[00:00:07.040] - EH Nexus Host
Hello everyone. Thank you for joining today's episode of the Centers for Disease, Control and Prevention's Environmental Health Nexus podcast, where we talk about environmental health topics. We are joined today by Dr. Michael Yeh, a medical toxicology physician in the Emergency Management Radiation and Chemical Branch within the CDC's National Center for Environmental Health. He is also a Lieutenant Commander in the United States Public Health Service Commission Corps. During this episode, we will discuss what medical toxicology is and CDC's role in it.

[00:00:42.890] - Dr. Michael Yeh
Thank you. I'm honored to have the opportunity to speak with you.

[00:00:46.680] - EH Nexus Host
Dr. Yeh, what is medical toxicology?

[00:00:50.540] - Dr. Michael Yeh
Toxicology is a branch of science that studies adverse effects of chemical substances on living organisms. Medical toxicology is a field of medicine dedicated to the evaluation and treatment of patients who have been poisoned. So a poison is any substance that is harmful to people and other living organisms. These can include chemicals made by humans or substances that are found in nature. For example, you can be poisoned if you are bitten by a venomous animal like a snake or a spider or stung by a s scorpion or a jellyfish. This is called envenomation. Now, medical toxicology physicians are doctors who take care of people who have health problems after being exposed to many types of substances. Sometimes, for example, people take too much medication or other drugs that lead to an overdose. We also see patients with substance use disorders, such as problems with opioids like heroin and fentanyl. Occasionally, people go foraging for wild plants and mushrooms to eat, but end up picking and cooking up a poisonous lookalike instead. So in those cases, medical toxicologists may then have to figure out what they actually picked and then how to treat them. We also take care of people who may have been exposed to chemicals in household products, environmental contamination, or in the workplace.

[00:02:18.210] - Dr. Michael Yeh
Medical toxicology is an area where the practice of medicine intersects with public health. Here at CDC, our work focuses more on environmental exposures, such as carbon monoxide, or lead, or other harmful substances in our air, water, and food.

[00:02:35.710] - EH Nexus Host
Okay, then what's the difference between medical toxicology and clinical toxicology?

[00:02:41.490] - Dr. Michael Yeh
Yes, that's a great question. Clinical toxicology is the overall discipline that is dedicated to the prevention of poisoning injury caused by chemicals, drugs, and toxins. Clinical toxicology includes a much broader group of professionals and not just physicians. Think of it as a big umbrella that covers more people with a wide range of expertise. Medical toxicologists make up a subset of clinical toxicologists who have a medical degree and are licensed to treat patients. Many clinical toxicologists are pharmacists, that is doctors of pharmacy with a PharmD degree. Within the clinical toxicology community, we also have some research toxicologists who work on basic science in the lab. There are also industrial hygienists, analytical chemists, nurses, and veterinarians as well. There are also the folks we lovingly call "Spis", S-P-I-S, which stands for Specialists in Poison Information. They answer phone calls at poison centers and provide guidance about clinical management of substance exposures. Most spies have a background in a healthcare profession like pharmacy or nursing, along with advanced training and toxicology. They often have to make quick decisions and give accurate information while staying calm and collected on the phone to help people who may be very sick or scared.

[00:04:12.350] - Dr. Michael Yeh
Medical and clinical toxicologists often work very closely together to prevent poisonings and to develop safe and effective treatments for humans and animals.

[00:04:23.420] - EH Nexus Host
In broad terms, what are the typical responsibilities and roles of medical toxicologists?

[00:04:29.060] - Dr. Michael Yeh
Medical toxicology is a small but very important specialty. The American College of Medical Toxicology, which is our professional organization, estimates there are about 500 actively practicing medical toxicology physicians in the U.S. But these days we are seeing an increasing need for our clinical expertise. We work in a wide variety of practice settings. For example, we provide direct patient care and consultation in emergency departments, intensive care units, and other hospital settings. There's actually published literature to suggest that hospitalized poison patients who are seen by a medical toxicology consultant, are more likely to survive and get discharged from the hospital more quickly. We also work in outpatient clinics to treat patients with substance use disorders, and occupational chemical exposures, as well as addressing other environmental health concerns. Many medical toxicology physicians are heavily involved with teaching medical students, residents, and other trainees in academic settings as well.

[00:05:44.900] - EH Nexus Host
Whenever I hear about poisoning and toxic substances, I always think about poison centers. What's their connection with medical toxicology?

[00:05:53.830] - Dr. Michael Yeh
Many medical toxicologists and clinical toxicologists work in poison centers. There are 55 poison centers across the country that provide expert advice about managing poisonings 24 hours a day, seven days a week, and 365 days a year. Anybody can call the National Poison Help Hotline and get assistance at no cost any time. The number to remember is 1-800-222-1222. I'd also mentioned that poison centers can help answer questions about a wide range of topics. So traditionally, we think of calling the Poison Center when a child gets exposed to a household chemical, or if someone has an adverse effect from a medicine.

[00:06:40.180] - EH Nexus Host
Sure. I think we were all taught that when we were kids.

[00:06:44.290] - Dr. Michael Yeh
Yes, but a lot of people might not realize that poison centers can offer guidance on all sorts of other exposures, including environmental health issues. We actually encourage people to call the Poison Center Hotline if they are exposed to things like wildfire smoke, or if they have concerns about chemicals in the workplace, or pollution in their communities. Many poison centers work very closely with local and state health departments. So even if they cannot provide an immediate answer to a question, they will make sure that there is appropriate follow-up.

[00:07:21.250] - EH Nexus Host
Also, there are medical toxicology physicians like yourself here at CDC and government in general.

[00:07:28.950] - Dr. Michael Yeh
Yes, that's right. There are quite a few of us actually who work in various federal, state, and local government agencies. Besides those of us here at CDC, we have colleagues in other federal agencies such as the FDA, the Food and Drug Administration, who work to ensure that our medications, food, and medical devices are safe and effective. Some medical toxicology physicians work to make sure our nation is prepared to respond to chemical, biological, radiological, and nuclear threats with appropriate medical countermeasures. They may work in agencies such as the Biomedical Advanced Research and Development Authority, otherwise known as BARDA, the Administration for Strategic Preparedness and Response, or ASPR, and the Department of Defense. Then besides federal agencies, there are medical toxicologists who work in state and local health departments as well, where they provide subject matter expertise on a variety of topics. Besides government, let's not forget about private industry too. Some medical toxicologists work in local pharmaceutical companies and other businesses in the biomedical or agricultural sectors. There they may contribute

to product development from the initial research and development through the regulatory process and post-market stewardship to ensure that products on the market are safe.

[00:09:03.090] - EH Nexus Host
Wow. It's interesting that medical toxicologists can work on so many different topics and in all these different settings. Can you talk a bit more about the connection between your specialty and environmental health?

[00:09:17.080] - Dr. Michael Yeh
Medical toxicology physicians play a key role in managing adverse health effects of environmental and workplace exposures. This work can be very challenging, especially when you're dealing with chronic, low-level exposures to environmental contaminants where it's difficult to prove causality. In other words, it's often very hard for us to say whether being exposed to a certain substance is truly to blame for an individual's health problems. Very often, we're faced with significant health equity challenges as well. We know that certain communities are more vulnerable and more severely affected by environmental problems. We need to be mindful of issues like environmental racism with situations where environmental hazards have a disproportionate impact on people of color. We also know that people living in lower-income communities are often more likely to be impacted. When people are worried about chemical exposures where they live, it's not all about the chemistry or biological effects of a certain substance to truly address environmental justice. We actually need to recognize that environmental issues are tied not only to health, but also complex intergenerational economic problems, and social inequality. So in these situations, it's often difficult to provide clear and concise risk communication. This is one area where the expertise of medical toxicology physicians really makes a difference.

[00:10:55.050] - EH Nexus Host
Can you explain what you mean by risk communication?

[00:10:59.460] - Dr. Michael Yeh
Sure, I'll give you an example. People are often concerned about whether an exposure to a particular chemical might cause them to develop certain health problems. So someone might come up to us and say, I was exposed to Chemical X. What does that mean for my future risk of developing health problems like cancer, or how will this chemical affect my kids? As medical toxicologists, we're trained to take detailed exposure histories by interviewing the patient to identify any possible chemical exposures they may have encountered. We ask patients lots of very detailed questions like what they do for work and whether they might encounter any chemicals on the job. We ask about products they might use, everything from personal care products and dietary supplements to pesticides. We also consider the home environment itself, such as where their water supply comes from, whether it's well water or municipal water supply. When their house was built, for example, we know some of the houses built before the 1970s may have lead paint. Whether there are any nearby industries in their neighborhood, any hobbies they have, and many, many other potential exposures. We also have to keep all this information in perspective by considering the extent and intensity of exposures.

[00:12:29.140] - Dr. Michael Yeh
For example, how was the patient exposed to chemicals or absorbed it through the skin? We need to find out how much of the chemicals did they encounter and how long they were exposed to it. And also we need to consider if they have any underlying health problems. For example, someone who has chronic kidney disease or, say, pre-existing liver or lung problems might be more likely to get sick from a chemical exposure than a healthy person. There may be other factors like family history and habits like smoking, and drinking alcohol that might affect a person's risk. We perform comprehensive physical exams, paying attention to subtle findings that might provide clues about the chemical exposures. Based on the history and physical exam, we may also consider ordering lab tests or imaging as needed. There may be thousands of chemicals that people are exposed to in many ways that we are continuing to learn more about. We comb through scientific and medical literature to review and interpret results of research studies, and then apply that knowledge to address individual health concerns. As we learn more, we can advocate for measures that can reduce harmful exposures. We can also help to reassure folks and contribute to defining exposure limits to protect

people's health.

[00:13:55.560] - EH Nexus Host
I'm glad to hear that medical toxicology doctors are so detail-oriented and take the time to listen to patients and evaluate them thoroughly. What about those of you who work here at CDC? What are your roles and responsibilities within the agency?

[00:14:12.690] - Dr. Michael Yeh
Sure, there are quite a few medical toxicologists working here at CDC. So I, for example, work in the National Center for Environmental Health, or NCEH. One thing we do on my team is public health surveillance, using poison center data in collaboration with America's poison centers.

[00:14:31.280] - EH Nexus Host
What exactly do you mean by surveillance?

[00:14:33.480] - Dr. Michael Yeh
So when we talk about the term surveillance, what we mean is a continuous, systematic process of collecting, analyzing, and interpreting health-related data for the purpose of public health practice. We use something called the National Poison Data System, or NPDS, which contains data from all 55 poison centers across the U.S. that's updated in near real time. We pay attention to these poison center calls to identify any anomalies that might indicate a possible event of public health significance. In other words, we want to identify situations in which more people might be at risk of a harmful chemical exposure.

[00:15:18.660] - EH Nexus Host
Can you give an example when this surveillance system made a difference in public health?

[00:15:25.050] - Dr. Michael Yeh
Sure. So remember how many of us were constantly slattering ourselves with hand sanitizer and disinfecting things around us to prevent COVID-19? It turned out that there were some hand sanitizer products that contained methanol and had to be recalled. Methanol is the toxic so-called wood alcohol, that can poison people who misuse or abuse it by taking it internally. When this happened, we used NPDS to keep track of exposures to methanol containing hand sanitizers. This allowed us to craft guidance to inform healthcare providers and the public about these recalled products. There are some specific topics that we always pay very close attention to. During hurricane season every year, we look for carbon monoxide exposures that can happen when people use gas power generators when the power goes out. NPDS is also set up to detect potential biological or chemical threats, like suspected cases of anthrax and botulinism.

[00:16:33.260] - EH Nexus Host
That certainly sounds like an important responsibility. Besides surveillance, what else do medical toxicology physicians do at CDC?

[00:16:43.670] - Dr. Michael Yeh
Medical toxicologists are often involved with investigating outbreaks of illness that may be caused by toxic substances, both here in the U.S. And around the world. We work closely with epidemiologists, other clinicians, as well as other experts to do the disease detective work in the field to figure out what might be making people sick. We've investigated mass poisoning incidents in many countries around the world with international partners. In recent years, here in the U.S., we have been involved with investigating lung injury associated with the use of e-cigarettes and vaping products, as well as various flu-borne outbreaks. And even if we don't go out into the field ourselves, we often provide technical assistance from headquarters here in Atlanta to other people doing outbreak investigations around the world. Emergency preparedness is another area in which medical toxicologists play important roles. We help to make sure that the CDC and other government agencies are prepared to respond to many types of disasters. These can include natural disasters like hurricanes, earthquakes, and wildfires. Other disasters can be caused by human activity, such as incidents where chemicals or radioactive materials get spilled into the environment. Sometimes we even need to test ourselves to

make sure we're ready to act quickly and also to identify areas where we need to improve.

[00:18:17.750] - Dr. Michael Yeh
Last year, CDC participated in a national exercise to test how well the federal government can respond to radiological dispersal device explosion. This is sometimes called a dirty bomb because it has a conventional explosive that spews out radioactive material over a large area. The exercise actually involved many federal agencies and lots of people working in different areas. As medical toxicologists, we had to provide guidance on how to assess injured patients, on decontamination strategies, and proper use of certain medical countermeasures, like medicines to treat people who are wounded and sick.

[00:19:03.260] - EH Nexus Host
Can you do any testing to look for chemicals that might be making people sick?

[00:19:09.050] - Dr. Michael Yeh
That's a great question. It's one that people often ask us here at CDC. There is the Division of Laboratory Sciences, which is also within the National Center for Environmental Health. We have highly experienced and astute medical toxicology physicians working there, who are experts in lab methods to diagnose disease and test for exposure to harmful chemicals. Lab testing can be very complex with many issues to consider. There's no single test for a machine that can screen for everything. I mean, there are literally thousands of toxic substances out there that can cause illness, and each agent requires a specific validated method for detection and confirmation. You'd also have to think about the sample itself, such as what to collect. Should we take blood, urine, or water, or soil from the environment? We have to think about how it should be collected, like the type of container to use, how to store it, and for how long we can store it. Then after you get test results, the interpretation can be very challenging. Usually, we're not dealing with just the simple positive or negative result, but we need to consider many factors like the limit of detection or the toxic threshold, which is the level that is concerning for causing adverse human health effects.

[00:20:33.990] - Dr. Michael Yeh
What I'm saying here is an oversimplification, of course, but the point is the hardest part of communicating toxicological outbreak findings is interpreting and communicating the lab data correctly. My colleagues in the Division of Laboratory Sciences have the expertise needed to do this well. We have other colleagues who work at the Agency for Toxic Substances and Disease Registry, or ATSDR. This agency works to protect communities from harmful health effects related to exposure to natural and man-made hazardous substances. Our medical toxicologists there also respond to environmental health emergencies through community health assessments and health consultations. They help develop and provide actionable guidance to public health professionals as well as education to healthcare providers.

[00:21:30.340] - EH Nexus Host
What about drugs of abuse?

[00:21:34.410] - Dr. Michael Yeh
Yes, that's another topic that is a huge public health priority. We have medical toxicologists in the National Center for Injury Control and Prevention, specifically working in the Division of Overdose Prevention. Unfortunately, the number of opioid overdoses has risen a lot over the past two decades, yet these are preventable illnesses and deaths. And it is not just opioids or the old, familiar drugs of abuse like cocaine, amphetamines, PCP, or marijuana. Now we're seeing new substances such as synthetic cannabinoids, which are man-made chemicals that have effects like marijuana. We have cathinones or so-called bath salts, as well as Xylazine, commonly called "tranq" or "tranq dope" that are causing illness. This is an area that will need a lot more research, education, and public health interventions. Medical toxicologists are a big part of that effort.

[00:22:35.830] - EH Nexus Host
Do medical toxicologists at CDC engage in collaborations with other organizations?

[00:22:41.240] - Dr. Michael Yeh
We work very closely with other centers within CDC as well as external partners. For example, when we do outbreak investigations, they're always a team effort. We work with state and local health departments, as well as other federal agencies like the FDA or EPA. For international outbreaks, we may work with health ministries in other countries. For our surveillance using National Poison Data System, we work with other medical and clinical toxicologists around the country through America's poison centers. When we find an anomaly that might indicate an incident of public health significance, we then notify state health departments and work with them to take further action if needed. We also collaborate with other professional organizations, such as the American College of Medical Toxicology and the American Academy of Clinical Toxicology. But we also work with clinicians and scientists in other disciplines as well, both in academia and other professional organizations. Another good example of collaboration with environmental health specialists is ATSDR's program called the Pediatric Environmental Health Specialty Units, or PEHSUs. This is a national network of experts in prevention, diagnosis, management, and treatment of health issues in children that arise from environmental exposures from preconception through adolescence.

[00:24:19.290] - Dr. Michael Yeh
In some cases, medical toxicology also collaborate with community organizations and people who are concerned about environmental exposures, where they live or work. We are always happy to connect with other groups to protect people's health.

[00:24:34.650] - EH Nexus Host
Overall, this sounds like a very fascinating career. If a student wants to embark on a career in medical toxicology, what steps should they take? I mean, how exactly does someone become a medical toxicologist?

[00:24:50.230] - Dr. Michael Yeh
Well, it certainly is an exciting journey. First, one would need to become a licensed physician. Here in the U.S., the process of medical education starts with getting an undergraduate college degree first, followed by four years of medical school. After that, doctors who want to train in medical toxicology will first need to complete residency training in a primary specialty. So these would include specialties like emergency medicine, pediatrics, internal medicine, family medicine, preventive medicine, or another discipline. Medical toxicology fellowship training requires completion of an additional two-year fellowship program after finishing residency. Currently in 2023, there are 30 medical toxicology fellowship programs across the United States. In fact, we also have a med tox fellowship right here at CDC in conjunction with Emory University.

[00:25:50.680] - EH Nexus Host
What distinguishes the Emory CDC medical toxicology fellowship from others?

[00:25:57.310] - Dr. Michael Yeh
The medical toxicology fellowship program here is unique, because we are the only one in the country with a specific emphasis on public health practice. It was founded in 2000 as a joint program between Emory University and CDC. We accept three fellows per year, so we always have six fellows at any given time. Our program is accredited by the Accreditation Council for Graduate Medical Education, or ACGME. This is the nonprofit, private organization that evaluates and accredits medical residency and fellowship programs across the U.S. Our first year fellows spend most of their time training at Emory, focusing on clinical medicine, and then when they get to the second year, they work on public health projects at CDC four days a week.

[00:26:52.180] - EH Nexus Host
What is the clinical training like? It seems unusual among our CDC fellowships that your program has such a heavy emphasis on providing direct patient care.

[00:27:03.890] - Dr. Michael Yeh
Sure. Well, remember, first and foremost, they are training to become medical subspecialists. Most of their education naturally focuses on taking care of patients, including critically ill individuals with

potentially life-threatening acute problems. Our med tox fellows are actually very busy. The program is a bit complex with many moving parts. For our first year fellows, a typical day starts around 6:00 AM when one designated fellow sends out a list of patients who need to be seen and assigns poison center follow-up cases. We then have a morning report conference at 8:00 AM, where we all get together to discuss interesting poison center cases and bedside consults from the previous day. After that, then the fellows go on to round on patients at bedside at our five affiliated hospitals, which include Grady Memorial Hospital, Children's Hospital of Atlanta at Eggleston and Hughes-Spalding, and Emory University Hospital. Now, to be clear, they might not necessarily have patients to see at all of the hospitals every single day, but basically, they have to be ready to see any consults that come in. After finishing hospital rounds, they go to work at the Georgia Poison Center in downtown Atlanta, where they provide guidance regarding medical management and follow up on any active cases that were called in.

[00:28:35.560] - Dr. Michael Yeh
Our fellows also work in two outpatient clinics, where they see patients with substance use disorders, as well as individuals concerned about occupational or environmental chemical exposures. They also take turns being on call for the poison center, which lasts 24 hours on weekdays or 48 hours on weekends. Then on top of all that, our fellows also have dedicated didactic lectures to learn core topics as well as their own academic research projects and other scholarly activities. And so all of that that I've mentioned is just on the Emory side. That's just one half of the program.

[00:29:16.930] - EH Nexus Host
That sounds really intense. What about the other half, the CDC part of the fellowship experience?

[00:29:25.770] - Dr. Michael Yeh
Here at CDC, each fellow is assigned to one of three duty stations. These are the National Center for Environmental Health, or NCEH, the National Center for Injury Prevention and Control, NCIPC, and the Agency for Toxic Substances and Disease Registry, or ATSDR. Our fellows get to work on a wide variety of public health projects, depending on their duty station. One unique aspect of our program is the potential opportunity to get involved in outbreak investigations. Over the years, our fellows have been deployed around the world, as well as here in the U.S., to work as disease detectives on the ground figuring out what is making people sick. We've had some notable international deployments. For example, one fellow went to Mozambique several years ago to investigate a mass poisoning associated with a traditional fermented beverage called Pombe, made of corn. Actually, the story behind this one is really fascinating. This was back in 2015, and 75 people died, and 230 people got really sick at a funeral where this beverage was consumed. And a lot of rumors started spreading with people speculating that it might have been an intentional poisoning with substances like crocodile bile or some plant toxin.

[00:30:50.880] - Dr. Michael Yeh
And early on, a lot of news outlets just ran with that headline. Although it didn't make any biological sense that people would be poisoned by bile from a crocodile's gallbladder. So CDC sent out a team to Mozambique to help with the investigation. And it turned out that the culprit was bacterial contamination. The corn that was used to make the Pombe, the beverage, had gotten wet in a flood, and this allowed a certain type of bacteria to grow. This bacteria was called Burkholderia gladioli pathovar cocovenerans. And these bacteria created a toxin called bongkrekic acid, which turned out to be the cause of this mass poisoning. Other notable international deployments involving our fellows include an outbreak of low blood sugar among young children in India who ate lychee fruit. Our fellows have also investigated topics like pesticide poisoning in Bangladesh and ackee fruit poisoning in Haiti. Domestically, our fellows were deployed to multiple states to work on topics like e-cigarette or vaping, use-associated lung injury in 2019. They have also gone on field deployments for drug-related outbreaks in many states where they addressed issues with synthetic cannabinoids and fentanyl in the illicit heroin supply.

[00:32:17.300] - Dr. Michael Yeh
More recently, fellows investigated topics like acute liver injury, linked to an alkaline water product in Nevada, and they also provided technical assistance for several other foodborne outbreaks. Of

course, we can guarantee that fellows will get to go on a field deployment during their training. It really depends on what's happening around the world at that time. However, if an opportunity does arise, we try our best to get our fellows involved.

[00:32:47.030] - EH Nexus Host
It's sad that these large outbreaks happen, but it's good to know that we have experts who can respond to them to prevent more people from getting sick. What else do the fellows do?

[00:32:58.600] - Dr. Michael Yeh
The fellows are assigned to the National Center for Injury Prevention and Control work in the Division of Overdose Prevention. There, they serve as subject matter experts on topics such as opioids, stimulants, and polysubstance use. They also contribute to epidemiologic studies and research in that division. At ATSDR, fellows there work on topics related to the adverse health effects of environmental exposures. We rely on the fellows to translate complex technical information into clinically relevant educational materials for primary care providers. They also help teach residents in the Morehouse School of Medicine Public Health and Preventive Medicine residency program on a variety of toxicology topics. Occasionally, they may get the chance to deploy with ATSDR staff for field responses. For example, last year, our fellows traveled to Hawaii, where ATSDR led an assessment of community exposure, otherwise known as ACE. And while they were there, they investigated the health effects of well water contaminated with petroleum products on people living on a military installation.

[00:34:13.180] - EH Nexus Host
Is there a particular type of fellowship applicant that you're looking for? What traits would make someone likely to succeed in the program? And do you have any advice for applicants?

[00:34:24.570] - Dr. Michael Yeh
I often like to say that we, as medical toxicologists, are a nerdy bunch. We're all huge nerds here. We really enjoy meeting candidates who demonstrate intellectual curiosity and a genuine enthusiasm for this esoteric specialty. We like applicants who love to learn about diverse topics, everything from adverse drug effects to substance use disorders to venemous critters like snakes and scorpions, poisonousous plants, industrial chemicals, and environmental pollutants. Most importantly, though, fellowship candidates need to be good physicians with a solid foundation of medical knowledge in their primary specialty. They need to display emotional intelligence, which includes the ability to remain calm under pressure, and they need to have strong problem-solving skills. Fellows must be comfortable taking care of critically ill patients in settings like the emergency department and intensive care unit. Overall, we want people who are responsible and dependable, people who hold themselves to high ethical and professional standards. We want colleagues who are genuinely caring individuals that we can trust to always do the right thing for our patients. Since our Emory and CDC fellowship is a bit unique, we are especially interested in recruiting physicians who are equally passionate about clinical medicine and public health practice.

[00:35:57.680] - EH Nexus Host
Can any physician apply? It seems like many of you here at CDC are emergency room doctors.

[00:36:06.400] - Dr. Michael Yeh
Most applicants to med tox fellowships in recent years come from a background in emergency medicine, but many programs, including ours, welcome applicants who train in other primary specialties. So these include pediatric, internal medicine, family medicine, and preventative medicine, among others. We're actually really lucky this year to have recruited a first year fellow who is a psychiatrist. I believe that having more primary specialty diversity among physicians coming into fellowship training can make our medical toxicology specialty stronger.

[00:36:44.330] - EH Nexus Host
What can a potential applicant do to get more experience or explore their interests to see if medical toxicology is the right career choice for them?

[00:36:53.520] - Dr. Michael Yeh
One of the best ways is to do an away rotation at an institution that has a medical toxicology service, whether it's through a poison center or an academic medical institution. Many places that offer med tox fellowships also welcome visiting residents and medical students to spend time with them. The American College of Medical Toxicology has an online directory of clerkships and fellowship programs, along with other helpful resources for students and residents on their website, acm.net. Through these visiting rotations, someone who discovers a passion for medical toxicology might be able to take it a step further by getting involved in scholarly activities such as participating in research projects, writing case reports, or teaching. However, when we're evaluating applicants here, we don't simply pick the people with the most toxicology activities listed on their resumes. Since med tox is a small specialty, we do recognize that not every resident has the same opportunities to get a lot of experience during their medical training. A resident who is training at a large academic medical center that has its own toxicology service might have more opportunity than someone who is training in a smaller community-based program. Sometimes, residents decide early on that they want to go into medical toxicology while others discover their interests later, or even after finishing residency.

[00:38:31.540] - Dr. Michael Yeh
And that's perfectly fine. Actually, I was in that latter category. I had been several years out of residency practicing emergency medicine in community hospitals before I was bitten by the tox bug and ultimately decided to go back for fellowship training. So we're careful to evaluate each candidate holistically, focusing on their enthusiasm and love for this specialty and not just how impressive they might look on paper. In general, I would encourage residents to pursue any opportunities to have well-rounded clinical training through their rotations. For example, preventative medicine residents typically start by doing an intern or transitional year, and then after that, their training emphasizes public health practice with fewer opportunities to continue providing direct patient care in hospital settings, especially in critical care units. Now, in contrast to that, emergency or internal medicine residents typically do five or six ICU rotations during their training. But the flip side is they might not have much exposure to public health. So therefore, for the preventive medicine residents, I'd say it may be helpful to seek out more inpatient and ICU experience if possible to build up their confidence going into a toxicology fellowship.

[00:39:57.400] - EH Nexus Host
That sounds like good advice. Anything else that you'd like to share about the fellowship?

[00:40:04.380] - Dr. Michael Yeh
I guess I'll close by saying that the Emory and CDC program is a fantastic place to train. Fellows get to see the entire spectrum of medical toxicology practice while they're here, from managing acute poisonings and inventamations to addiction medicine. They get to do poison center work and manage occupational exposures, radiation. We have international tox collaborations as well as the public health practice here at CDC. The Georgia Poison Center is an extremely busy center. They're always managing a lot of interesting and often unusual exposures. Because our fellows get to experience a bit of everything within the realm of medical toxicology, our graduates are well equipped to pursue careers in a wide variety of settings, including academic medicine, clinical practice, government, public health, and industry.

[00:41:03.580] - EH Nexus Host
Thank you, Dr. Michael Yeh, medical toxicology physician in the Emergency, Management Radiation, and Chemical Branch within the CDC's National Center for Environmental Health, for joining us today and sharing this wonderful information. And thank you all for listening to today's episode of the Environmental Health Nexus podcast. Stay tuned for upcoming episodes where we will continue to dive into all things environmental health.