

***Haematospirillum jordaniae* Etymologia**

[Announcer] This program is presented by the Centers for Disease Control and Prevention.

[Sarah Gregory] Hello, I'm Sarah Gregory, and today I'm talking with Dr. John McQuiston, a lead in the Special Bacteriology Reference Laboratory at CDC in Atlanta. We'll be discussing the etymology of the bacterium *Haematospirillum jordaniae*.

Welcome, Dr. McQuiston.

[John McQuiston] Thank you. It's great to be here talking with you today.

[Sarah Gregory] Tell us what you do at CDC.

[John McQuiston] I always tell people I have a great job at CDC. I'm the Team Lead for the Special Bacteriology Reference Lab, which is the bacterial diagnostic and research lab for the weird and wild and wonderful species of bacteria that really nobody has ever heard of. We're the last stop in the path for when somebody is sick with a bacteria and nobody knows what's causing it, and we work on really odd diseases like *Elizabethkingia*, *Capnocytophaga*, *Streptobacillus*, and of course *Haematospirillum*. They can cause very serious illness and even death, and sometimes nobody has ever heard of these because they are so rare. But we need to have these diseases studied because together there's still quite a few people that get sick from these each year, and I'm sure for the person who's sick and their family members, not knowing what it is must be very scary.

So that's where our team comes in. We try to give it a name or figure out what it is so that doctors can treat them and hopefully prevent further cases. And I've been at CDC for 25 years. Actually, next week (June 1st) will be my 25th anniversary at CDC, and I previously worked on *Salmonella* for many years, and then I came over to SBRL in 2010 and have been here ever since. And we get to do the fun microbiology of the unknown and new species, but yet still somewhat dangerous bacteria.

[Sarah Gregory] Your laboratory is the original bacterial diagnostic lab for CDC and dates back to 1949, and the staff in it has named or helped name almost 400 species through the years. Give some history on that.

[John McQuiston] Yeah, SBRL started as the original bacterial diagnostic lab for CDC. It became the Special Bacteriology Reference Lab under Elizabeth King back in 1953, and we've had some of the world's leading experts working in here since the beginnings of CDC. And for over seven decades now, we've identified new diseases that many people now know as common ones, but at one point they were emerging diseases like Legionnaires or Lyme disease. They all came through here as unknowns, and our expert microbiologists were the first ones who worked on these and gave them a name, and specifically a taxonomic name, that described the organisms that all the scientists knew what they were talking about and all talking about the same thing.

When I came on board in 2010, I was privileged to work with scientists who had been working at CDC in the early days and really had a chance to learn from some of these people. And they are all gone now, and we're a new, younger team at SBRL, but we still carry on that tradition. And we use newer technologies now than they used to back in the test tube days, but we're still trying to reach the same point of identifying a disease and we still adhere to those traditional ways of naming them.

[Sarah Gregory] The EID journal has an occasional feature called Etymologia where a specific unusual pathogen is explained. So tell us about the April pathogen that we're talking about today.

[John McQuiston] Yeah. *Haematospirillum jordaniae*, it was an unknown bacteria until about 2014 when one of our lab staff noticed that we had three bacterial submissions from geographically-close state health departments, and they all came in all in the same month (in October) and they all had the same 16s DNA sequence match for identification. But they were all identified as unknowns and listed as unidentified species, and this is because there was no match in any of our databases that were used to search from.

So then our staff then went further into the DNA sequence databases and our freezers to look and see if there were any others in our historical collection in the freezers that matched this small cluster. And it turned out there were 14 other ones that had been listed as unidentified over the previous 10 years or so, and they all matched each other but they were all listed as unidentified species. And this was because we get thousands of submissions in the CDC, and so it really wouldn't be picked up if we had one per year or so. And so, it really was an unusual pathogen that just showed up and just somebody...one of our microbiologists was alert and picked up on that these matched and then we named it from there.

[Sarah Gregory] And why is this an interesting pathogen after you've named it?

[John McQuiston] What was interesting about it was when our staff looked back at the data from the cases, every one of the infections were blood infections in men, all of them were over 45 years old and where reported, all were associated with injuries or exposure to water sports in some way like boating or fishing or tubing, or two cases where they were digging for freshwater mollusks.

But these were also men who had done a lot of outdoor activities like hiking and hunting and walking through wooded areas, so we really weren't sure where it was coming from. Most of them were in the eastern and central states in somewhat rural areas. So at the time, we really often had no idea where this was coming out of. But we did know that almost every one of these infections were being reported in the late summer and early fall, and they were all blood infections of small spiral bacteria, and the closest match was a bacteria called *Novospirillum* (which wasn't too close), and that was found in mosquito larvae in water.

Now, just in the last couple of years, we've received specimens from one state in which four people were identified at different times and injured in a river in close proximity and we were able to detect this species in the water. And from that site, with the help of the state health department, we were able to identify that the source is probably water. But to us it was very interesting because it happened in a very small group, and they all had very similar outdoor activities and trying to link these activities together to find the source of this was a very interesting study.

[Sarah Gregory] Let's go back to naming species. I know that it's a challenging task to say the least, and there's a lot of controversy and strong opinions. Tell us how that goes.

[John McQuiston] So contrary to what people think, you can't just name a species...well, with some exceptions, you can't name a species whatever you want. It's really not accepted to name a new bacteria after your dog, for example, or your child or something like that. Most of the time, a new species is either named for somebody very prominent in the field of study for bacteria, for

example, we named one species with the help of the Cleveland Clinic called *Lawsonella clevelandensis* which was named for Dr. Paul Lawson (who's at the University of Oklahoma) and where it was found, in Cleveland, Ohio by our colleague Dr. Susan Harrington, and together that...we put together the name *Lawsonella clevelandensis*. Or sometimes they are named for a characteristic or set of characteristics of the bacteria to describe its uniqueness like *Capnocytophaga canimorsus*. *Capnocytophaga canimorsus* is a very serious disease and it can come from a dog bite. *Capnocytophaga* means that it's carbon dioxide-requiring that 'glides' on the surface of agar media (that's where that name comes from). And the *canimorsus* translates into 'dog bite'. So it's a gliding carbon dioxide-requiring bacteria that you can get from a dog bite. And so, that's how taxonomic names usually come about. So it can be really challenging for some of these rarer species, especially when we don't know where they are coming from, and scientists would love to name a new species but sometimes finding a name that really fits can be problematic.

Now, we've named hundreds of species since our inception in 1953 with many of them that you recognize today like *Legionella* or *Borrellia* that are causative agents of Legionnaires or Lyme diseases. But they were unknowns at one point, and we helped many decades ago to name those species. But taxonomists take naming a new species very seriously, and sometimes they can get in some pretty heated debates about whether it should be an '-iae' or different naming trends, whether it's a feminine word versus a masculine word, and really it gets really interesting in some of the discussions. And *Haematospirillum* was no different. But if you want to name something, you want it to be something that fits the characteristics of the disease because it may become big at some point, and you really want it to be recognizable.

[Sarah Gregory] Well, speaking of this controversy, there apparently was some about why this pathogen was named after Jean Jordan. Tell us about that and about her and her 54-year career at CDC.

[John McQuiston] Yeah, well *Haematospirillum jordaniae* was no different with the challenging ways of naming it, and we went back and forth with some taxonomy experts in the global community to make sure we got it right. First, we felt that *Haematospirillum* itself described the bacteria—it was a small spiral bacteria, which is the 'spirillum' part—and we got that from blood; all the 45 year-old males (14 of them) were all blood infections. So that's where the name *Haematospirillum* comes from. It's a good description of the bacteria as a whole. And then we wanted to recognize one of our most loved and honored microbiologists who worked with CDC and SBRL for more than 50 years, Jean Jordan. And Jeannie, how most of us referred to her, was one of three little old ladies that worked in, and they knew more about microbiology than probably anybody I've ever known, and Jeannie was in the door early every morning and she was very passionate about all her microbiology work in the lab. She knew everyone and she was a very happy, fun person to work with. But she was brilliant and really was very dedicated and worked at CDC for 52 years and two years at the VA. And I was really lucky to have had the chance to work with her and supervise the lab with her and June Brown and Dannie Hollis. The three of them were just amazing, probably the three greatest microbiologists who ever worked together. Sadly, Jeannie passed away in 2014 at the age of 84 and was still working full-time at that age and absolutely loving her work. And June and Dannie worked into their 80's as well, all three of them providing insights and knowledge beyond any class in college you could ever hope to learn from.

Now, Jean never really wanted recognition for her work and really didn't care to be on publications, although she is on a few. And she was a coauthor with a bunch of other scientists for the Manual for Identification of Unusual Pathogenic Gram-Negative Bacteria, which is known as the “the Orange Book” in public health microbiology, and maybe some of your listeners would know about this Orange Book. She literally wrote the book on rare bacteria.

With *Haematospirillum jordaniae*, we really wanted to recognize Jeannie’s love for the rare and unusual and unexplained bacterial species that she had worked on for so many years and her passion and following all the paths and leads so that she could finally figure out what it was. And she would get so excited about these new and interesting bacteria.

The controversy came when the taxonomists didn't know who she was, and that they searched the literature and they were like, "Who is this person? Why was this species named after her?". But they really didn't know that she was the expert behind the scenes that really did so much for our knowledge of microbiology. And her work spanning 52 years at CDC and two years at the VA hospital before that led to so many discoveries in microbiology, and so many people really never knew that. So we felt that it was very appropriate to name this bacteria after her.

[Sarah Gregory] Was it named after she was no longer with us?

[John McQuiston] Yes, it was. It was named in 2016, a couple years after she passed away.

[Sarah Gregory] Well, speaking of women, your wife also works at CDC and has done some truly amazing things here. What's it like to both be working at CDC?

[John McQuiston] Well, it's interesting. It's fun to see each other and nice to be working together sometimes, but we don't get to work as much together as we used to. We're both in leadership roles now and are very busy, and she's extremely busy as the Deputy Division Director for the Division of High Consequence Pathogens. So I don't get to eat lunch with her very often. But back in the days when we started at CDC, we used to have lunch in building 16 cafeteria just about every day, and we got to see each other a lot more. In fact, one time some of the women in Jen's branch at one time came up to her, they thought we were having an affair because we were meeting off in the corner of the cafeteria eating together every day, and she's like, "No, that's just my husband", and laughed about that.

I'm proud of all that she's done for CDC. She's had an amazing career with everything from Ebola to mpox outbreaks and COVID and polio. She was one of the first teams into New York on September 11th. She's really done an amazing amount of work for CDC over 25 years. And it has been an interesting time to be at CDC during these years and to see all the changes that have gone on at the agency and growing up with it, it's the way we feel about it.

[Sarah Gregory] I've been here 27 years myself, so I have seen a lot. Jennifer's a vet, right? Her background is veterinary, isn't it?

[John McQuiston] Yes. So she's a veterinary epidemiologist. She has a Doctor of Veterinary Medicine, and we came here right after we got married...actually, the week after we got married, we came to Atlanta and she started in the EIS program (the Epidemic Intelligence Service), and I started with the *Salmonella* lab. And she really studied diseases that transfer from animals to humans for most of her career—rabies, a lot of those types of diseases. So she uses her veterinary medicine in a different way than most people think (her knowledge of veterinary medicine).

[Sarah Gregory] It's wonderful that you both got to start jobs at CDC the same time. That's quite incredible. Good fortune for you and for the nation.

[John McQuiston] Well, thank you.

[Sarah Gregory] And thank you, Dr. McQuiston, for taking the time to talk with me today.

[John McQuiston] Well, thank you so much for having me and giving me the opportunity to share some of what we do in SPRL. It has been a great place to work, and some great people over the years. And I really appreciate the opportunity to let people know about Jeannie and why it was so important that this species was named for her and who she was. She was a very important person to all of us here, and just wanted to recognize all of her years of work.

[Sarah Gregory] Well, we are very interested to know about her. I've got to say that I had heard about her, but I didn't really know all that you just told me.

And thanks for joining me out there. You can read the April 2023 Etymologia, *Haematospirillum jordaniae*, online at cdc.gov/eid.

I'm Sarah Gregory for *Emerging Infectious Diseases*.

[Announcer] For the most accurate health information, visit cdc.gov or call 1-800-CDC-INFO.