

Host

Dr. Sarah Probst Miller

**Dr. Sarah Probst Miller**

Welcome to our next addition of P's in a Pod. I am sitting here with Dr. Kent Schwartz and Dr. Aaron Lower and I am Dr. Sarah Probst Miller. We are going to talk about ileitis today. We really want to just go back to the basics and talk about what is ileitis, what is actually occurring in the body when we have that disease, and as veterinarians out there, like Dr. Lower, trying to make decisions on what is best for the client, how are we basing those decisions, what are we doing to gather diagnostics, and how to make the best decisions for our clients. So, Dr. Schwartz, let's start with a very simple question, I hope, and that is, what is ileitis? When we are out on a farm, how do we explain this disease to our clients?

Dr. Kent Schwartz

That's a fair question. Ileitis is generally regarded as a disease associated with a particular organism, *Lawsonia Intracellularis*. It's a pretty common infection amongst swine herds. It doesn't have to cause disease, but certainly is capable of causing mild to very severe disease by infecting the epithelium or the cells that line the intestine and altering their function. Ultimately, that disease can resolve after weeks or it may persist, it is extremely variable on its outcome.

Dr. Sarah Probst Miller

When you look at the literature, folks site that it can cost on a per pig basis anywhere from \$4.00 per pig to \$20.00 per pig depending upon the severity. I think that ultimately, it results in a lot of variation and impact on the number of pigs that we can get to market at the right weight.

Dr. Kent Schwartz

I honestly think you hit on a key term right there with variation. The disease causes a lot of variation in terms of its impact, the severity of the lesions, and certainly its impact on growth, feed efficiency, this varies from pig to pig, group to group. Variability is really the definition of this disease.

Dr. Sarah Probst Miller

Yeah, now Dr. Lower, when you are on farm and you see variation as an issue, what are some things that you as a practitioner are doing to measure some of that variation to help explain the impact of that to producer?

Dr. Aaron Lower

Well, we look a lot at the close-out numbers in a barn and that's not very real time. It's a lot of looking backwards on where we've been, but looking at the number of lights and the percentages of culls that are pulled out of a barn is what really signals us to look at the variation and really try to track down what's the cause of that.

Dr. Sarah Probst Miller

Have you done any work with specific close-outs as to actually looking at the variation in an individual kill or different cuts from a barn?

Dr. Aaron Lower

Yeah, one of the things that we look at with our clients would be the variation of weights coming out of the barn and helping them to try to optimize their slaughter weights and this is one of the key areas that

we can look at and compare between producers is what is that weight variation on loads set to market, so typically, we see weight variations around 16 pounds as a standard deviation, but when producers are above 20 pounds, it starts to signal there is quite a bit of variation in that barn and that we need to look at what the causes of that variation might be.

Dr. Sarah Probst Miller

And I'm sure on your list, I know on my list ileitis is very high, especially during the summertime and maybe when we are seeing clinical signs. It may be the root cause of some of that variation and some cases and there may be other variables, but when we're looking at ileitis, why does it occur? I mean, it's in some pigs normally, naturally, potentially commensally. When does it cause disease and why?

Dr. Kent Schwartz

That's a very good question and I would answer it with my favorite answer for most questions related to biology is "it depends". It depends a lot on the dose that an animal will receive. It depends a lot on the age at which the animal receives it, that dose. It would depend upon whatever residual maternal immunity either in terms of antibody or cell mediated modulations still remains in that animal. It probably depends upon some of the interaction within the environment itself and the hygiene that would be present there. So there's a lot of factors that influence how this organism transmits the dose it transmits and the susceptibility of the pig.

Dr. Sarah Probst Miller

Now, as vets we often look at serology as a way to help us figure out the actual timing of exposure to the organism. What is really shifting that timing of when it occurs? Is it load? Is it sow/pig transmission or what is helping determine the time at which the pigs are experiencing ileitis as a disease?

Dr. Kent Schwartz

I see that maybe as two different issues. I think exposure to sufficient numbers of organisms and replicating those organisms is likely to cause seroconversion. Bacteria are a lot different viruses. They tend to move slowly through herds. Sometimes our perception is that all pigs are exposed at the same time, but I don't think that is true at all, particularly with *Lawsonia*. So, I think the exposure can vary and when it occurs and there probably needs to be a sufficient dose, and infection, true infection, to amount serologic response and so ... factors that might influence when a pig is exposed. Probably would include management style, pig flow, any of the co-mingling go on as well as the use of antimicrobials. I certainly think that antimicrobials can prevent exposure by decreasing the dose, but it won't eliminate the organisms. So, when the antibiotics are moved then there's an opportunity for the organism to transmit again.

Dr. Sarah Probst Miller

Now, when we are using diagnostics to try to figure out the best timing to reduce the load...I've been guilty of using serology alone at times to figure out that timing. On better days, I've used both PCR and serology and on my really great days, I might even throw in some necropsies with that. I mean as veterinarians what is really the best strategy to figure out if we think a strategic pulse of medication is right? What's the best way for us to figure out that timing?

Dr. Kent Schwartz

Well, I think your clinical assessments probably would dictate whether some type of antimicrobial intervention could be warranted. In terms of determining timing, I think the way I have used serology is that answers the first question of, is it even there, right? And if there's seroconversion occurring,

certainly there has been infection. Then when one thing affects the timing of sero conversion related to infection it's generally going to be 3-4 weeks. The biology of *Lawsonia* is such that animals are infected and can harbor that organism as it proliferates for 2-3 weeks before the animal recognized it as a foreign antigen. Then, it can take another 2-3 or 4 weeks to actually seroconvert. And so when one looks at when sero-conversion is starting in a pig, there is a good chance that infection was as much as 6 weeks prior to that. And so if you hope to influence the organism and it's interaction with the host with an antibiotic, one would suspect that you would want to put it, the antimicrobial at least 3 weeks prior to sero-conversion and probably not more than 6 weeks. They need to be infected for it to be effective.

Dr. Sarah Probst Miller

And review for us, as veterinarians, what is actually going on in the ileum? Pathology wise...what is occurring there to cause the damage that impacts our operational drivers?

Dr. Kent Schwartz

Lawsonia infects epithelial cells as we mentioned before. Basically, stops their development so that they don't mature and so those cells pile up. The gut thinks it needs more of them so proliferation rate increases, so it in fact causes a thickened immucosa, that doesn't function as an intestine with the digestion and absorption. And that lesion can occur in the jejunum, ileum, cecum or colon, and in any combination. And the pig has those organs for a reason and so it compromises the function and that would be the method by which it compromises feed efficiency and growth. Ultimately, depending upon clinical form or pathologic form, the lesion itself can cause significant damage with necrosis inflammation, hemorrhage, and sometimes death.

Dr. Sarah Probst Miller

I was always amazed by the range of damage that we see in relation to ileitis. You know from these sub-clinical, can't see the white glove behind the ileum tests to all the way to necrotic, bloody, hemorrhagic ileitis. When we are at the sub-clinical level, what are we seeing on pathology as comparison to when we have say, clinical ileitis versus hemorrhagic, necrotic ileitis?

Dr. Kent Schwartz

It seems like an easy question, but it's really not. Sub-clinical would mean that we can't measure it there's no clinical effect and indeed there can be some substantial lesions present and some compromised growth that wasn't noticed, wasn't measured. Some animals can look fairly robust and have extensive lesions. If one were to backup, the simple concept that I've got that is when *Lawsonia* infects an animal, replicates in the epithelial cells, causes mild to moderate damage during that process, you get about two weeks into that process and the pig's immune system has to decide how it's going to respond. If it responds early and not quite as aggressively, it probably will eliminate the infected cells and we will never ever see clinical sign in that pig as it goes ahead and resolves back to normal. If that immune response is robust and includes a lot of cell mediated immunity, a lot of killer cells if you will that would kill the epithelium and denude the surface of the gut. Then, the hemorrhagic, necrotic form seems to be what shows up. So, the extent of that infection and the aggressiveness of that response sort of dictate's the outcome of that individual animal.

Dr. Sarah Probst Miller

Why does hemorrhagic ileitis occur?

Dr. Kent Schwartz

My suspicion why the hemorrhagic form, it's generally seen in older animals, nearing market weight or in gilts introduced to a sow farm. My suspicion is that it's related to the severity or the magnitude of the immune response and the quality of that, such that, these pigs are totally devoid of any maternal immunity modulation. The organism replicates for a period of time, probably infects quite a few cells. For 2-3 weeks that animal mounts are very robust so immediate response and over-aggressively eliminates the epithelium and causes the hemorrhagic episode. So, I think it's probably an over-aggressive immune response to late infection without modulation of age dose and maternal immunity.

Dr. Sarah Probst Miller

Now, as veterinarians out in the field, why do we tend to see hemorrhagic ileitis seasonally?

Dr. Kent Schwartz

I don't know! What's the right answer? You know, our data would show that indeed the number of cases we get of ileitis will increase in the late summer and fall, so there's seasonality to clinical disease presented to a diagnostic lab. I honestly don't know the reason why. I don't!

Dr. Sarah Probst Miller

Yeah. I can only speculate that maybe in the heat of the summer they are more...the pigs are more stressed and maybe hot, not eating and maybe not getting the continuous gut flow. It seems that it's during those months that I see more hemorrhagic ileitis in the field. And it's often on farms...and I think Dr. Lower you have a case that you want to talk about a little bit where...either they're...they have perhaps too much antimicrobials in the feed or in some cases not at all in the finishing stage and so. Aaron, why don't you talk a little bit about the case where you had a finisher that had no antimicrobials in the feed, had not chosen to vaccinate pigs, as an alternative to preventing the disease but this farm is doing no prevention. Can you talk a little bit about their decision?

Dr. Aaron Lower

Yeah. This producer as we all know when the economy got pretty rough, they pulled a lot of their interventions and they felt strongly that they were... had a high inclusion rate of bi-products and distillers and corn germ and thought that the increased bulk and fiber in the diet would help control ileitis and pull out antibiotics and vaccine. And one of the things that we did with Pfizer was a STOMP project to look at the serology of their finishing diseases and hence a lot of clinical ileitis in the finishers, but would we see from time to time and typically in the late summer some hemorrhagic ileitis and then also a little bit of late cough. So we decided to do a cross-sectional bleed of the finishing to look specifically at when the ileitis sero-conversion was happening as well as trying to pin down the cause of that late cough. When we bled these pigs, and this is a mycoplasma, positive sow farm, we were able to see that pigs would start converting to mycoplasma at 14 weeks of age and then were 80% positive near the end of finishing.

Dr. Sarah Probst Miller

Did you see any clinical signs in these hogs in relation to mycoplasma?

Dr. Aaron Lower

Yeah, there was a mild, dry cough in late finishing, but not really that severe and affecting performance, and causing mortality, but was definitely evident in the barns. Additionally, when looking at the ileitis these pigs started to sero-convert around 18 weeks and then were 70% positive at 24 weeks of age.

Dr. Sarah Probst Miller

And clinical signs in regards to ileitis, what did you see there?

Dr. Aaron Lower

Most of the year we don't see much, but we do see significant...or we do see hemorrhagic ileitis during the hot summer months. So, my...the question posed to me from the producer is, is it cost effective and what are my options for trying to control and look at ileitis control and mycoplasma control in my finishing flow?

Dr. Sarah Probst Miller

And so, what options did you talk about or/and what are you thinking as far as timing?

Dr. Aaron Lower

Yeah. With ileitis, we discussed the options between vaccine and strategic feed medication pulses to help control that organism. Additionally, with mycoplasma, this herd was vaccinating and so we couldn't really change much of that vaccination program, but could look at different changes in gilt development because they had a mycoplasma, negative gilt source and then also strategic pulses of feed antibiotics to help control the mycoplasma pneumonia in late finishing.

Dr. Sarah Probst Miller

So, Dr. Schwartz, when we look at this case and the work that Dr. Lower has done so far, do you have any tips, diagnostically, for pinpointing the right time of intervention or pinpointing what sort of strategic intervention would be appropriate in this case?

Dr. Kent Schwartz

Well, when I look at just serologic data, I also have to ask the question of impact and clinical affect and so it would be nice to couple with the serologic data some definitive evidence that some of the clinical signs were associated with these organisms of PCR done on feces from pigs that are loose and we do these surveys fairly routinely, but it's nice to demonstrate *Lawsonia* and that *Salmonella* and brachyspira aren't there. It adds a little confidence in the diagnosis. Once one has done that, you are feeling fairly confident that *Lawsonia* is a player. Then, I think the strategic use or pulse dosing of antimicrobials is certainly a pretty good option. One would probably want to do that at some of the earliest clinical signs at least to pulse there and depending on what age that is, if that's 18 weeks, one might have to pulse them another time or two. I think it's going to be somewhat farm specific or system specific, and in lou of your discussion, maybe some seasonality applied to that as well.

Dr. Sarah Probst Miller

Aaron, in this system are you dealing mainly with wean-to-market barns or...and what is the size of the specific sites?

Dr. Aaron Lower

Yeah, these would all be, for the 80% of production, would be wean-to-market barns and mostly 1,200 to 2,400 head size in barns.

Dr. Sarah Probst Miller

And so, Dr. Schwartz, when you think of barns that size does that have an impact on our decision as far as the load that they are experiencing? And is it typical for that load to be somewhat the same if those sites are that small and they're fairly far apart and it's the same flow?

Dr. Kent Schwartz

Well, I think you are into opinions and experience, hard to measure type question there. I think experience would tell us that some of these events are fairly predictable. You don't have to measure every barn to know that it is a fairly consistent finding. So, you know in a situation described, I would think that once you accumulate sufficient data with sufficient confidence, you know on a site or two, I think you could start to make more broad recommendations across the system with some confidence.

Dr. Sarah Probst Miller

And, so Aaron, have you done any necropsies or fecal PCR's on this case or is that something that is on your radar right now?

Dr. Aaron Lower

Yeah. We did necropsy a few of the hemorrhagic, diarrhea pigs and submitted them and they were positive for *Lawsonia* in the ileum. So, we do feel like we have infection and some clinical disease, but it's still tough for the producer to make the decision when times are tough like this. He isn't losing a lot of pigs, but he is losing a few and trying to make the decision on whether the interventions are cost effective.

Dr. Sarah Probst Miller

And so, when you...should you convince the producer to have an intervention, how are you going to measure impact or what are your plans on measuring impacts? What are the capabilities of the system?

Dr. Aaron Lower

Once again, it is going to be a lot of reflective data; it won't be very real time. I would look at mortality, average daily gain, feed conversion, culls, lights, parameters such as that and chart that and look to see if our intervention made a difference.

Dr. Sarah Probst Miller

In an ideal world, let's say we had all the inputs that were necessary, Dr. Schwartz, what would be...what would be the ideal way to measure the impact of disease that can be both, sub-clinical, clinical, and sudden end deaths?

Dr. Kent Schwartz

Well, I think the question you ask is being increasingly asked, particularly for some of these endemic infections. And from where I sit, well-designed field trial with sufficient replication for...to detects statistical differences can be extremely valuable to sort this out. You know obviously not every farm, not every system can do this on every event. But, when you have clearly interventions that can prevent a disease and you compare to those to pigs where that intervention isn't put in place, it would seem to me that regional data could be collected and then applied across farms as some evidence for the impact of that intervention. And as...in all these cases, you ultimately have to compare it or have to keep in mind what the overall productivity of the farm is, what's it capable of achieving and what it is currently achieving? So it is a production goal driven system.

Dr. Sarah Probst Miller

As veterinarians in the U.S., we're blessed with many opportunities to different ways that we can treat ileitis ranging from vaccination to several feed antibiotics that can make a difference. I know in this case, with both mycoplasma as a factor and ileitis as a factor, I personally might lean towards an

antibiotic that covers both mycoplasma and ileitis. Whereas in another case, I might lean towards vaccination or something more specific to ileitis.

Dr. Kent Schwartz

Yeah, one of the problems with vaccination is that you're shooting a rifle. You're attacking one target. And we know *Lawsonia* vaccination can be very, very effective. We know mycoplasma can be pretty effective, but at the same time that's only one agent. In the case of *Lawsonia*, gut flora is much more complicated than one bug. And so, I think practitioners tell me that pulse doses of medication sometimes have increased value maybe beyond just a single agent that they're treating. And I can, in my mind, rationalize that because we're looking at a micro-flora that's very complicated. The whole issue of spirochetes enter into this discussion. Other anaerobes, aerobic bacteria, antimicrobials could be having an effect on something we don't know. And so, one could argue that antimicrobials are a reasonable approach to control some of these late term problems.

Dr. Sarah Probst Miller

Absolutely, now Dr. Schwartz, I'm sure you get a lot of submissions from veterinarians that you wish we would have submitted it better or in a different way. When it comes to enteric diagnoses and submission, how can we, as vets, be better? And, you don't need to call Dr. Lower out or anything, but you know. What can we do to get the best diagnoses?

Dr. Kent Schwartz

Well, I'm backtracking here just a little and again, probably because I live inside of a white walled room, but, I continue to be struck by an advertisement out there that says "a barn is not a pig." And I think what that's telling me is careful assessment, clinical assessment of animals in their environment is critical to be able to understand what disease impacts may be occurring. Careful selection then of representative animals becomes important. A systematic approach to assessing the barn, assessing the environment, and assessing tissues at necropsy is very important or a collection of samples whether we are collecting blood, whether we're collecting feces or actual tissues or oral fluids. So, I think having a veterinarian very much involved with that process rather than allowing technicians, that may not know exactly what they're looking for, do the collections can really be helpful. Because by and large, our swine veterinarians do an excellent job of selecting tissues, preserving tissues, and getting it to the laboratory when they are directly involved.

Dr. Sarah Probst Miller

Great! Well, thank you so much Dr. Lower and Dr. Schwartz for talking with us today about ileitis. It's a disease that we deal with on almost every finisher, and ...although, it's a very common disease, I think that we talked about some things that we can go out and apply in the field and we hope that you can apply them as well. So, as you drive down the road, please be safe and have a great day!