the district. But in 2017, there was a change where the majority of the cases were classified as accidents and not natural. And so we really started to look into that data. The overwhelming majority of those accidental deaths were attributed to intoxication. Or accidental intoxication deaths known as drug overdoses. And as we've mentioned, we know fentanyl was a big player in that. And our, the top three drugs that we were detecting at that time were fentanyl, cocaine and

heroin. And so at the time of our application, which was in 2019, the district had reached the point where accidental deaths were 43% of the medical examiner caseload, which was the majority. And that was followed by natural, that 39%. So a deeper dive into those accidental deaths, 66% of them were due to intoxication. So ultimately, we applied for the COSSUP grants out of a need to really support the toxicology division through this process of making meaningful and sustainable changes that were going to impact the district and those we serve in a positive way.

Lawrence Mullen [00:07:41] Thank you for providing that context. Can you tell us how you designed the COSSUP program, and how does this program address the needs of your office in DC as a whole?

Samantha Tolliver [00:07:51] Administratively, I wanted to look at our processes and mean them or sort of trim the fat, so to speak. So we had processes that I believe could be more streamlined. It's ultimately the goal went on a back burner, and I hope to address that in this upcoming year. But the project for COSSUP really ended up we focused in on the long term laboratory improvement process. So the funding was used to allow the laboratory the time and space it needed to revamp our analytical testing scheme. We had intelligence from seixed drugs and from federal and local partners, and we had our toxicology data and all combined. We had the information that was telling us that fentanyl, as we discussed it, was really the problem. And in 2020, 57% of our accidental intoxication deaths had fentanyl in them. So we didn't know how long that trend could last. It's 2024 and we're still here. But then, you know, you don't know things can change within a matter of months. So, you know, and we and we had been seeing that the toxicology landscape has been changing over the years. We've seen, synthetic cannabinoids, synthetic cathiones, designer benzos, and now we're at, cannabis analogs. And so the list just kind of continues. And so then and even now, our laboratory, we had an expansive testing panel, but there was an opportunity for improvement in terms of responding to newer shifts and drug trends. And so we used the COSSUP funding to supplement testing to purchase our standards and consumables. And in terms of the supplemental testing, which I mentioned a little bit ago, we did a mixture of things that first year. There's a period of about two months or so where we were sending all of our postmortem cases out to the reference lab. And so what that did was it allowed us the time that we needed to get additional training on our instruments, in our instruments software, and really understand the capabilities of what we already had in-house. We knew how to do what we were currently doing, so to speak. But how do we push the software? How do we push our innovation? How do we move forward to better handle case loads that don't seem to be on the decline and still have it? And so in addition to that, you know, our method development program was looking at their processes, identifying their opportunities for improvement too. And I'm sure a lot of labs out there can relate to you. You look at developing a validated method, and a whole year can pass between the time that you started it and you finished it. And so by the time you finish that method, those analogs, those analytes in your method may or may not even still be relevant to what's going on. So we knew that the one year model wasn't serving us and we needed to address that. So I'd say, you know, the process of sending our samples for the reference lab was very helpful because, decreased our batch sizes. We still maintained analysis for our impaired driving casework, which we do in our laboratory, as well as sexual assault casework, which we also do. So we kept those in house, sent out the bulk of our work, which was post mortem. And, that really just gave us some time to, like I said, learn about our instrument capabilities and revamp our method development validation processes. And really, all in all, the investment has really paid off. And that's resulted in us implementing some really great improvements in our laboratory process.

Lawrence Mullen [00:10:58] So I would say what you kind of loosely described is more of a surveillance tactic. Would you agree?

Samantha Tolliver [00:11:04] Yeah. So we're definitely doing a lot of surveillance. So the nice thing, about surveillance is that it really allows us to fully understand what's going on in our jurisdiction. Like I said, we do postmortem and human performance testing. So we have a good swath of data and information. So in terms of surveillance, we knew that our role as a resource in the district was that we needed to be able to flow with the change in a way that offers little hindrance, but still ensures the production of forensically defensible casework and also in a timely manner.

Lawrence Mullen [00:11:39] All right. Well, let's shift gears just a bit. You talked about surveillance. You talked about, you know, the COSSUP funding and what you wanted to do with and what you planned and actually did implement with it. So let's talk more now about the technology. In regards to it can you explain to our listeners what high resolution mass spectrometry is?

Samantha Tolliver [00:11:57] Oh well it's great. So it's a great technique. It's arguably the most sensitive analytical tool in the toxicologist toolbox. It's an instrument that really allows you the ability to identify very low levels of drugs. And one of the things that we see now more than ever are high potency drugs. And so when there's a highly potent drug, particularly in the illicit market, you're really talking about low levels of drugs that are present in those materials. So in terms of toxicology and biological analysis, if there's low level drug material, then there's even going to be less in detection. Right. So you need a high resolution instrument that can really get down to those picograms. That's a picogram levels of drug present.

Lawrence Mullen [00:12:42] What's the training process look like for this type of technology? So how long does it take? How many hours?

Samantha Tolliver [00:12:48] Oh so that depends right. That's a great question. So training for us is really modular. So what we do is we break down each component of a system. So in this instance a trainee would need to pass the liquid chromatography module. They would need to pass the mass spectrometry module. And they would need to pass our high resolution as a quadrupole time of flight. And so there's a module for that. And then within each of the modules the trainee is going to learn theory. They're going to become familiar with our standard operating procedures. When they finish all their reading and understanding, they're going to complete a test, a written exam to demonstrate that they comprehend that material. And then once that's completed, they're going to work with the trainer and they're going to go to the laboratory, to the instrumentation and the trainer, familiarizing them with the system and the software. They learn how to prepare the instrument for a run, how to maintain it, how to troubleshoot it, how to operate it, how to do that process all of those things. When the trainee demonstrates competency and receives an authorization memo and they'll be allowed to conduct the casework. And so one of the nice things about our laboratory is that the trainers are actual toxicologist analysts. So if a trainee has a question or has some difficulty or just a point for clarity, very likely the trainer is going to be in the laboratory with them and they're right there to assist in that situation. So how long does it take? Well that varies. It can vary from person to person. But, you know, ultimately the goal is not so much to worry about how long it takes, but it's to ensure that the trainee is comfortable and competent and able to do the work.

Lawrence Mullen [00:14:23] Wow. I really like that response. So basically it takes as long as it's time for as long as it takes.

Samantha Tolliver [00:14:29] Exactly.

Lawrence Mullen [00:14:31] With the high resolution. How did the implementation of high resolution mass spectrometry help with analyzing, reporting and informing the public about new drug trends?

Samantha Tolliver [00:14:42] Right. So the high res is, you know, it's obviously an extremely powerful tool. And so one of the biggest strengths is its ability to provide comprehensive analysis of a sample while utilizing a really minimal sample volume. You know, when I first started, methods were 1 or 2ml of sample per assay. And now with these instruments, you know, we're looking at 20 to 200 microliters for most labs. And so that's really important particularly in a landscape of poly drug use because you can use the sample for multiple analyzes if it's needed. And while maintaining and preserving other other parts of the, of the case. So that's really wonderful in terms of specifically the district, we're really leaning in on the flexibility of a system. So we search case results against not only the vendor provided library, but we also build our own libraries. So we use standards that we purchased from a grant, to better identify fragmentation patterns and retention times of the analytes under our instrument, method parameters. And that helps to improve the accuracy of identification. We can also focus on analytes that are specific to the district and our region as a whole. And that focus is really nice because high res, you know, it offers such a broad swath of information. And so we have the ability if we if we do detect something, we can really target confirmation testing. So we leave the high res open to detect anything and everything. But our confirmatory methods are decidedly more specific. So there are laboratories that develop, you know, assays that may have 300 analytes. And of the 300, you may only see 25. Right? Right. So one of the things we did in the district is we said we have all this intelligence, we have all the surveillance data, we have all this information. Let's be very intentional about our methods and make sure that we're focusing in on what is actually important to our jurisdiction. And I think it's a better use of our time, and it's a better service to those in the district as well.

Lawrence Mullen [00:16:35] I would agree. How is your lab evaluating the outcomes of the COSSUP project?

Samantha Tolliver [00:16:40] Our outcomes are that we have updated and improved the relevancy of our testing panels, we've better trained and prepared our staff, with a process in place that allows for streamlined response to new and emerging drugs. And all of those changes are sustainable and don't feel overly burdensome, which was really important to us. And I would say all of those things are really notable successes.

Lawrence Mullen [00:17:02] Do you have any advice for other toxicology labs that may want to implement this type of technology?

Samantha Tolliver [00:17:08] Yeah, absolutely. I say do it. Definitely, definitely do it. It's great technology. And I will also say take advantage of the training that they give you about the software. It's not good enough to just have the instrument. You're also really going to want to take advantage of what it can do for you, and how it can make your processes more simplified and more streamlined. But absolutely, take the jump and do it.

Lawrence Mullen [00:17:33] Would you be able to share any barriers or challenges that you faced with implementation of like high resolution mass spectrometry?

Samantha Tolliver [00:17:40] I don't know that we necessarily had any barriers. I would say, the implementation wasn't so much the problem for us or my end. I will say I was naive about the amount of data that our instrument and I'm sure all the high res instruments produced. So what I learned along the way is I really needed to purchase a data server to store all of this information. And so we were able to use grant funds in order to buy us a data server for that. And so that really that's going to be very helpful now. And as we move into the future, because we'll have all this information for years to come.

Lawrence Mullen [00:18:17] As far as public impact goes as it relates to the COSSUP project. Do you have any examples of any kind of public impact that the COSSUP project has had, or DC or anything like that?

Samantha Tolliver [00:18:28] Well, I think the public impact isn't something that's going to be, you know, out there front and center. You know, a forensic toxicology lab typically isn't center stage, but the impact that they'll feel behind the scenes is that the laboratory or the toxicology lab, we are stronger, we are better, and we are better prepared at handling the challenges of today and those of the future. And so, you know, we are going to be able to respond in a manner that is swift and efficient and forensically defensible.

Lawrence Mullen [00:18:56] All right. So as we look to the future, what would you say is next for this program?

Samantha Tolliver [00:19:01] So sadly, this project, this program for us is actually going to end in September. But we know that the work continues. So, you know, the good thing is the funding really helped us to get us, give us the time and space we needed to effectively respond to the needs of the district. As I mentioned, we were able to purchase standards. We were able to purchase additional consumables. We purchased a data server, and while we were going through this period of growth, we were able to, lean on a reference laboratory, which was also funded here. So, you know, like I said before, we're stronger than we've ever been, and we're ready to take on the new challenges should they and as they arise.

Lawrence Mullen [00:19:40] Doctor Tolliver, have you all noticed any emerging drug trends or anything of that nature in the DC area?

Samantha Tolliver [00:19:47] So currently, I think we're moving a largely the same way as that as the nation is. We're seeing xylazine in our casework, we're seeing some nitazines in our casework, but quite honestly, nothing too novel or new at the moment. So, almost a little nervous about it because. Because I think this could be the calm before the storm.

Lawrence Mullen [00:20:06] We're running near the end of our time together. Are there any final thoughts you'd like to share with our listeners?

Samantha Tolliver [00:20:11] Sure. First of all, I just wanted to take a moment and acknowledge the toxicologists at the office of the Chief Medical Examiner in Washington, DC, and we have all been pushed outside of our comfort zones during this period and the growth and the change has really been fantastic. And so I'm just thankful for their dedication and also wanted to thank the administration and the office of the Chief Medical Examiner for supporting the toxicology lab through these changes and updates. And then

more broadly, I would just tell any listener who's working in a laboratory, you know, if your organization hasn't considered applying for federal funding, I would highly encourage you to look into it, because it can really make a difference and how you serve your community, and that's a win for everybody.

Lawrence Mullen [00:20:53] So I'd like to thank our guest today for sitting down with Just Science to discuss the DC Office of the Chief Medical Examiners COSSUP Project. Thank you so much for joining us today, Doctor Tolliver.

Samantha Tolliver [00:21:05] Thank you. Have a great day.

Lawrence Mullen [00:21:06] If you've enjoyed today's conversation, be sure to like and follow Just Science on your podcast platform of choice. For more information on today's topic and resources in the forensic field, visit ForensicCOE.org to request training and technical assistance or learn about additional resources from the COSSUP TTA collaborative visit COSSUP.org. I'm Doctor Lawrence Mullen and this has been another episode of Just Science.

Introduction [00:21:34] Next week, Just Science down with Bill Barber to discuss how the King County Office of the Chief Medical Examiner uses rapid DNA testing methods. This Just Science season is in collaboration with the Bureau of Justice Assistance Comprehensive Opioid Stimulant and Substance Use Program that promotes effective response to substance use and misuse, working to reduce overdose deaths, promote public safety, and increase treatment and recovery access in various sites across the United States. A partnership of the National Institute of Justice's Forensic Technology Center of Excellence at RTI international and the Bureau of Justice Assistances COSSUPs Training and Technical Assistance at RTI international made this podcast season possible. This series will serve as a space to disseminate ideas, motivate listeners of both state and local agencies to develop their own programs and research to address substance use and misuse and encourage innovation. The COSSUP TTA providers, which includes RTI, help grantees focused on local and state based implementation efforts aimed at addressing behavioral health and public safety needs within their communities, and strategies supporting families impacted by substance use and prevention in their communities. The FTCOE highlights program implementation strategies, outcomes, and challenges of implementation through the lens of innovative research for drug monitoring and its community impact. The opinions, findings, and conclusions or recommendations expressed in this podcast season do not necessarily reflect those of the Department of Justice.