

**Season 1 Episode 3: Daniel Gerrity with the Southern Nevada Water Authority, Nevada**

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Transcript

00:00:00 Anna Mehrotra

All right. Hello and welcome to sewer signals, a podcast on utility experiences with wastewater surveillance. I'm Anna Mehrotra, director of the Wastewater Surveillance Program at the Water Environment Federation, and I'm thrilled to be talking to Dan Gerrity today, who is joining us from Southern Nevada. Hey, Dan, it's great to be chatting with you. How are you doing?

00:00:23 Dan Gerrity

I'm doing great. Thanks for having me. And hello to everybody listening.

00:00:27 Anna

Awesome. So, Dan is the principal research microbiologist in the water quality research and development division at the Southern Nevada Water Authority. Dan earned his PhD in Civil and Environmental Engineering from Arizona State University and worked as a consultant at Trussell Technologies in San Diego and also spent seven years as an assistant and associate professor at the University of Nevada, Las Vegas. During his career, Dan has analyzed drinking water and wastewater for a wide range of targets, things including PFAS compounds and nitrosamines, pharmaceuticals and other endocrine disrupting compounds, and now SARS Co V2 RNA. His past research focused primarily on potable reuse topics, including ozone biofiltration and quantitative microbial risk assessment. So a little bit about Southern Nevada Water Authority. It's a utility comprised of seven local water and wastewater member agencies serving more than two million residents in Southern Nevada. SNWA is a wholesale water provider responsible for water treatment and delivery, as well as acquiring and managing long term water resources for Southern Nevada SWA's multi-disciplinary R&D team performs leading edge research to provide innovative treatment solutions for the one water industry. Wow. That's a lot: 2 million people is a lot. You've obviously looked at a lot of different things in water, but we're going to talk about SARS-CoV-2. So. So let's get into it. So, Dan, tell me a little bit about how SNWA got started with its wastewater surveillance program for COVID.

00:02:17 Dan

So, we are a drinking water utility and so one of the questions that always comes up is why is the drinking water utility doing wastewater surveillance work? And so historically, we've had this great R&D group. So I actually started as a postdoc here at the water authority back in 2008 and did a few stints elsewhere and eventually came back to start up the research microbiology. And so we've historically worked really closely with the wastewater utilities on a lot of water reuse research, understanding the trace organics that are discharged into the Las Vegas, Wash and wind up in Lake Mead. We need to understand what challenges are coming down the pipeline on the drinking water side. And so that's, that's where that collaboration really starts and so fast forward to COVID. When this hit and people realize very quickly that SARS-CoV-2 RNA winds up in stool samples and feces, there's that connection with wastewater. And so as the drinking water utility, we wanted to better understand what the potential issues might be on the drinking water side, on public health. And so that's why we originally launched this program and so pretty early on we found and a lot of other people found that the SARS-CoV-2 RNA the virus

gets removed. Very quickly in wastewater treatment plants or it gets inactivated very quickly. And so there was very low risk, if any, on the in a drinking water context. And so that allowed us once we had this infrastructure in place to do this kind of research we were able to focus more on the research component going back upstream and figuring out what this meant for public health. And So what does finding SARS-CoV-2 RNA mean in terms of what's happening in the community? And that's launched a multi year project. Now that we never thought we'd still be doing this at this point. But it's been a great opportunity to to make connections in the industry with other researchers. Other people like yourself, working with with WEF now. And and so it's been a troubling time in some respects because of COVID. But it's also been a great opportunity to do really interesting and helpful research for the community.

00:04:26 Anna

That's wonderful. Yeah. You're so right. I don't think any of us thought that we'd still be talking about wastewater surveillance being relevant for COVID specifically right in May of 2022.

00:04:39 Dan

Yeah. When you when you think about it's called COVID-19. And here we are in in 2022 still talking about it, so I don't think. I think people would be lying if you asked them and they said, yeah, you'll still be talking about this 2022. I think people realize it would take a while, but maybe not this long. So that's been one of the more surprising things. Maybe not this long.

00:04:58 Anna

For sure. OK, so talk a little bit about who you're partnering with in this effort.

00:05:04 Dan

Yeah. So again, being on the drinking water side, we can't do this research without the collaborating wastewater agencies. And so we have partnerships with all of the wastewater treatment facilities in town and. And so basically, we're getting a snapshot of the entire Southern Nevada community, all of Las Vegas, Boulder City, the samples that we collect, we're able to look at each of those little sub communities with within Las Vegas to figure out what's going on, so the wastewater agencies are obviously key. Over time we've developed a great collaboration with UNLV and Doctor Ed O at UNLV associated with the medical school, he's been doing a lot of the sequencing work or all the sequencing work actually for us. And so we'll quantify source code to in the wastewater and it will tell us which variants are are present in that wastewater and so with those two pieces of information, it really gives you a lot of powerful data to share with public health to really understand what's going on. So collaboration with UNLV has been awesome over time. We've also started working more closely with the public health officials in town, so the Southern Nevada Health District. We now have weekly meetings with the Nevada State Public Health Lab. We've been doing some work with the University of Nevada, Reno, so they're doing wastewater surveillance up in the north. We're doing in the South. So we can basically get a a good picture of what's happening throughout the state. We've worked with the governor's office now trying to provide them with data so that they can make more informed decisions about what's happening related to COVID and then I think one of the best outcomes from this research has been all the collaborations with other academic institutions. And so early on people were scrambling to try to figure out what's the best way to do wastewater surveillance for, particularly for SARS-CoV-2. And so we worked with a number of universities throughout the country to brainstorm basically and figure out how to do this effect.

00:07:09 Anna

Oh, that's awesome. Wow. So you have partners really kind of at all levels of government within your state. And then as you mentioned, kind of outside the state with other academics and you

also mentioned that obviously you're working with your wastewater agencies. So and that, you know, combined your samples cover Boulder City, Las Vegas, you know, big swath of the population. Kind of dig in and talk a little bit more about the details about where the samples are collected. Are you collecting them at the influent to the water resource recovery facilities? Are you collecting them out in the in the collection system? Talk about that and how frequently are you taking samples?

00:07:46 Dan

Sure. So like I mentioned, we've been collaborating with the wastewater agencies for a while. In particular, Clark County Water Reclamation District is the largest wastewater entity in town. And so we always have a variety of research projects going on with them. And so when SARS, Kobe 2 is found in feces. Katerina is the research microbiologist that works with me. We were just talking. We're like, we wonder if we can find this in local wastewater. And so we had been working with Clark County at the time and so we reached out to them and asked if it was OK to take some samples and start looking. And then one thing led to another. Clark County became city of Henderson and city of Henderson became City Las Vegas and it just kept growing and growing. And so now we are collecting samples from all the major treatment facilities. So we have it varies from week to week depending on which little side projects we want to do and other things we want to look at. But we generally have at least seven samples per week that gives us an idea of what's happening throughout the community. We go out every Monday morning at the same time. I've lost track of how many times we have done this, so it's basically been every single week since early March 2020. And one of the things that we've tried to do, which has been a struggle is try to keep as much the same as possible because anytime you change something it adds another variable to the mix and so if you see a spike that particular week, is it a real spike or is it some artifact of some method change that you did? And so by keeping things the same it makes it easier. So every Monday same time we collect samples from each of those facilities in town. Mostly it's influent samples, so we have composite influent from a few facilities. We have grab influent from one of our smaller facilities that doesn't have an auto sampler at the largest treatment plant. We take primary effluent and that's just an artifact of that's where we started. And so again, we wanted to keep everything the same and so if I had to do it all over again, we'd probably change a few things, but we kept that the same. So we're doing primary effluent at Clark County, influent at all the others and a combination of composite grab just based on practical aspects of the sampling and what's possible.

00:10:03 Anna

That makes sense. So you're kind of locked into those points of sampling for now and those sampling methods for now. Wow, every Monday morning. So that makes it hard to take off a week here or there for your team.

00:10:13 Dan

Yeah, it makes it basically impossible because you've got that Monday sitting right there that you always have to be here.

00:10:18 Anna

Yeah, yeah. And so it is your team, which is essentially you and Katerina taking the samples, is that correct?

00:10:28 Dan

Yep. So some of the facilities will run their auto samplers and collect the sample for us. And Katerina will go pick those up and then at other facilities, I actually go out and run the auto sampler myself and collect those samples and then bring them back to the lab. And then that's

where Katerina takes over. So none of this would be possible without Katerina. So she does all the the sample processing, all the analysis all the way through qPCR sends me the Excel file and then we work together to figure out what it all means.

00:10:54 Anna

Yeah. So so you're generating data then once a week. And you're looking at the Excel file and then you're sharing it back out with the wastewater agencies with some of your health departments, like how does that whole data sharing process go?

00:11:10 Dan

Yeah. So it's evolved over time. So one of the challenging aspects of this is trying to put it in a format that people will understand. And that's been a work in progress from day one. So trying to make it better over time so that people can look at the data and understand what it means. And so another thing that I would have changed if I had known how long this was going to go on for is the way that we provide the data to everybody. And so over time, it's just basically become an extra e-mail that goes out to different people each week. So there's an e-mail that would at the start would just go off internally within SWA. Here's what's happening this week. Here's how things are changing and then it would go out to the wastewater agencies in a separate e-mail and then the public health people came on board. So then I'd send an e-mail to them and then the governor's office. And so each week, there was another e-mail. So I'm probably up to 7 or 8 emails every Tuesday afternoon with different types of information, depending on who the reader is going to be so that they understand what's happening.

00:12:09 Anna

Oh wow. So what are you actually plotting or summarizing in that e-mail? Is it normalized concentrations? Is it trends? I mean, what, how, what information do you highlight out of your data each?

00:12:23 Dan

So everybody I think likes to see data in different formats and so the report that I put together has basically everything. So it's got a figure showing the observed concentrations versus new cases by day, and then we've developed a model to try to estimate what should the wastewater concentration be based off of the case data that's been reported. And so we can track that over time, see how those are changing relative to each other to get an idea of how clinical testing is capturing infections. And so if we start to see deviations between the observed data and the model data then that might be an indication that clinical testing has changed. Maybe we're not capturing as many infections as we were in the past. And so that gives us a little bit of information there. Then we also have a table. So we just summarize all the concentrations at each facility just in a table format some people might like that and then we have several other. Other figures showing just case data by itself and each sewer shed how that's changing, and so a whole variety of plots and tables, and then hopefully somewhere in there everybody's finding a useful piece of information for them.

00:13:33 Anna

Yeah, you're so right. We all home in on different types of information and different pieces of information, so that's interesting that you're looking at sort of expected wastewater concentrations relative to reported cases. I'm suspecting that that relationship is sort of disintegrating over time because of increased use of rapid antigen tests that and those results don't necessarily get reported to local health departments and become part of the official COVID incidence data, right. Have you seen that kind of that relationship between wastewater concentrations and case data change over time?

00:14:11 Dan

Yeah. I think the first time we really noticed it was delta where we started to see spikes in concentration. But the case data didn't increase to the same level that we would have expected based off of, let's say the the alpha period. And so there was definitely a discrepancy in there. And then we would start reaching out to people like, hey, are you seeing the same thing in your data? So that was the first time we noticed it. Surprisingly like you mentioned, with the at home testing, which is very abundant now, a lot of people have it. A lot of people are using that as opposed to going off to a site to get the the PCR tests. I would have expected that discrepancy to grow even more, but when I was looking at the data just yesterday, it seems like the clinical testing is still holding up, at least relative to Delta, so it's still lower than what we had seen during the earliest phase of the pandemic. But if you go back to the delta period. What we're seeing now is is pretty similar and so the clinical testing surprisingly is still doing a decent job of capturing what's happening in the community, at least based off of what we're seeing in the wastewater.

00:15:12 Anna

Oh, that's that's interesting. Good to know. OK, let's talk about money. How is all of this funded?

00:15:19 Dan

Well, one of the great aspects of working for the water authority is the funding that's provided to the research group. And so a majority of the testing that we've done since March 2020 has been internally funded by S&W. But then working with Ed Oh at UNLV, we were able to tap into some CDC and Southern Nevada Health District funding. And so that has been providing funding for our project over the last few months. And so that's helped out quite a bit to try to justify what we've been doing here at the water authority. And so it's been a combination of internal funding and now external funding that has been able to to let us do this for so long now.

00:15:59 Anna

OK. And then what about beyond COVID? I know that obviously you've measured a lot of different things in water and wastewater, right? So you were already doing that. And I'm sure you'll continue to do that. But in terms of your wastewater surveillance program to inform public health action specifically, are there other targets that you're already thinking about besides SARS-CoV-2?

00:16:25 Dan

Sure. So a background in research has focused on portable use for a while now. So at UNLV and then back at Trussell Technologies doing a lot of work on the potable reuse side one of the main things we want to look at is what have we learned from SARS-CoV-2 that we can put into the potable reuse context? So we now know that there's a really strong correlation between infections in the community versus what we see with SARS-CoV-2 and wastewater. Theoretically, we should see the same thing with norovirus or adenovirus or enterovirus, Giardia, crypto. All these things and so is there a better way for us to understand what's going to be coming into wastewater treatment plants in a polar bear use system so that they can better respond to that, make sure that they're adequately protecting public health in that context. So that's one aspect. Here at the Water Authority, historically the R&D group has focused on trace organics, pharmaceuticals, endocrine disrupting compounds, now PFAS. And so another great thing about working here is that we can tap into that expertise as well. And so just recently, a few weeks ago, we expanded our COVID monitoring to include trace organics, illicit drugs metabolites so that we can understand those compounds and how those are changing over time

and in different parts of Las Vegas and so every two weeks going forward we're going to include that data now. To get an idea of how that varies across Southern Nevada.

00:17:51 Anna

Wow, that's great. So same samples, but obviously a very different method for those sorts of compounds, trace organics and pharmaceuticals, illicit drugs, that kind of thing.

00:18:02 Dan

Yep, and then completely different interpretations. So all the struggles that we went through with interpreting what SARS-CoV-2 was telling us, we're going to go through the same thing. But fortunately, there's a lot of literature out there that has been done throughout the world looking at, let's say, illicit drugs and metabolites, for example. So when we see the actual parent compound or let's say heroin or cocaine, that literature is gonna tell us. OK. You should also see these metabolites. And if you look at ratios, it's going to give you an idea where these things are coming from. Is it coming from a hospital, for example? Or is it coming from illicit use of those compounds? And so we'll be able to tease apart all that information over time. Once we develop this larger data set.

00:18:43 Anna

OK. And so those data will go out to the same same Tuesday afternoon e-mail recipients that are getting us the.

00:18:48 Dan

Yeah, but I'm sure there will be a few new recipients as well. Maybe some more emails. We'll figure it out. So it'll be a work in progress.

00:19:00 Anna

Well, I mean, it's just a huge amount of information for public health use. So listening to you talk, I would say that perhaps the one thing that really describes your program is adaptive. You really have adapted it and evolved it over time. Looking back on the last two years, what would you say, you know, has been one of your biggest challenges? That maybe would have been helpful to be able to anticipate way back in March 2020.

00:19:28 Dan

Uh oh. Bunch of different things, I would say so. So like I said, trace organics have been the the bread and butter of S&WA R&D group for a while. Research microbiology is brand new. So I started here to start up the research microbiology lab to build the lab. Essentially in June 2019. This is just a few months before COVID hits, so Katerina fortunately came over right around the same time that I did. So we're trying to start up this lab and COVID hits. We start this project. We had no idea it was going to be going on this this long, and so that has been a shock trying to do all the lab construction stuff. We didn't even have a qPCR instrument. We barely had an autoclave set up. Fortunately, we got that all in place right at the right time, but that's been a challenge is just to get the lab going, make sure we get. All this data for SARS-CoV-2 out to the right, people in as quick a time frame as possible. But I would also say that I might not have submitted so many other proposals during this time because now we have all these other responsibilities. For these, we'll call them normal research projects that are starting to pile up. And so it's just been a struggle to try to stay afloat during all this time with all these things going on simultaneously.

00:20:41 Anna

Yeah. So having sort of the breathing room to focus just on the SARS-CoV-2 would have been nice. But yeah, how could you have anticipated? So if folks want to learn more about your program, are there articles they should read? Is there someplace they can go online to find out more information?

00:21:01 Dan

Yeah, we've done a quite a few interviews now with the media, so look up Las Vegas, wastewater surveillance, sewage surveillance. You'll probably find a bunch of those. Fortunately, Ed has been doing a lot of those recently, so I haven't had to do quite as many. So media interviews have been one way of getting the word out. Here at SNWA and I'll say another great thing about working here is that we have a public relations group, public information officers that work with us. They put together a podcast. So we actually have two podcasts now. It's called Water Smarts podcast. So there's two on wastewater surveillance, a bunch of other ones on conservation and the water situation in Southern Nevada, a lot of interesting information out there. So that's another way. And then Ed has been hosting [empower.unlv.edu](http://empower.unlv.edu), his website where he posts the data updates at each week so that the public can go there and see what's changing in the wastewater and in the case data simultaneously.

00:22:00 Anna

OK, awesome. I will share all those links in the in the notes for this episode. And yeah, I'll say I'm absolutely a fan of the Water Smarts podcast, and I've listened to both of your episodes. So I give those a big thumbs up, yeah.

00:22:12 Dan

Thanks for the support.

00:22:15 Anna

All right, one more question for you, not water related, but Southern Nevada related. I think many of us have an image in our heads of Las Vegas as being just the strip that 4.2 mile long stretch of resort hotels and casinos. And I guess there's a Ferris wheel in there as well. I do realize there's so much more to Las Vegas than the strip, but I'm still curious if you were to take an out of town guest to the strip, where would you take them and why?

00:22:48 Dan

Oh, that's a good question. It well, it depends on the person. So everybody has their, their taste and whether they actually would want to be involved in all the, what I'll call the chaos on the strip. One of the best parts about Vegas is that you have that just down the road, it's 5 minutes away. You can you can be in the middle of all the lights, all the the fun activities going on, but there's also a lot of normal stuff too. So if you want to get involved in all the excitement, there's a lot of great shows. All the Cirque du Soleil shows, it's amazing the talents that we have in Vegas in that respect. But I would say what I didn't know, even when I moved to Vegas for the first time, was all the outdoor activities that are around. I'd say the most popular one is Red Rock. And so there's a lot of hiking up in the northwest part of town in the Red Rock area, there's Mount Charleston. It's a 12,000 foot peak that actually has a ski resort. Here, so even in Vegas you can go to the strip and the winter and then drive 45 minutes and be skiing. People don't know that. Then you have the Colorado River, so you can go fishing, you can go kayaking, you can go and just hike along the river. So there's all these outdoor activities that really nobody knows because everybody goes to the same place, which is perfectly fine lots of fun activities, but I would say venture off and try some of these other things as well.

00:24:11 Anna

Those are good words of wisdom. I'll look forward to visiting some of those places for sure. So there you have it. Your activities in Southern Nevada and water and wastewater, like I said, you'll be able to find links to the resources that Dan has mentioned in the notes to this episode. And I just want to say thank you so much, Dan, for talking with me today. I really appreciate you taking the time.

00:24:34 Dan

Thanks for having me and thanks for all the great work you're doing. Also to to get this ball rolling across the wastewater industry to make sure it keeps going.

00:24:40 Anna

Thank you.

Links to people, utilities, government agencies, and resources mentioned in the episode:

- [Katerina Papp](#), who is the other half of SNWA's wastewater surveillance team
- Wastewater agencies: [Boulder City](#), [Clark County Water Reclamation District](#), [City of Henderson](#), [City of North Las Vegas](#), [City of Las Vegas](#)
- [Associate Professor Edwin Oh](#) in the Medical School at the [University of Nevada Las Vegas](#)
- Public health collaborators: [Southern Nevada Health District](#) and [Nevada State Public Health Laboratory](#)
- News articles about SNWA's wastewater surveillance: [Wastewater testing could offer clues about COVID-19 infections](#), December 3, 2020; Las Vegas researchers: [Omicron variant takes command in Southern Nevada](#), January 4, 2022; [COVID-19 in the sewers: New dashboard unveiled for Southern Nevada](#), March 23, 2022
- [Water Smarts podcast](#) episodes on wastewater surveillance: [AH HA! How the pandemic led to new insights for wastewater surveillance](#) from April 26, 2022 and [Poops don't lie – tracking a pandemic using wastewater](#) from March 15, 2021
- The [Nevada Enabling the Management of Public health Outcomes through Wastewater Resources \(EMPOWER\) Program](#)