

Rounding@IOWA: One Health Approach to Antibiotic Resistance

[Upbeat theme music plays]

Dr. Szot

Welcome to Rounding at Iowa, a continuing medical education podcast developed by and for healthcare teams. I'm your guest host, Dr. Joseph Szot. Clinical Professor of Internal Medicine and Associate Dean for CME and Integrative Education here at the University of Iowa's Carver College of Medicine. Today we will discuss the importance of antibiotic stewardship and the interplay of efforts in veterinary and human medicine to curb antibiotic resistance. Our objectives today include: First, we want our participants to understand the scope of antibiotic overuse in humans and animal medicine. Second, we hope our participants will be able to identify factors that affect antibiotic resistance and availability. Third, participants will gain confidence in applying antibiotic stewardship principles to their clinical practices and their personal lives. Today, our expert guests are Dr. Will Sander and Dr. Dan Livorsi. Dr. Sander is Assistant Professor for Preventive Medicine in Public Health and Director of the DVM-MPH Joint Degree Program at the University of Illinois College of Veterinary Medicine. Dr. Sander received his BA from Colby College, his DVM from the University of Wisconsin, and his MPH from Yale University. One of his main research foci is on antimicrobial resistance in veterinary medicine, how it connects to human health, and how to better educate future veterinarians. Dr. Dan Livorsi is an associate professor of infectious disease at the University of Iowa Carver College of Medicine and has a joint appointment at the Iowa City VA. He received his MD at the University of Illinois, an MS from Emory University. He completed his residency at Baylor College of Medicine and his fellowship in infectious diseases at Emory University. For over a decade, he has been involved in antibiotic stewardship programs or efforts to measure and improve how antibiotics are prescribed. A major focus of his research is developing and testing new strategies to reduce the unnecessary use of antibiotics. Dr. Sander and Dr. Livorsi, welcome to Rounding at Iowa.

Dr. Livorsi

Thank you for having us.

Dr. Sander

Yeah, thanks a lot for having us.

Dr. Szot

To both of you, I just provided our listeners with your official titles and a summary of your training. Could you give us a better idea of your daily work and what a week of work might look like for you? Dr. Sander, why don't you go first?

Dr. Sander

Sure, happy to. So the antibiotic resistance is certainly important in my line of work, but it's only a small portion of what I get to do on a weekly basis. I have 10% of my time spent on clinics where I actually treat wildlife that comes in that needs help and is injured. I also spend time teaching to all four years of our veterinary student curriculum here around things like global health, one health, the idea of this interface between human, animal, and environmental health, and epidemiology and public health. So pretty broad and expansive. And then I have a wide range of research projects that I'm involved in too, from things like looking at heavy metal lead in wildlife and what type of effects we might have there long term and how that might be a sentinel for human health, particularly in children, to looking at how we deal with livestock emergencies, particularly around infectious disease. How do we handle that and big livestock situations, to antimicrobial resistance and antimicrobial stewardship. So I get to collaborate not only within the veterinary school here, but across several different departments at University of Illinois, as well as obviously nationally too. And so I enjoy the variety I get to have on a weekly basis and even on a daily or hourly basis. And it makes for an exciting time to continue to explore and collaborate.

Dr. Szot

Dr. Lavorsi.

Dr. Lavorsi

So I also have different aspects to my job. As an infectious disease physician, I help diagnose and treat patients with difficult or complicated infections. My other major focus is antibiotic stewardship, which I'm involved in a couple of different ways. First, I'm involved in stewardship in a very practical sense in that I help with the stewardship program here at

the Iowa City Veterans Affairs Hospital. I also do a lot of research. about developing and evaluating ways to decrease unnecessary antibiotic use and thereby promote the principles of stewardship. So some of my current projects focus on decreasing unnecessary antibiotic use in settings such as urgent care clinics, post-operative wards, and at the point of hospital discharge.

Dr. Szot

To help set the stage for today's discussion, could you comment on the impact that antibiotics have had over the years and what things might look like if we lost effective antibiotics? Dan, we'll give you a first crack at that.

Dr. Livorsi

All right, yeah, thank you. So it's really hard to overstate the value of antibiotics. They really are miracle drugs. Before we had antibiotics, one out of every four patients with pneumonia would die. Other infections like meningitis or endocarditis were universally fatal. Now that we have antibiotics, the mortality rate for those infections has decreased substantially. And before antibiotics, even something as minor as a puncture wound could cause a staph infection that could kill somebody. So it just kind of puts things into perspective when we compare what it was like before we had these drugs. Antibiotics have also been really important to several advances of modern medicine. So some advances such as chemotherapy, Certain types of surgery, critical care medicine, organ transplantation would all be difficult, if not impossible, if we didn't have antibiotics.

Dr. Szot

Dr. Sander, anything to add to that?

Dr. Sander

I would just say I would completely agree with everything Dr. Livorsi's said. You know, it's been a great advance we've had in the last 80 years, having antibiotics as a tool, and it's something that's been used equally so on the veterinary side. And it certainly allowed us, in many cases, to expand a lot of the intensive livestock agriculture systems that we have in place now. We've taken a lot of our animals and put them into more confined settings,

which is a lot more efficient. It also excludes a lot of potential pathogens, but for those that doesn't exclude, antibiotics are quite useful when needed for some of those species. And so a lot of our food system, which a lot of us I think take for granted, is built again on some of those modern advances. You know, we talk about on the human health side, but it's also true on the veterinary side, and that in turn informs our ability to have a safe, secure food supply.

Dr. Szot

I think it would be good if we reviewed some background information to make sure we are all on the same page. I'd ask the audience to think about how many courses of antibiotics are prescribed each year in this country. And then I'm going to ask our panelists to answer that same question. Dr. Sander, you want to give your perspectives on that?

Dr. Sander

Sure, happy to. So I think it's a challenging thing on the veterinary side for describing how many courses of antibiotics are prescribed. We know kind of volumes of sales of antimicrobials used on the animal side of things. And in general, we have over the last four or five years, we have about 30% more in terms of weight of antimicrobials used for animals compared to humans. And so, you know, we're talking with numbers around 12 million pounds of antimicrobials. There were some significant changes that happened for how we use antimicrobials in livestock back in 2017. And so we used to actually have uses up to 20 million pounds in some years for animals. And again, this is more on the livestock side. We don't quantify it as well on the companion animal side. We have really challenges around how do we bring those numbers together. We don't have a fantastic surveillance system in place to quantify that in a way that's as useful, I think.

Dr. Livorsi

I don't have an exact answer to that question. I know that antibiotics are among the most commonly prescribed medications. If we look within hospitals, about half of patients in a hospital will get an antibiotic. So they're very frequently used.

Dr. Szot

We will be referring to antibiotic resistance throughout this discussion. Could you give some background on antibiotic resistance and how does it develop?

Dr. Sander

So, we have kind of the typical biologic causes that we talk about, where we talk about selective pressures, which I think is kind of the classic example, right? Where you have a non-resistant bacteria, that bacteria multiplies, we apply a drug, the bacteria die, and that person's unhealthy again, right? Well, there's obviously inherently some mutations in bacterial populations where some of those may be resistant to, or even a couple, just resistant to a drug that you're applying. So then that bacteria may then be able to multiply because the other competition has been eliminated. And that's kind of our typical selective pressure we talk about. There's also the idea of how we can transfer bacteria, some bacteria can actually transfer genes. So we have this ability with a drug resistant bacteria to actually be able to do transfer. We talk a lot about horizontal transfer, you know, passing 1 plasmid to another and passing that to a bacteria that might not have that resistance built into it. And so that's kind of the main pathways you think about for natural causes. And I think that's at a micro level, what we think about, but also the societal causes too. And I don't know if we want to talk about that a little bit down the road, but as Dr. Livorsi was talking about the number of antibiotics that are prescribed, I think drives those macro changes around selective pressures.

Dr. Szot

Dan, anything to add to that?

Dr. Livorsi

Yeah, I think it's helpful to put things into historical perspective, that being that bacteria have been around for over 3 billion years. And they found ways to survive just in about every environment on the planet. As Dr. Sander pointed out, they're constantly evolving, developing new mutations, acquiring new genetic material. So they're really well suited to find ways to survive in the presence of antibiotics. And in fact, we know that antibiotic resistance has been around for a very long time, probably for as long as bacteria have existed. Most of today's antibiotics actually are derived from substances that microorganisms, whether they be bacteria or fungi, naturally produce. So resistance has

been around for a while, but our use of antibiotics to treat animals, to treat people has accelerated the pace at which resistance is emerging and spreading.

Dr. Sander

I'll just add quickly to that too, if you don't mind. I think that's a great point that when we had penicillin came out in 1943, we didn't start seeing really resistant lines against penicillin for about 20 years. But now we start seeing resistance develop within a year or two after some of the new drugs or modifications of new antibiotics come out, again, because of some of these selective pressures that have been in place.

Dr. Livorsi

And if I could just add to that as well, antibiotics are really different than other medications we use and that they're a finite resource. I'd like to make a comparison between aspirin and penicillin. Both of them are old medications. Aspirin's been around for over 100 years. Penicillin's been in use since the early 1940s. Aspirin is as effective today as it was when it was first introduced. Penicillin, in contrast, used to be a broad spectrum antibiotic, but due to the development of resistance, it has very limited uses nowadays. So antibiotics, the more we use them, the less effective they become. And another unique feature of antibiotics, which is sort of tied into what I just mentioned, is that they're really the only drug that we use where how I use them for you can impact how effective they are for other people. So for example, I prescribe an antibiotic, it creates a resistant organism in you, you get admitted to the hospital, you spread that resistant organism to somebody else. And then when you spread that resistant organism to somebody else, that antibiotic that I gave you won't work in that person. So again, the more we use antibiotics, the less effective they become.

Dr. Szot

I think that's a great segue into what's the current and potential future impact of antibiotic resistance in medicine. Dan, I'll ask you to comment on that first.

Dr. Livorsi

Sure. So I can cite two sets of numbers, one global and then one specific to the United States. So from a global point of view, there was a study published in The Lancet last year, and that study estimated that there were over 5 million deaths in 2019 that were associated with antibiotic resistance. And the paper estimated that 1.3 million of those deaths was directly attributable to resistance. In the United States, the CDC estimates that 35,000 deaths per year are due to antibiotic resistance. This is probably an underestimation, but it's difficult to get accurate numbers. So that's the number that they cite. And the CDC also tells us that resistance is increasing. So a recent report compared resistance in 2020 to 2019, and there was a 15% increase over that one year time span.

Dr. Szot

Will, anything to add?

Dr. Sander

I think it's an area we're trying to understand more and more about too, about what the real impact is and how much resistance is present out there. And so I think Dan's numbers are completely accurate, right? This idea of how much is actually directly attributable and indirectly attributable globally and then also within our country. There's actually, speaking of the Lancet, an article just came out this month in April 2023, looking at kind of the One Health ecological approach of antimicrobial resistance and what are the factors that influence antimicrobial resistance. And it's striking that in our higher income countries like the US or Europe, we have some of the highest uses of antimicrobials, but we have some of the lower resistance rates, right? Whereas in lower or middle income countries, we still use quite a number of antimicrobials, but there's a lot less policy in place. There's a lot of other factors that play into it from socioeconomic side of things where resistance is actually quite a bit higher. But those [pause] We don't operate in a bubble. So even, like Dan said earlier, if you have somebody who develops resistance somewhere in the world, that resistant bug can then move somewhere else too. And so that's, I think, for me, a very concerning threat. And the fact that also in this article, it discusses the fact that there's a strong correlation between the human resistant bacteria that develop and that affecting animal health and animal resistant bacteria being correlated with affecting human health too. It doesn't have a direct causation, but there is a strong association there.

Dr. Szot

Could you give some insight into the pipeline of future antibiotics? How they are developed and brought to market?

Dr. Livorsi

So antibiotic development is technically difficult, it's expensive, and it's time consuming. I'll try to briefly outline the process in my next few comments. So the first challenge is really finding a substance that will be toxic to bacteria but not toxic to people. This isn't easy. Over the past 80 years or so, the pharmaceutical companies have tapped into many of the natural sources of antibiotics already. Now there is some potential to re-explore those sources or to synthetically develop new agents. So there is some hope there. But that would be the first step, to find that lead substance. After that lead substance is identified, there's a long and complicated series of preclinical and clinical studies that need to be done before the antibiotic is ready for use. This whole process can take 10 to 15 years, and most drugs will fail at some point and never make it into clinical use. And the next thing I'll touch on is once an antibiotic is brought to the market and can actually be prescribed to patients, has been approved by the FDA, one challenge from the pharmaceutical company's point of view is that they often don't get a good return on their investment. So new antibiotics are typically expensive. When there's generic alternatives, providers are going to tend to use those generic alternatives instead of a more expensive antibiotic. So these new agents tend to be seen as kind of last resort drugs. Their use is limited when they are used. Like other antibiotics, they're only used for a short duration of time. And like any antibiotic, the new agent is going to lead to development of resistance to that drug, and eventually it will be less effective. So for all these reasons, Many pharmaceutical companies are really not interested in developing antibiotics anymore. They'd rather focus on drugs that patients will take for a long period of time and they can get a higher return on their investment.

Dr. Szot

I think this next question is for Dr. Sander. Tell us about One Health and the interplay between humans and animals and antibiotic resistance. You touched on that a little bit earlier, but I'd like to hear a little bit more in depth on that.

Dr. Sander

Sure. So again, one health is this idea that you can't have the health of one of three sectors without the other two sectors. So this case, we're talking about human health, animal health, and environmental health. And so that none of us work in a silo. What we do on the veterinary side, affects the human health side and vice versa. And similarly, all that goes into the environment in some form or fashion. And so the challenge really is for antibiotic resistance is how much are these tied together? And I think there's still a lot of question on that. So we talk a lot about, we use a lot of drugs in livestock, we use a lot of antimicrobials, and there's lots of control measures in place too of how we can use those antibiotics. But once they enter into a cow, where do they go, right? And so those antibiotics, will be in the meat for a while, but the residues go away before they're sold off. That's tested time and time again. So those policies in place by the USDA to make sure that antibiotic residues do not exist in our meat products that we then buy at the grocery store. However, they also go out our feces. They're excreted right into the environment too. And so they can enter the environment that way into waterways, into crops as manure is reused for fertilization. And we might introduce antimicrobial resistance that way as well. And so there's a few different pathways could have where antimicrobial resistant bugs could survive and potentially come to us from the livestock side. The other challenge I think that's been explored a lot more in recent years is the companion animal side. So your friendly dog and cat. I have a dog, I have a cat in my house. You know, they get a lot of the same drugs I do if an infection pops up, right? We use a lot of the same third generation cephalosporins, we use fluoroquinolones in our dogs and cats pretty routinely. And we use those pretty routinely in human medicine too. And so how they interact, a lot of them sleep in our beds, they interact with our kids, with us, with elderly adults. How does it work if they develop resistant bug and then spread to us? And we've had plenty of instances where things like MRSA, methicillin resistant staph aureus, has spread from either a person to an animal or an animal to a person, or methicillin resistant Staph pseudointermedius, which is more common in dogs than in people, has spread from a dog to a person. And so this is some of the one health challenges we think about, right? I think the big driver for antimicrobial resistance in humans is still antimicrobial use in humans. That's still the biggest input, but we have other factors to consider and work together on. Nobody's off the hook on this one.

Dr. Szot

Thanks. What is antibiotic stewardship and what are its goals?

Dr. Livorsi

So antibiotic stewardship refers to systematic efforts to prescribe antibiotics in a more evidence-based manner. This would refer to giving antibiotics when they are indicated, but not giving them when they're not indicated. And the reason this is so important is because as we mentioned before, antibiotics are a finite resource. The more we use them, the less effective they become. So when we do use them, we want to make sure that there's a good, prudent reason to make use of them. And I think antibiotic stewardship is even more relevant and important now than it's ever been before because that antibiotic pipeline is running dry and new antibiotics are just not being developed at the pace that is needed to keep up with the spread of antibiotic resistance.

Dr. Szot

Will, anything to add?

Dr. Sander

I think, from a clinician standpoint, whether it's a physician or a veterinarian, I think it's also thinking about what do you do at the practice level, right? Whether it's a hospital, a small clinic, what type of activities can you do there to commit to stewardship? And some of that's about just documenting your antibiotic use within your practice. and thinking about how do you use that over time. Do you have a standard approach that you're doing clinic-wide? Is that something that can be rolled out or thought about more broadly in the region? And then thinking about how do you work with the laboratories where you might be doing cultures and sensitivity or looking at other aspects related to infection to think about what drugs are these bugs in your community sensitive to and how can you best utilize that information? So you have to really think about this at a practice level for clinicians, it has to be part of your daily sort of idea, right? You have to keep this front and center of your brain and have somebody reevaluating this as you move forward. On the veterinary side, we really advocate for trying to appoint somebody within your practice who is an advocate for antimicrobial stewardship and is thinking about what drugs are we buying and what drugs are we allowing to go out the door to be used in our patients. And so I think we're in different phases, I think, for stewardship between veterinary medicine and human medicine, but we all have similar goals and it all fits in that framework that Dan was describing.

Dr. Szot

Thanks. Going beyond stewardship, what other steps can be taken to combat antibiotic resistance?

Dr. Livorsi

I can mention a couple of things. Antibiotic resistance is, it's a multifaceted problem, so the solutions are also multifaceted. So stewardship is a big part of the solution for sure, in addition to restarting that antibiotic pipeline, which is really the most important thing. But other things that can be done and that are also crucial would be infection control. This is important in all healthcare settings. And infection control would include things like washing hands to prevent the spread of germs, isolating patients with resistant bacteria, cleaning surfaces and shared equipment. So those would all be important. Other interventions that can slow the spread of resistance could include better diagnostics. So are there tools to help clinicians more quickly diagnose infections or more quickly determine which antibiotic can be prescribed to treat an infection? That could be helpful. Vaccines to prevent infections could also be useful. By preventing infections, we could be preventing the need to give an antibiotic. And if we're not going to give an antibiotic, then there's one less bacteria that could develop resistance. So those are some initial thoughts.

Dr. Sander

I would just add to that I think all those are true on the veterinary side of things as well. We get the luxury of talking about controlling animal husbandry too. And so we can talk about influencing our clients or owners or farmers or things like that. How do you keep your animals, right? And what nutrition are you providing to them? All those factors can help drive whether you have a disease issue or not, including things like ventilation for some of our producers out there. That's one of the big causes for upper respiratory infections that we have in cattle situations or swine operations. And then I think one of the other aspects too is just the education component from clinician side of things. How can you try and talk about that with your patients or your clients in the veterinary side of things? And then preventing environmental contamination I think is another one too. So how do we actually, whether you're a clinician or whether you're somebody out there who's received antibiotics, how do you fully utilize that course of antibiotics and then dispose of it properly, right? It doesn't just necessarily go in the trash. You should go back to a drug disposal center if you're a patient who's received antibiotics and there's plenty of drug take-backs events that happen in communities around the country. Or if you're in a clinic, how do you reverse

distribute that back to the provider so that it's disposed of in a proper way and minimizes potential contamination that way?

Dr. Szot

What are some common situations that antibiotics are inappropriately or overprescribed? Dan, I'll give you first crack at that one.

Dr. Livorsi

Sure. So when we think about stewardship in people, one consistent finding across a variety of healthcare settings is that approximately 30% of antibiotic use is unnecessary. And that's true in hospitals, it's true in outpatient clinics. So approximately one out of three antibiotics is not necessary. And an antibiotic can be unnecessary, I guess, really in two main ways. One would be that the patient does not have a bacterial infection and does not need an antibiotic at all. The other way would be that an antibiotic is indicated, but it's given for longer than necessary. So those are two things we focus on in stewardship is making sure we're making the correct diagnosis and then giving the antibiotic for the shortest effective duration. I'll also add to this that two other areas of focus for stewardship as well, which I guess could also fall in this theme of antibiotic overuse, would be dosing of antibiotics and also the choice of antibiotics. So we want to choose antibiotics that are narrow as opposed to broad spectrum antibiotics, narrow spectrum antibiotics will have less collateral damage. And then we want to make sure we're dosing the antibiotic appropriately. If we're underdosing the antibiotic, then the likelihood of developing resistance would be higher.

Dr. Sander

I think on the veterinary side, we have similar challenges too. Estimates there, 30 to 50% of antimicrobials that are prescribed on the veterinary side are probably inappropriate or not necessary. A common one we see a lot of is diarrhea, for example, in dogs. A lot of times we get prescribed metronidazole, which is not usually indicated. Actually, it's more often a change in diet and how do we control that aspect? I think one of the other factors that plays into why things are overused is also confidence of the clinicians too. I know I can speak on the veterinary side. There's been a number of studies looking at newer graduates from veterinary school, for example, being more inclined to want to provide something to the client when they come in for a problem. And there's some psychological drivers for that

too. And a lot of clients, and I think this is true on the human side, patients come in wanting to have something to go out the door with. They don't want to say that's a viral infection, just get supportive care and move forward. And so I think that's a challenge as well. And I think that goes the same way for if you're going in to see a doctor, being an advocate as well, right? And deciding, is this really necessary? Do I need an antibiotic? Is this something that we can do a culture for, figure out, is this a lab diagnostic to figure out if we need an antibiotic or not? On the veterinary side, I would say one other limitation we have is typically a lot of times owners are not able to afford doing a culture and sensitivity to figure out what antibiotic might be appropriate or most appropriate and have a more narrow focused antibiotic to prescribe them because of financial constraints. So I think there's challenges there for sure that help drive some of the use.

Dr. Livorsi

I would agree with Will that in people that just in case antibiotic is also a challenge and something that we try to focus on in stewardship. I think a key point there is that oftentimes that just in case antibiotic is going to do more harm than good. If the patient does not have a bacterial infection, the antibiotic will be causing side effects without providing a benefit.

Dr. Szot

Will, are there any changes coming forward around antibiotic incorporation into agricultural feeds and things that may impact antibiotic resistance?

Dr. Sander

Sure. So I alluded earlier that back in 2017, there was a shift with FDA, with the Food and Drug Administration, and that they basically made it so that we could no longer give antimicrobials for promotion of growth. And so we discovered in the veterinary profession back in the 60s that certain drugs actually helped get our livestock to grow faster, particularly for cattle. And so that was something that's been utilized for a long time in our field, and that's now shifted, and rightly so. And so we no longer can provide drugs unless it's actually responding to a specific disease situation, which seems intuitive, but it's an economic decision as well. And so that was a big shift and that's driven reduction of use by about 33% of antimicrobials by volume in the last four or five years, which is great. And then the other shift I'll say is that starting in the next couple of years, FDA again is restricting use a little bit more. And so that off the counter or off the shelf antimicrobial use that you

can get sometimes in feed stores that have antibiotics in them is going to be much more challenging to get a hold of. And so a number of producers will just go and grab something off the shelf that's been allowed to be not a prescription required for that. So that's going to be a shift as well. It won't be quite as drastic as the 2017 shift, but it will help limit some of those inappropriate uses.

Dr. Szot

Thanks. Are there other current programs that you haven't touched on that are in place to help decrease antibiotic overuse?

Dr. Livorsi

On the side of human medicine, the main focus has really been the antibiotic stewardship programs that we've mentioned. And now in the United States, all hospitals and nursing homes are required to have these programs, which is a really big step forward. Granted, these programs are not always well funded and sometimes exist in name only, but at least it's a starting point. And really the main thing these programs are focusing on are education and then other common strategies for stewardship as well would include restricting access to certain antibiotics and providing feedback to clinicians on their choice of antibiotic and their prescribing in general.

Dr. Sander

And on the veterinary side, I mean, we don't have that requirement yet in place for our hospitals or clinics. I think it's moving that direction. We don't have the same sort of regulatory oversights, particularly on the companion animal side in the US at least. I would say that if you go to any continuing education, our version of continuing medical education, continuing education on the veterinary side, you will find a laundry list of presentations on antimicrobial prescribing practices, stewardship, things of that nature. So it's certainly become much more front of mind on the veterinary field. And I think that's one of the big drivers for some of the shifts in attitude, as well as how veterinarians are educated at this point to going through veterinary school.

Dr. Szot

So When I go into the grocery store, it seems more and more common that I see labels about antibiotic-free on the meat and dairy that I'm looking to buy. Any comments on that trend?

Dr. Sander

That's a great question, Joe. So in most cases, it's really just, that's not a label that's regulated by USDA. Most labels, most things you see on meat packaging or dairy packaging or egg packaging is not a USDA federal mandated thing. So if you see a USDA organic label on there or you see animal welfare certified, those actually have real meaning behind them, a real federal guideline behind them. But most of the rest of that is not necessarily regulated. And so there's taking advantage of the common mentality, you know, right now of everybody wanting to have less antibiotics in their food, right? The thing is, there's really not been antibiotics in our food for a long time. And so dairy, we have decades of data where we've had no antibiotics detected. They're tested at four different levels as milk is processed through the system for antibiotics and no residues have been found for the last three decades in a row. And same thing for the meat side. We have withdrawal requirements. So if you do have to give an antibiotic because an animal's sick, there's a certain period of time after the antibiotic's given before the animal can be slaughtered and then sold. And that's again to reduce the risk of antimicrobial resistance or of antibiotics residues in our meat products. So it's really a marketing ploy more than anything at this point.

Dr. Szot

Thanks. What are things that our audience could do to help reduce antibiotic resistance as they go about their daily lives?

Dr. Livorsi

So what people can do probably depends upon whether you're a patient or a clinician. From a clinician point of view, We all can work on improving how we use antibiotics, how we prescribe them. And then some of those infection control measures I mentioned as well are important. Basic things like washing your hands reduces the risk of infection, convincing your patients to get vaccinated when that's indicated. From a patient perspective, in a similar vein, good hygiene, vaccines, And when you go to the doctor, don't demand an antibiotic. Studies have shown that many times doctors are prescribing an

antibiotic only because the patient is asking for it or because the doctor perceives that the patient wants it. So I think it's helpful as patients to be clear that you only want the doctor to give you an antibiotic if that's really what is necessary. And the last thing I'll mention applies to everybody, whether you're a clinician or a patient. All of us can encourage our lawmakers to work to create a better model for antibiotic development. As we've mentioned, the pipeline for antibiotics is dry. There's a lot of discussion about different incentives that can be developed to try to restart or kickstart the discovery and development process. But those things need to be moved forward. and they need to be assigned into law, but all of us have a voice in encouraging that to happen.

Dr. Sander

Yeah, I would echo what Dan said there, too. I think the same thing happened, like I mentioned earlier, the clients come in and want something to treat their pet, right? Most of us, our pets are part of our family. I know mine are. And so you want to try and do what's best for your family member. And getting an antimicrobial or antibiotic isn't necessarily the solution there. So again, a lot of it's thinking about as a client or an owner, what can you do that's not related to giving them a drug to help resolve the situation. And that includes things like vaccines. For the clinicians, again, I encourage all my clinicians to have a full infection control protocol in place for their clinic or hospital and make sure that everybody's aware of what's going on there because that can reduce a lot of risk that way and spread. And I agree with Dan about being an advocate towards policymakers. It doesn't mean you have to contact a lawmaker necessarily, but even voting in your elections and making sure that this is an issue that at least they've touched on is important because I mean, there are some like CARB-X and BARDA that exists to try and push drug makers to come out with new antibiotics. But there's gonna be a lot more support for this. And for me, as a One Health person, this is one of the biggest One Health challenges in our future. If we don't have antimicrobials in place, like Dan alluded at the beginning of this podcast, we will have a lot more people succumbing to infections that we took for granted we could take care of in the past.

Dr. Szot

As we close, what are some take-home points that you would like to leave our listeners with? Dan, why don't you go first?

Dr. Livorsi

Whenever I think about antibiotic resistance, it is a very scary problem, and it can be disheartening. But I think there's reasons to be cautiously optimistic. If we think back to the challenge of antibiotic discovery and sort of kickstarting that antibiotic pipeline, there are some things the government has done here in the United States over the past 10 years to try to lure people back into the market. Things like changing patent laws or lowering the threshold for clinical trial requirements. And those things seem to be working. That they're not sufficient. There's more that needs to be done and there's more that can be done. But I think what we've seen so far is that if the government is engaged and willing to act, we can start to make progress on this problem.

Dr. Szot

Will, anything to add?

Dr. Sander

I would also say I'm optimistic too, despite some of the gloom and doom we might have shared today. But there are a lot of good efforts in place. And within the US, we have a lot of efforts both on the human side and on the animal side that have pushed things forward nationally from the Presidential Advisory Council on antimicrobial use to we have a National Institute on antimicrobial resistance to on the ag side as well, trying to look at some of these issues. So I think there's a lot of momentum moving this way and recognition that this is a concern that we all need to be part of moving forward and we can all do our part within the realm we're in.

Dr. Szot

To our expert guests, thank you for joining us on Rounding at Iowa and for the work you do promoting health and well-being across the spectrum of the animal kingdom. For our listeners, you can access instructions for CME and CEUs within our show notes. And as always, we hope you join us again for another session of Rounding at Iowa.

[Upbeat theme music plays]

