

## EQUINE INNOVATORS PODCAST TRANSCRIPT

Episode 1 / February 2020

### A Discussion with the University of Kentucky's Dr. Martin Nielsen

*Editor's note: The following is a bot-generated transcription of our Equine Innovator's podcast.*

**Michelle Anderson, TheHorse.com**

Welcome to the premiere episode of The Horse's Equine Innovators Podcast, sponsored by Zoetis Animal Health. I am your host, Michelle Anderson, digital managing editor of *The Horse*. Every day, researchers at universities and other institutions around the world are investigating new ways to care for and understand our horses. In this podcast series we'll be talking to those innovators to learn more about their work. Our guest for this first episode in the series is Dr. Martin Nielsen an equine parasitologist and associate professor at the University of Kentucky's Maxwell H. Gluck Equine Research Center. He also co-authored the American Association of Equine Practitioners' Parasite Control Guidelines. Thanks for taking the time to talk with us Dr. Nielsen, and thanks for being our guinea pig on our first episode.

**Dr. Martin Nielsen**

It's my pleasure. Thanks for having me.

**Michelle Anderson, TheHorse.com**

So, let's start with your background. I know that you started your career as a practicing veterinarian in Denmark. How did you end up transitioning from being a practicing vet to research? And I think the big question is, what got you interested in worms?

**Dr. Martin Nielsen**

Yeah, that's a great question, and it's actually one that I often get asked. What on earth? What happened? How could this? You know, going to veterinary school in Denmark, that's kind of where I developed the sort of interest in research. I didn't really know anything about it prior to going to vet school. I hadn't ever thought about ... I'm not even sure I knew what a PhD was. I just wanted to be a veterinarian, but going from school, I just developed an interest in the equine, or not the equine. The parasitology research group at the university at the

time was extremely active, had a lot of funding, had a lot of people working. At one point, I think they had like 30 PhD students engaged in parasitology projects. None of them were equine, but lots of lots of projects and lots of funding, so lots of opportunities to join the team and be a student worker. And I was one of many, many students that earned a little extra on the side and helped out with various parasitology projects. And so I think you know, I got my hands up there, and then in the Danish Veterinary curriculum, you actually do a research project. It's a mandatory thing that's part of the education that every veterinarian will actually have done their own project, will have written up a report and defended it. It's sort of a mini masters. And so, of course I chose to do parasitology, so my interest was there already late 1990s. I was interested, even as a vet student. Right around that time, Denmark was changing their legislation to make all dewormers go on a prescription-only basis. So ... horse owners and animal lovers in general were only able to get there their dewormers through their veterinarians, and veterinarians would have to do some kind of diagnostic work in order to be able to justify the prescription. So, you know, that just led to a lot of questions. I mean, I was just wondering, how is this going to pan out? Is it going to be strict? A dramatic change from an over-the-counter availability, just like they have here in America, to this system? Is it even going to work? What are the needs? Are we even ready? Do we have everything we need in order for that to work out and specifically, perhaps, to diagnose the parasite so prescriptions can be made?

So that happened in 1999. And like I mentioned before, there was a lot of research going on in parasitology at the university, but nobody was working on horses. So, I thought, man, you know, I might be that guy. I did go into practice, that you mentioned. I thought, you know, I started out wanting to be a veterinarian and driving around my truck with an ambulatory practice, so I felt I had to do that and try it out and see how that worked for me. And in many ways, I loved it. I enjoyed this whole thing of showing up in the morning not knowing what

Episode 1 / February 2020 / A Discussion with the University of Kentucky's Dr. Martin Nielsen

the day would look like and driving around and getting into contact with a lot of people, uh, and a lot of different places and helping with their animals. I did really, I loved that. What I didn't like, I realized, was this sort of generalist's approach to things – you rarely or barely had any time to get into that particular question or problems. You just sort of had to come up with something quickly and then move on to the next patient, and I just realized more or that my temperament was to sometimes really dig deep and get all the evidence, all the information you could get about a particular problem and then seeing what you could do with the result. And that's really the approach you take as a researcher. And that's what led me to go back into graduate school after three years of practice. Long story short, although it's already a long story, I'm now here at a premier equine research institution, where, you know, we have a department full of people all devoted to helping the horse.

**Michelle Anderson, TheHorse.com**

Well, it sounds like a lot of what led you into this work was timing and your exposure in vet school. But what then led you to the U.S. and to Gluck to work in your lab there?

**Dr. Martin Nielsen**

Yeah, that's also a great question. Your point is, is a very good one. Timing ... it's kind of a random thing sometimes. But, you know, um, you get in contact with, it's what kind of people you run into on your path. And I say this to all the young people that come into my life now, you know you might run into something that certain topics, certain area of work that interests you, but it's very often dependent on the people. We had a professor at the veterinary school in Denmark at the time who was particularly keen on encouraging young people into getting involved with parasitology. But he wasn't doing that across the board with everyone, but when he sensed that, here's somebody who might actually have a little bit of interest, he would encourage, he would make suggestions of ways to get involved, things that you could do, parts you could be involved with, meetings you could go to, and basically just provide young people with that opportunity. And so, that's what he did. I'm just mentioning that. I'm trying to do that same thing now, and I think a bit fulfilling part of my work, yeah we do all this research, but we're also engaged in young people and providing them with the opportunity to be involved in research at some level and get a little bit of, ah, you know, a peek into the wheelhouse and know how does it work when you're generating scientific information. And how does that all work out.

How I ended up in the U.S. was also interesting because I came back to the University of Copenhagen before starting my PhD, wanting to do equine parasitology and because I saw I had identified this cabinet, but nobody was working on it, and so I was able to find two great supervisors, PhD supervisors. But none of them had a research program in equine parasitology. One was a general parasitologist with some interest in equine and then the other was the clinician, also with a great interest in equine parasitology, but none of them had an actual research program. So I still needed, I needed to find somebody with more specific knowledge, because when you read the papers, you're trying to figure out, what should my project be about? Reading the published papers, you only get part of the story. You get all the things that were out and were good enough to be able to be published. But you don't really get a feeling for what thoughts might people have had. What approaches might they have tried that didn't work out it? All of that you need in order to be able to define what your project should be about.

So I started reaching out to people that I could had been publishing about equine parasites, and that led me to the U.S. So in 2004, I reached out to Dr. Tom Fly at Louisiana State University, who had been a leader in the area for a long time, and basically asked if I could come visit. Just to seek some inspiration, have some conversations with him. And he said, sure, Martin. Um, but why don't you make it as a small circular drive, visiting three other guys in the southeast of the United States. And I said, well, that's, you know, that's probably two hours of driving, being naïve and never having been to the U.S. before, I really realized what that would entail. He then introduced me to three people: Dr. Jean Alliance here at the University of Kentucky, Dr. Craig Reinemeyer at East Tennessee Clinical Research, and Dr. Ray Kaplan at the University of Georgia. And so I ended up visiting all four in the matter of 11 days, a lot of time on the road. It was extremely critical to my career that I got to meet these people, and they always were very welcoming, set the time aside talk to me, make suggestions, and also basically to start offering their thoughts on where I should be going. And so, they all become became part of my network. And ultimately, they're the reason why I'm here today.

I did not go to Kentucky at the time, but already I was aware of the extremely unique resources that are available here. I ended up hooking up with Dr. Kaplan

Episode 1 / February 2020 / A Discussion with the University of Kentucky's Dr. Martin Nielsen

at Georgia, and he had some thoughts on the molecular techniques we could develop for diagnosing some parasites. And I ended up spending a significant part of my PhD with him, I owe him a lot. You know, he was such a support, such a great mentor, to me both during the time of my PhD and now practically to this day. And so that's where my U.S. connection was established. And then I went back. I graduated from the University of Copenhagen with my PhD. I got my first faculty position there working in the clinical department, but then I was fortunate to get a grant that allowed me to go on sabbatical. I thought all right, I've been to Georgia, where should I go next? And I thought, well, Kentucky. They have these resources, this wealth of knowledge, and Dr. Eugene Lyons was a living legend teaching parasitology. So I went here on a sabbatical back in 2008-2009, and that's where the department chair of the director of the Gluck Center at the time, Mats Troedsson, sort of pulled me aside and said, Hey, Martin, what are your career plans? And I'm like, well, I'm in a position, I don't know what to tell him. Could you see yourself working at the U.S.? And I said, um, I think you need to ask why. And so, he and actually Dr. Squires who was at Gluck at the time of this as well, basically invited us all out one night. And I said, as I told my wife, I spoke to them about this and she's like, OK, all right, all right. And we sat there at this dinner at this restaurant, and I remember we were chatting, and they didn't really bring it up. And I was like, well, maybe I misunderstood. Starters, nothing happened. The main entrees, nothing happened, they still didn't talk about it. And we were like, OK, they asked for the check and I thought, OK, maybe I didn't, maybe I just misunderstood the whole situation, and we got up. You know, Ed Squires signed the bill and tip and everything, and we stood up on the way out. And then he just leaned over to my wife and said, hey, wait, could you see just living in the U.S. And she said, sure, and he said, all right. And then they set everything in motion about the position, and you know, those have to be advertised and open to others to apply.

That's where the financial crisis hit everywhere, including here. So this university went into a hiring freeze and weren't allowed, you know, the department wasn't allowed to put in new positions. And so Dr. Troedsson called me up and said, Martin, I'm sorry, we're in the situation right now, we just can't and I, uh oh, yeah, it's one of those, you know, nice, encouraging conversations that just didn't pan out for reasons that's nobody's fault, you know? So, over the course of the next couple of years, he sort of checked in with me. He's from Sweden.

So he would sometimes be heading home to visit family and he would always swing by Copenhagen. And we'd just sit down and chat and you know, it doesn't hurt. And then, a faculty member at the Gluck Center actually passed away. Very sad, very unexpected. But, then, you know, all of a sudden there was this unfilled position, and Dr. Troedsson was able to convince the dean at the time that, you know, it would be useful to convert that into a parasitology position. Because Dr. Lyons had established this program and the department wanted to make sure they continue it, you know, going forward, should he decide to retire, or pass away or whatever, and the dean allowed it. So, then finally, the position was available, it was advertised, and I applied. I've been here almost nine years now.

Timestamp: 14:44

**Michelle Anderson, TheHorse.com**

And so, you named some big names in parasitology, that those of us who write and work in the horse health space are really familiar with. But I think it brings up this interesting thing that we're seeing in research is a generational shift. So we had all these greats that were boomers, and they're retiring out or aging out of the work, and then you're like me or in the Gen X, the sandwich generation. And there's a lot fewer of us. And then we're followed by this big millennial generation that I think outnumbers the boomers at this point. So, do you find in research that, uh, that you're in a space where there aren't quite as many people entering your field of research?

15:37

**Dr. Martin Nielsen**

Interesting, interesting question. I kind of think that in my area of parasitology, um and this is, generally speaking, not just equine. I think we went through sort of a dry period, uh, funding-wise, up through the 1980s, 90s, and perhaps even early 2000s where, you know, we had all these great dewormers and everything was under control and it was just less incentive to invest a lot of funding into research. So I think, I actually think that generation struggled a little bit. For me right now, I could tell you it is way different. There's a lot more need, and it's much more recognized now for research, and certainly from my area equine, and I also get a lot of interest from young people. Um, so I'm not struggling, uh, when it comes to attracting or finding the next graduate students and engaging young people, my undergrads, and my veterinary students. So you know, I think we're in an upswing, and we have been for a while

Episode 1 / February 2020 / A Discussion with the University of Kentucky's Dr. Martin Nielsen

when it comes to just recognition of the need and also the availability of at least some sources of funds. We can discuss those more in detail if you're interested. I think things are looking pretty positive. And the other point that you bring up, which I would like to very briefly touch upon is this whole thing about the shift between generations. I think it's so important to make sure that the knowledge is passed on. There's so many ways to do it. I mean, one is obviously through training students that come out of your lab, and people have mentioned before all being part of that and done that. And I'm sure that there's a legacy, but I also think me working with all of them, you know, has been so valuable for me in my career that I've been around, I've been able to have interaction with these great people with all the great knowledge, specifically Dr. Lyons that I worked alongside with here for many years. It's still really important. And those are all the things that aren't necessarily all written down.

18:15

**Michelle Anderson, TheHorse.com**

So why is the work that you do and your colleagues do, why is it important for the horse owner for people like me home with our horses that everyday aren't living in your world? You live and breathe horse worms, but what does it mean for those of us on the ground?

18:38

**Dr. Martin Nielsen**

I mean, it's important because all of you, all of you, and I mean really all everywhere in the world, everybody who has horses, deals with parasite control. It's just part of the handling and managing of your horses. You all have to make some decisions regarding what to do, when to do, with what, and how. And those are the questions I get all the time. And so my mission is to provide those answers. You all, we all deal with parasites, whether we want it or not. There is not a horse out there that doesn't have any parasites. They all have them. And so there's always gonna be all these questions, and they will never go away. And so yes, it's very important. It's important because, you know, we're running, we're sort of finding ourselves more and more with our back up against the walls because all the drug resistance, we're running out of treatment options. So what are we gonna do? Uh, how and should we ever get a new type of dewormer on the market? I don't see that coming any time soon, hopefully it will happen. What are we gonna do different? Can we do it a little bit, you know, can we be smarter, uh, in how we make use of these products? Can we learn

from the past? I think those are important questions, and those apply to everybody. It doesn't matter whether you have like the fanciest, most expensive horse, like top-performing athlete or breeding horse in the world or just your backyard pony. You know, parasites don't care. They're not snobs. They just infect the horses.

20:31

**Michelle Anderson, TheHorse.com**

Something that's been really great about your work is that you, you can speak to the researchers, but you're also really good at speaking to the horse owner and sharing information with horse owners. Recently you won the Winnie Award from the Equus film festival for your educational videos targeting the horse owners about debunking deworming myths. Can you tell us a little bit about that project?

20:53

**Dr. Martin Nielsen**

Yeah, I'm trying to ... I think it's an obligation as a research scientist and certainly someone working at a land grant university to disseminate knowledge to what I call the end user. You know, it's veterinarians, horse owners, managers, people that deal with parasite control on a practical level. And it's an obligation that we have to basically find effective ways of communicating this and bringing the message across. And I like to just try out different platforms, different media, if you will, social media, and we're having these opinions is a big yes. I think we have to, but there are so many different ways of doing it. So what I did with that video series was just like I wanted to prove a point. I want to just basically demonstrate with your own smartphone and iMovie, you can make, you know, videos without spending oceans of time.

And they could be effective. And I wanted to make them short, 45 seconds or less, so they go on Twitter as well as on Facebook, as well as on my YouTube channel. Um, just to try a different format where you basically have a single message. We know that people's attention span on social media might not be more than a few seconds anyway, so just cut to the chase, bring the message across, and then a brief explanation why. So that's what I wanted to do. And I, you know, having worked in this field since, well, I mean, since veterinary school, I've come across so many misconceptions and myths and, you know, traditions that are not based in anything. I would like to try and address and make people aware. So that's how that idea of deworm, debunk, the basic

Episode 1 / February 2020 / A Discussion with the University of Kentucky's Dr. Martin Nielsen

debunking of some of those misconceptions or myths, and that series ran in the fall of last year, so 2019. The videos are all still available on the Gluck Equine Research Center Facebook page, so you can look that up, find the videos between October and December of last year, with comments and questions. You can also find them on my YouTube channel, Martin K. Nielsen equine parasitology. All the videos are there as well as on my Twitter feed @MartinKNielsen. So just really trying to spread the message in a matter that is meaningful and useful to people. I learned about this film festival, and the director of the film festival Lisa Diersen encouraged me to enter my film into the festival. And she told me there was an educational category, and I thought, why not? And I won, so that was fun! I think I'm going to do another video series again. If I can find the time, I'd like to make them a little longer this time, try a slightly different format. A little more educational. I was inspired by some videos my daughter was watching. She was preparing for some history exam that she was taking in high school, and it was this guy who was doing like a brief overview, you know, these different historical periods in world history, and I thought, I can do the same with parasites, and here's how to approach, uh, putting together a parasite control program for foals or yearlings or young horses or broodmares and so on. So if I can find the time, I will try to do that.

25:05

**Michelle Anderson, TheHorse.com**

So, for our audience, I think a lot of us when we think of research and researchers, we think lab coats and microscopes. Um, so that's part of what you do. But you also have a research herd there at UK. Can you describe to us what that herd is like and what they're used for?

25:27

**Dr. Martin Nielsen**

Oh, yes, absolutely. I mean, when I talked about the unique resources is that I noticed already as a grad student here at the University of Kentucky, I particularly meant those two research herds. They are really, um, something else. I mean, Dr. Lyons who was here passed away two years ago, had maintained these for, well, actually for decades. There were two herds. They were both of established in the 1970s by him and his colleague Dr. Harold Drudge, and they, um, they wanted to, I don't know who had the idea, but they decided to basically just keep a herd of horses without deworming, and I think kinda just see what happens.

So they, that herd, I inherited that herd, and that's a major resource for me now, as a source of the research samples and materials. Ah, they haven't been dewormed. The horses, several generations of horses have not been dewormed for 41 years this year, and so they have a lot of parasites, and actually quite high numbers. The horses are remarkably healthy. We used these for a bunch of different things, and some of my videos in that series in the fall actually talk about that, how I get seasonal data, data on seasonal fluctuations for different parasites. We've also developed several diagnostic techniques, new diagnostic tests for parasites, and for those kinds of tests, you need to validate them. In order to be able to validate a diagnostic test you need samples from animals where you know that they were infected with a particular parasite to make sure that the test is actually accurate. That herd of horses is a fantastic resource for validating purposes and a lot of things.

27:22

The fact that they haven't been dewormed for 41 years means that the parasites are naive to ivermectin, moxidectin, to drugs, the most used drugs, the most used dewormers in equine parasite control. And these parasites have never seen those. So, they are not resistant. We can look at what the genes may be of resistant parasites and compare those to parasites from these horses. And we can start mapping out, what are the genes? There so many different genetic mechanisms and were still struggling to understand exactly how drug resistance works on the genetic level, in horse parasites or parasites in general.

28:10

The other herd is a herd of miniature horses that was established in 1974. And Dr. Lyons did a series of studies with these where he basically just dewormed them, not anything excessively, but with commercially available dewormers following sort of the norms of the time. He typically would treat them every two months year-round, which is not what we recommend any more, but that was recommended back in the 1970s, 1980s, and he just documented how quickly resistance develops. He first used one class of dewormer, the benzimidazoles, that's where you have fenbendazole and oxibendazole, so panacur, those kinds of products and got resistance within eight years. Then he shifted over to pyrantel products, especially strongid dewormer. Staying six times a year protocol and got resistance within six years, and now he's showed that they had resistance

Episode 1 / February 2020 / A Discussion with the University of Kentucky's Dr. Martin Nielsen

to both. So these parasites are double drug-resistant, which is actually the norm, all over the world, to have small strongyle parasites that are resistant to our big drug classes and leaving only ivermectin, moxidectin as the last resort. And so, we have a simulation. I call it a "mini," pun-intended, simulation of the real-life scenarios that most people are starting with, facing around the world, and that allows us to evaluate various deworming programs, regimens in the face of resistance to kind of see it. When you already have resistance, how can you go about deworming wisely? And so, it was just tremendous resources that you will find nowhere else in the world, and I try to raise funding to support them periodically because I think they're worth maintaining for the future. I think it is in everyone's interest that we keep these horses available for the type of work that we do. And I also make sure to share resources, samples, etc., with collaborators again, because we're kind of the only ones that have this. I get a lot of interest from researchers at other institutions, both here in the Midwest, but also international, for samples and materials, etc.

30:31

**Michelle Anderson, TheHorse.com**

So besides the actual living, breathing horses in your herds, what tools do you have that technology allows you or what technology allows you to also do your research?

30:48

**Dr. Martin Nielsen**

What technology allows me to do my research? I mean, I think part of my research is actually to develop new technology, and so we've developed on the diagnostic side a few diagnostic tests that we're helping colleagues develop and validate additional tests, so, blood tests, looking for bloodworms in small strongyles. The small strongyles have this encysted stage where the larvae just sit in the mucosal wall, and no egg count will ever detect them, and so finding, um, finding a method that can actually detect the presence of these and approximately how many, that's a collaboration with the folks over in the United Kingdom. And then we have this automated egg counting system that we have developed here. It's basically trying to see if we could get a machine to do the counting for us instead of us having to do it by the microscope with our little clicker. And then so the concept is to, uh, use image-based analysis, that we have a system that takes a picture of a sample, where the eggs are filtered and then stained. And then it's an image analysis algorithm that recognizes the eggs based on

shape and size and delivers an egg count in two and 1/2 minutes. We develop that and validated that. That's very precise, much more precise than anything else or any counting method. And so, those are technologies that we are part of developing, if not, developing ourselves.

32:30

I think if you asked about emerging research technology, in sort of a broader picture, one thing that's happening right now and in this podcast series, you will be hearing about this from a lot of people is "-omics" concept. So, any word that ends with the word "omics." Ah, that's just, uh, that's the description of a method that generates a lot of information. So, for example, genomics. So all the sequencing, genetic sequencing material from the entire genome, and that's something we can do now from the parasites. We can do it for horses, prepare the two, um, and because it's become affordable. It used to be extremely expensive, and price is going down every year. And the sequencing technologies are becoming better and better as the quality of the data that you get is going to get better and better. You can do transcriptomics. So that's the genes that are expressed to DNA, it's translated into RNA, RNA are the genes that are actively upregulated. So not only can you ask what are the genes, you can also ask which genes are active in response to fill in the blank. And so again, we could do that in response to dewormers, expose parasites to a certain dewormer. Are there any genes that are upregulated or downregulated? Recently I had a PhD student who's defending her dissertation this fall and doing exactly that as with parasites and horses. So, all of the sudden we can start getting into these things that we weren't able to before. There's you know, a proteomics. So that's looking at what proteins are the parasites making. And there was metabolomics. So anything and everything "omics," that's a big area right now and will continue to be going forward.

34:29

**Michelle Anderson, TheHorse.com**

So, when you talk about equine internal parasites, you talk about parasite control. And if people, if horse owners are talking, we tend to say deworming or deworming program. Why do you think it's important to shift that language from deworming program to parasite control program?

34:56

**Dr. Martin Nielsen**

Well, I mean, because parasite control is more than

Episode 1 / February 2020 / A Discussion with the University of Kentucky's Dr. Martin Nielsen

deworming. I think we want people to think about that and be aware that it matters how you manage your pastures, the quality the pastures are, stocking density. And then if you want to do something sophisticated, you could do mixed alternate grazing with sheep, cattle. I see people doing that in some areas of the world, not so much here in the States. I see that a lot in Ireland, for example, some in New Zealand. And so you know there's so many other things you could do that are helping control the parasite. Deworming also means getting rid of the worms, if you really think about it, and we have to realize that we're never, ever going to get rid of the worms. But we can keep the parasites under control so that we minimize or avoid that risk of parasitic disease. That's the goal here. And I think we have to remind ourselves, and each other, that's the goal—it's to control the parasites, not eradicate them. I think you can say we actually tried eradicating the parasites, I think chemical warfare we've been leaving against them. It was probably with that in mind. And then I think, you know, it's safe to say that when we get rid of a single one of them, but we've got a lot of resistance out of that exercise, so we know that's not sustainable. So a little bit more of a holistic approach where the deworming is understanding the part that they'll never go away, but we have to use our deworming products wisely.

36:49

**Michelle Anderson, TheHorse.com**

So you mentioned that Mini herd that you have at UK and the resistance and how quickly that developed with the internal parasites in those Minis, which to me as a horse owner is kind of terrifying. But you said that that those Minis were dewormed on that traditional program that was recommended in the 1970s and 1980s, and I find that horse owners are still following those same protocols that are now outdated. Why do you think horse owners have been so reluctant to change and adopt parasite control guidelines rather than a deworming program?

37:29

**Dr. Martin Nielsen**

I think there's several reasons. I want to emphasize that I actually do see change. Um, I see changing what veterinarians are recommending now, and I see that in a number of different places. Uh, this morning I had an email come from the American Association of Equine Practitioners that I work with. They were like, there's this survey that was recently published by the FDA, the Food and Drug Administration of the United

States, where they asked veterinarians, cattle and horse veterinarians various questions about how they approach parasite control and what they recommend to their clients. And it was very clear that equine vets are really recommending all the right things. The things that we put in the guidelines paper, so you know, the message is coming across. And so I think you know, I think we just have to realize that changing flow. We also have done a number of surveys targeting horse owners, two of them. You know, one was nationwide with the so called "NAHMS"- National Animal Health Monitoring Systems. That's a program in the USDA. I was part of that with them. In the equine survey of 2015-2016 we asked them, asked horse owners a lot of questions about how do you approach parasite control? And then we were able to compare those results with a similar survey also done by the same entity, NAHMS, in 1998, so 20 years apart. And interestingly, we did see change. Um, most, actually, the change was primarily just not treating as often as back in 1998. People treat, they deworm less, less frequently per horse, per year. That's interesting. And I think there's a recognition that, you know, a lot, there's been way too many treatments. Way too many deworming treatments administered, people overdewormed, and it hasn't been necessary. So, that message has come across. But there is certainly in that survey a reluctance toward getting a whole lot of parasite egg counts done. And you know, when you think of the psychology there, you can actually understand, because you look at two recommendations, uh, one is, deworm less--that saves you money right there. So that's a no brainer, and you realize that your horses are doing just as well with fewer dewormings. So that's great, everybody's happy, horses are happy, and horse owners are saving money, great. The other recommendation adopting more parasite fecal egg counts, that comes with a cost, a cost per sample, for getting that analyzed, but it also costs in terms of extra effort, getting the samples collected, getting them shipped or up to the clinic, or whatever you're gonna do, and you know the cost per sample is often more than it is for a dewormer. So there is reluctance there, and I think that's basically just because of the cost.

40:50

And then there's, you know, there's some confusion. What do we do with those egg counts? What does it mean when you get an egg count? How do you, what do you make of those counts? And I think that's where I come into the picture, really educate and give talks, seminars, doing podcasts like this, really, just trying to provide as much guidance as possible and in terms of

Episode 1 / February 2020 / A Discussion with the University of Kentucky's Dr. Martin Nielsen

what to do with these things and maybe reduce some of that confusion. I think I often hear from people. I participated in a couple of those Facebook groups where horse owners can ask veterinarians questions, and I chime in there as much as I find time for it. They often say you know, you get as many opinions about deworming as you, you know, as you ask people. The more people you ask, the more opinions you get. And I see that, I recognize that, and I try to just do what I can to at least provide the guidance I think is right. And sometimes I make jokes about it but say, well, that's fine, you get a lot of different opinions as long as you just do what I say. But, you know, I recognize that it's hard and then, you know, the last thing that also is certainly a factor is just, you know, traditions can be strong, you know, we're used to always doing things this way, and that's human nature. You're just not necessarily very willing to start changing something that you have done for a long time. And so that is, that's also a little bit of a psychology brought against it, people have a certain way of doing things they're comfortable with and uh, you know, regardless of how much fancy information I might be able to show them or provide them with, it's still an uphill battle to get them to change their approach. But I think it's happening. I just think we have to be patient and just sort of, you know, that this is a slow process and it's a gradual process, and that just requires people like me and my colleagues, we just need to keep going.

43:14

**Michelle Anderson, TheHorse.com**

But didn't you say that those Minis had resistance within six years?

**Dr. Martin Nielsen**

Yeah

**Michelle Anderson, TheHorse.com**

So, the resistance happens quickly, but change in our management is happening slowly. Is that okay?

43:30

**Dr. Martin Nielsen**

No, I mean, I'm not going to say, I'm not here to say that this is all great. Um, but I think I may just have to accept, uh, those are the conditions we're working under, changing direction, changing habits is something that just don't do overnight. And yeah, that happened quite quickly. I think. I think though as a general concept, I think we can say that resistance in parasites is much slower to develop than drug resistance in bacteria. And

there's many, many reasons why, but it takes, it is a slow grinding process with the ascarid parasites that are roundworms in foals, it took, you know, 20 years. In 20 years of heavy usage of Ivermectin before that started popping up, uh, in the early 2000s, and now it's everywhere. And so it is something that takes years, sometimes even a couple of decades rather than weeks or months, like you sometimes see in bacteria. And then the other thing that's different between bacteria becoming drug resistant in parasites, um, is once it's there in the parasites, it never goes away. So resistance, once it's developed, it is here to stay, and the parasites will never, ever revert back to becoming susceptible to the dewormer. So once we've lost the dewormer, you know, in a different, a specific parasite, it's never gonna come back.

45:14

**Michelle Anderson, TheHorse.com**

So what's the consequence of that, of not having a way to treat those in horses that do need treatment?

45:23

**Dr. Martin Nielsen**

Yeah, I mean, that's sort of pretty obvious that, you know, we would like to be able to have an effective couple of treatment options for that horse. And we might be in situations where we don't, and I think that's the big fear. That we end up having nothing that works. Even though, most of the time horses are completely healthy even with sizeable parasite burdens, but every now and then there's the single horse that isn't, right, and that's really what we're here for. That's a) trying to prevent that from ever happening. And b) if it's happening, that horse is sick from its parasites, then we want to be able to treat that horse and do it safely and effectively. And those are the scenarios that we are, you know, sort of moving toward. We can look at small ruminants, the sheep and goats, and they're a little bit worse off than we are with the horses because there are plenty of examples of total drug failures where you know you have a population of parasites and affecting goats and sheep and nothing works, regardless of what you're throwing at them. At least we still have somewhat effective options for each of the important parasites in the horse. But we don't have as many options anymore. In many cases, we might be down to just one option for these parasites.

46:46

**Michelle Anderson, TheHorse.com**

So, with that in mind and the work that you're doing,



Episode 1 / February 2020 / A Discussion with the University of Kentucky's Dr. Martin Nielsen

where do you think we're going to be in 10 years when it comes to parasite control?

46:56

**Dr. Martin Nielsen**

I mean, I hope that, that we will have a new dewormer for horses on the market. Like I said, there was really no ??? right now. It's been like this ever since I started 15 years ago. And so ... but in 10 years, there is recent and these would be optimistic and hope it's something new could be made available. If that happens, I hope that we as an equine industry, including veterinarians and the pharmaceutical industry, have learned from the history and are not going to be committing the same mistakes again. Um, which is, no, forget about testing, just go ahead and blast them, we now have something that works, everything's great. I mean, if we end up doing that again, that would be a terrible mistake. And I'm gonna be here to do everything I can to prevent that. But I know that there's also some marketing forces in here, where if you're a company you want to maximize the selling. So there's some different interests there. There's certainly hope that we can at least approach this differently than how it was done in the past.

And then I think we'll have more exciting and convenient diagnostic tests. Tests that are, you know, easy to use and cheap and meaningful that will allow us and inform us about the needs of any particular horse. And so those are things I think in 10 years we'll know much more about all the genetics that I talked about earlier with the "omics" approach, and I think that would give you, that will provide us much better understanding of genetics behind resistance. They might also lead to discovering new drug targets and better diagnostics. There's a lot of potential there that I think we'll be tapping into a lot over the next 10 years.

48:56

**Michelle Anderson, TheHorse.com**

Well, we touched earlier on the new generation of researchers coming up and your work mentoring graduate students in your lab. Do you have any specific advice for young people who might be listening to this podcast and who have an interest in this area and want to enter it? What would you tell them?

49:17

**Dr. Martin Nielsen**

I want to emphasize that, yeah, I have my graduate students but I have even more undergrad students. Currently, I have about 10 undergrads working at my

lab or doing projects with me. And I emphasize that because you know that most people you know in higher education at least have been an undergrad at one point. And the earlier you can get involved with something like this or just getting some experience with being involved with research, whether that be equine parasitology or something else, the better. And that's what I always say when I have, ah, have an undergrad in my office to aspire to us you know, starting this podcast, and they're always asking, you know they're saying, I don't even know much about research, Dr. Nielsen, but I'd like to get a little bit of experience. And then I said, that's a perfectly fine motivation for coming here to work with me. I mean, I don't need people to tell me I've always dreamt to be a parasitologist like you, because that's gonna be a lie, in most cases. But, you know, there's just this general curiosity about something that they don't know about, but they're willing to learn about it, that's perfect. And so, you know, I encourage young people to get involved in many universities. If you're interested, specifically in parasitology and you have a university with a veterinary school, there will be parasitology people, labs with researchers and people who do diagnostic work where you can come and get involved and reach out. And I think most professors are like me, you know, we know there's gonna be a generation after us, and the only way to make sure that it's gonna really happen is to encourage and engage with as many young people as possible. I've even, uh, had high school students come and do projects with me for science fairs. Um and, uh, that's been just as much fun. So I'm not saying you have to, I'm just saying that that could also be an option to be able to do or get involved in some projects as a high school student. So I think it's just a matter of reaching out. Um, and that most labs would be very welcoming unless they have, like, certain restrictions that I don't have with horse parasites. Like the other animals might have parasites that are zoonotic, meaning that they can infect people and there's some biosafety issues that you also have to deal with before you get to work with those. Not that it makes it impossible, that just it's another little obstacle. Me, with the horse parasites, none of them infect people. So we're very safe here. So yeah, I'd just encourage if anyone has an interest, um, and I get lots of people just asking me questions, emailing me or asking questions on some of those Facebook groups that I mentioned before. I mean, there's always an opportunity to reach out just ask.

52:41

**Michelle Anderson, TheHorse.com**

So that is the human resource, bringing people into

Episode 1 / February 2020 / A Discussion with the University of Kentucky's Dr. Martin Nielsen

research and getting the next generation excited about research. But research is also expensive. Can you tell us a little bit about funding sources and how research like yours gets the financing it needs to go forward?

52:59

**Dr. Martin Nielsen**

Yeah, I think there's, for me there's actually four categories of funding. So we have the federal grants, like USDA, NIH, etc., where you can apply. There's calls, different themes. And if you think you have something that might fit, then you can submit a proposal and keep your fingers crossed. I have been funded through the USDA. Currently, I am funded in a collaborative project where we actually have a bacterial dewormer that we're testing in horses. It could be something for the future, actually. We did a treatment trial in the fall in foals, and this stuff just knocked out the ascarid parasites, which is very exciting. It didn't really do anything against the strongyles, so we need to look at what we can do to maybe make that work as well. But at least we have great promise with ascarid parasites, just as an example.

So, federal funding could be one category. Then I get what I called industry funding or pharmaceutical funding. So some of these drug companies, dewormer companies, some often would have an interest in us doing various projects that are related to something with their product. Not necessarily just testing the efficacy of the product, we do that too, but with the sponsor of this podcast, I have a long history evaluating, um, both inflammatory and immunological reactions to parasite infection in horses and to deworming of those parasites. So if you have a horse with a burden of parasites, is there any risk of an adverse reaction if you deworm it with a very effective dewormer, and we've done that with a series of different types of dewormers. That's been a very, very beautiful avenue of research for me and we've been able to really look at how the parasites interact with the host immune system and vice versa. There's a whole lot of cross talk going on there. It's kind of fascinating. So, that's just an example of some of that research. So industry funding was the second category, and then, um, private donations. So philanthropy, if you will. So, I do get donations from, single donations from the average horse person that just feels like, OK, Martin Nielsen is doing some interesting work. I'd like to support it. I've run a few crowdfunding campaigns rallying support. That's been quite useful. I get support from some of the some of the horse farms around here and elsewhere in the world. They just appreciate the work that we're doing and want

to support us going forward. Some of that goes to those Mini research herds that I talked about before. I mean, they don't come for free, so I do have a budget, about \$100,000 a year that I need to find to keep them. And so, that's philanthropy's part of funding. And then the fourth category is business investing. And so that's interesting when I talk about that automated smartphone-based app system, that does the egg counting automatically with image analysis. We have actually established a spinoff company and then through that, we've been seeking private investors that are investing in the business. But part of that is research dollars that allows my lab to do more allegation and develop and try new things. So, and in this day and age, you've got to just basically go in all possible directions that might lead to some funding, and it's a lot about selling your idea and pitching it. It's kind of a Shark Tank approach sometimes, you know, what are you going to get out of investing in Martin Nielsen's program? But I think it's a challenge. I think it's also a fun one. Many times a big part of my job to be a fundraiser and nurture these relationships with entities that could have an interest in what I do.

57:10

**Michelle Anderson, TheHorse.com**

So that makes me want to see you go on Shark Tank. I think that would be, yeah, it would be interesting to see how Mr. Wonderful responded to horse worms.

Spk\_1

Right, right.

**Michelle Anderson, TheHorse.com**

We're coming to the end of our hour. But before we go, I wanted to you ask you, what is the one thing you hope horse owners take away from this conversation, if they're listening.

57:35

**Dr. Martin Nielsen**

If they're still listening, I'm gonna say first, thumbs up. Thank you so much for staying with us. No, I hope that horse owners, veterinarians, etc. leave with the knowledge that we're here, I am here, my lab, my people, we're here to serve you. That's really our mission here, and that's really all it is. We're trying to do everything we can to help and to guide and to provide new technologies, new options, treatment-wise, diagnostic-wise, uh, basically ask the questions that you are faced with. I hope. I hope that that's the impression I've left. That's at least what I'm trying to do here.

Episode 1 / February 2020 / A Discussion with the University of Kentucky's Dr. Martin Nielsen

**Michelle Anderson, TheHorse.com**

Well, that is all the time that we have for our conversation. But I want to thank you, Dr. Nielsen, for joining us. Really interesting conversation this morning.

**Dr. Martin Nielsen**

Well, thank you for having me, and it's an honor to be the first on this series.

**Michelle Anderson, TheHorse.com**

Yes, thank you, thank you. Thank you for being so helpful. I also want to thank our sponsor, Zoetis Animal Health, for helping make this podcast series possible and to our audience, thank you for listening. We hope you will subscribe and join us for the next episode of "Equine Innovators" Podcast. If you're interested in more horse health news, please go to TheHorse.com. Thank you, and we'll talk to you next time.