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Field experiences in post-weaning diarrhea and specific disease treatments

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Post-weaning diarrhea is the type of disease that when you have it, it is bad and when you don't, you hardly even think about it. In my experiences, post-weaning diarrhea can be severe and rapid in onset and in other cases can be mild to non-existent.

The luxury of my portion in this program is I only need to discuss field experiences and not define the pathology of disease or the pharmacokinetics of antibiotics. For that reason, I will speak in general terms about what I have seen and then also what I have used in order to battle these disease pathogens.

With any disease, appropriate diagnostic sampling and exact definition of the problem is the best place to start.

With post-weaning diarrhea, there should be plenty of opportunity for sampling both with swabs of the rectum, gut samples from diarrhea pigs, and simple clinical judgment of the history. By my last comment, I mean things like feed outages, pigs held over or overcrowded, unsanitary conditions, or other obvious contaminants into the environment.

For this case study, I will discuss primarily *E. coli* as the source and the most common cause of post-weaning diarrhea. However, I would expect on your rule-out list would be chronic TGE or the more common post-weaning Coccidia. Both of the latter can be identified and quickly solved. The primary cause of *E. coli* is a mystery in many cases.

With the *E. coli* as the primary focus of my presentation, I would expect we truly have three treatment options to review prior to getting into the case examples.

Water-soluble antibiotics

In my experience, water-soluble antibiotics at the appropriate time are the most successful and have been the most prudent in solving post-weaning diarrhea when it is not a severe blow out. When we are dealing with a pure culture of *E. coli* and pigs that are struggling for whatever reason to get on feed, simple antibiotics in the water to the entire population do the most at solving the problem. In my experience, these include Gentamicin or Neomycin. If antibiotics such as Gentamicin or Neomycin are not solving the problem, it has been my experience that there is some-

thing else contributing to the ongoing battle and we need to look further.

Sanitizers and acidifiers

Sanitizers and acidifiers are also successful on occasion. Common citric acid add-packs or propionic acid water solutions have been successful. In these cases, I believe it is the environment or the water supply that are providing a continued source of *E. coli* and preventing the pig from overcoming the disease. Sanitizers such as H₂O₂ (peroxide) or acidifiers such as propionic acid (Kemsan) or citric acid are essentially killing the *E. coli* in the water supply and could be contributing to an acidic environment in the gut that reduces growth of *E. coli*.

Vaccination

In my experience, vaccination has had limited success and taken a great deal of effort to both establish and maintain. I believe you can identify a hemolytic *E. coli* in the event of post-weaning *E. coli* outbreaks. It is my concern that maintaining this *E. coli* and feeding it back to pigs where you do not have disease syndrome is both risky business and in some cases unnecessary. We, as veterinarians, are constantly challenged to find the answer in the event that antibiotics and additives are not effective. Therefore, I can certainly understand vaccination as a method to inoculate pigs and solve the issue. However, in my experience, hemolytic *E. coli* is fed orally through water lines have not been successful at solving the true problem, which is eliminating diarrhea.

In an effort to again provide field experiences and give you my plan of action, I would outline the following strategy:

Sanitation

First and foremost, I refer back to Dr. Christa Irwin's study at Murphy Brown where they established a certified clean program for their contract growers in North Carolina. That simple study provided the entire industry with the ammunition to evaluate sanitation. If you recall, the 8% to 12% mortalities in nurseries were cut to 2% almost overnight by establishing a certified clean program where pigs were

not delivered until someone inspected and critically evaluated the sanitation of a nursery environment.

I do not know any producer who would intentionally believe to put nursery pigs into an unclean environment. However, I do know many producers who are rushed to move nursery pigs out and reload with wean pigs at a time when clean, disinfected, and dry is nearly impossible

Likewise, I know that nurseries attached to sow farms where wean pigs are held reloaded and weaned on a weekly basis. These “micro-environments” could certainly incubate large quantities of contaminants that would expose an entire population once these pigs are stressed, put on a truck, and placed in a nursery. I would challenge you as veterinarians to not become complacent with accepting the sanitation as adequate prior to inspection and review.

Feed

Feed management of early wean pigs, primarily is the appropriate diet and appropriate feed space with excellent piglet management. Piglet management requires multiple feedings throughout the day for the first three to four days. This all sounds good in practice. However, I would argue that many producers are ignoring the fact that piglets are coming off the sow with the behavior of everyone eating all at the same time. Piglets need trained to eat in shifts throughout the day. The fact remains that we need to teach pigs to find the feeder, find the water, and eat in a uniform distribution throughout the day. In the absence of hand feeding on mats or some method for training the pigs, our producers are allowing piglets to starve for three or four days before pulling them out and putting them in a separate “fallback” pen.

Education

I believe that understanding post-weaning diarrhea as a biological process is first in identifying the problem and, then second, being a person quick to react to what you see in the barn leads to the appropriate timing of treatment.

I like to explain the watery, post-weaning diarrhea as a “red winker.” These piglets get a raw, red anus from the diarrhea and are easy to see if individuals in the barn know what to look for. If they are waiting until pigs appear dehydrated or fallback, they are obviously waiting much too long to identify these sick pigs. It has been my experience that individuals who are battling chronic post-weaning diarrhea are taking the approach of solve the problem after it is severe as opposed to establishing early prevention and treatment strategies.

With respect to those battling chronic, unresolved, hemolytic *E. coli*, I would still recognize marking pigs

early and acting fast as necessary. However, further investigation into the source is recommended.

Treatment

Treating pigs should be obvious and should come quick and easy to the veterinarian. If I do not see treatment charts and treatment marks, then to me it is not well understood by the staff. Individual pig treatments for post-weaning diarrhea, in my opinion, is a losing battle as we know this will move quickly and you are simply only going to be able to treat those pigs that are still at an acceptable level of hydration. Giving broad spectrum injectables such as Excede(r), Excenel(r), Gentamicin, or others off label to me are only necessary in that very early incidence of disease. In my opinion, a quick trigger for three days of water-soluble antibiotics will be much more effective if in fact you do see the disease.

My favorite choice for a quick reaction to post-weaning diarrhea is three days of neomycin sulfate in the water using the Neomix 325 product commonly available on the shelf.

Directions for Neomix 325 (neomycin sulfate): Use the number of packets indicated below in 256 gallons of water or in two gallons of stock solution used in proportioners set to meter one ounce per gallon.
Pigs weighing 25 to 50 pounds: 2 packets

If this fails, I would commonly follow with Gentamicin.

Directions for Gen-Gard or Garacin (Gentamicin sulfate): Colibacillosis – 0.5 mg per lb per day for three consecutive days (25 mg per gallon dispensed at 1 oz per gallon).

Both Neomycin and Gentamicin are aminoglycosides and have label indication for *E. coli*. I have been satisfied with the appropriate placement and results of either of these products. On occasion a severe post-weaning diarrhea does not resolve and in those cases I have identified some other means to correct the problem whether it is an environmental contaminant or a chronic contributor to the *E. coli* infection.

I have three case examples to discuss with this presentation. First is the blow out. Second is the chronic poor-doer, and third is the routine treatment and result.

The blow out

First, with the blow out, let me explain that this producer is an excellent producer and has done a fine job of converting facilities to a nursery-grow-finish. The producer invested in a sow group and was very excited to begin receiving weaned pigs from a new 2600-sow farm. This producer group made the decision to wean pigs into an

onsite nursery and receive shipments off of a semi once a week at a 1000+ pigs per week.

This producer received 1257 pigs on day one which looked slightly rough. However, the majority of the pigs did go to feed rather quickly and the producer was rather satisfied the group looked overall quite well. Average weaning weight was 10.8 lb and by Day 2, 12 pigs had died. By 4:00 p.m. of Day 3, a total of 16 pigs had died out of the 1257 and pigs were beginning to look gaunt and empty. The local veterinarian posted four pigs from the starve-out pigs. They all had empty stomachs and severe dehydration. Coccidia was diagnosed on a direct smear from the bowel and pigs are placed on Corid in the water on Day 4. By Day 7, the pigs continued to look severe and more than 70 pigs had been sorted off into a “fallback” pen.

Keep in mind that this producer is an excellent client, strong member of the sow group, and in the past had little to no nursery mortality. However, this was right in the middle of harvest time for this producer and the limited amount of time available for starting pigs began to show. The sow unit diagnostics occurred within days of the initial phone call on Day 3 post delivery. Furthermore, we requested additional diagnostics as we were not satisfied with the coccidia being the only contributor to the diarrhea. Pigs were placed on Albon Day 7, followed by Neomix on Day 10. Pigs were also fed the Land O’Lakes gel on Day 7 to the fallback pigs. Pigs that were fallbacks or severely dehydrated continued to die off and did not eat. On farm diagnostics found the nursery at the sow farm was not being satisfactorily cleaned and sufficiently disinfected and dried prior to reloading.

The policy was established that the on farm nursery had to be totally emptied every week, no pigs held back, and no questions. Likewise, the producers in the group were all forewarned of the possibility of fresh weaned pigs arriving on the same semi as pigs that had been on feed for 3 to 5 days. In all, this case was a complete blowout as 187 pigs were lost out of 1257. The board of directors for the sow farm discussed the case and accepted a good portion of those losses as well as the owner recognizing that a quick trigger on treatment for *E. coli* may have prevented some of the mortality. In total, 150 losses were attributed back to the sow farm nursery. Likewise, a lesson learned that weaned pigs are gated off separate on the semi and the owner/producers receiving pigs from this sow farm are quick to place water-soluble antibiotics and individually feed pigs.

The chronic poor-doers

Another post-weaning diarrhea problem became prevalent at a producer receiving 2000 weaned pigs from a new 6000-sow farm. Some of the members in the group were

having excellent success with the weaned pigs post arrival and 12 to 12.5 lb weaned pigs were coming off the sow farm. This producer receiving shipments of 2000 was having 4% to 5% nursery mortality attributed partially to strep but primarily to the first two weeks post weaning. It is our on farm assessment that starting pigs was a chronic problem. However, once feeding and handling of pigs was managed the nursery mortality continued to be a battle. On this farm, water samples identified the red-orange slime as an algae growing, producing a perfect environment to incubate *E. coli* and other contaminant organisms. Simple water sampling and submission for livestock suitability identified *E. coli* to numerous to count and cryptosporidium among others. The cryptosporidium was a clear warning to the farm staff not to drink the water. However, the *E. coli* was a continued concern to me as the veterinarian and needed to be resolved.

On this farm, the water supply came from a large water shed with an on farm, above ground, 20,000 gallon water tank. The water tank supply came from two in ground water wells at an on farm pressure tank system. The owner was resistant to chlorination with this volume of water on site going to 4000 nursery pigs and 8000 grow finish pigs. Initially, we instituted the Kemsan propionic acid product to sanitize nursery water and had excellent results. Mortality has dropped to 2% or less on the subsequent six nursery closeouts and the owner is now installing chlorination of the entire water supply. In this case, we may be able to remove the water sanitizer after chlorination is in place. However, the propionic acid was an excellent diagnostic tool for solving the chronic *E. coli* contaminant.

From a pathologic standpoint, I am not certain that it was a post-weaning *E. coli* as we were never able to identify the organism or the pathology within the pigs. What I believe was occurring was the chronic diarrhea present from poor quality water and the water refusal among pigs starting on feed.

The routine

The routine process in our clinic and in my hands with many of these producers receiving shipments of early wean pigs is placement of Neomix in the event that “red winkies” or diarrhea creeps up in two weeks post-weaning. This producer receives 2400 weaned pigs four times a year into wean-to-finish barns. In this case, he received 2400 head of pigs in one week and the pigs went on feed within 24 to 48 hours. The overwhelming majority of the pigs went on feed without any problems. However, the producer began to realize that two or three “red winkies” in fallback pens and by Day 7 was recognizing a slab sided pig approximately every other pen. This producer has 50 pigs per pen.

In this case, the producer called for Neomix on a Sunday afternoon and was quite concerned that an ensuing diarrhea problem could occur. Pigs were posted and tissue was sent in for the organism, culture, and sensitivity. The producers' diagnostics are included with this presentation.

From the diagnostics and the organism identified in this pig, we would think that a severe blowout certainly could happen. In this isolate, the toxins were present and identified as listed in the pathology report (**Figure 1**).

The good news is this producer lost 15 pigs out of 2400 and was very happy with the results of three days of Neomix in the water. Nursery closeouts continue to be to be 1% or less in mortality on our best producer's farms. We are quite satisfied that early attention to post-weaning *E. coli* and the appropriate feeder management will start these pigs.

In conclusion, I might comment that enteric disease in the nursery is minimal to insignificant in many of our

Figure 1: Pathology report.

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Veterinary Diagnostic Laboratory College of Veterinary Medicine 1333 Gortner Avenue St. Paul, MN 55108	
1-800-605-8787 612-625-8787 Fax: 612-624-8707 e-mail: mvd1@umn.edu www.vdl.umn.edu	
Received: 05/24/2005 Species: Porcine	Breed: Misc Age: 6 Wks
Clinical Signs: Dyspnea, recumbency and paddling.	
History: Clinical signs are being observed in 10% of a group of 1,200 pigs at six weeks of age.	
Specimen: Fresh and fixed tissues from one six week-old pig.	
Histopathology: Jejunum - postmortem autolysis. Possible mild villus atrophy. Ileum, turbinate, brain, spleen, lymph node, heart and liver - no lesions.	
Bacteriology: A beta-haemolytic <i>E. coli</i> was isolated by aerobic culture of the intestine. There was no significant growth from aerobic culture of the liver, lung and from swabs of the brain, pericardium and a joint. No <i>Salmonella sp.</i> was isolated by enrichment culture of the colon and a tissue pool.	
Immunohistochemistry: Negative results for <i>Lawsonia intracellularis</i> from an IHC stained section of intestine.	
Molecular Diagnostics:	
Positive PCR result for type 2 circovirus from a tissue homogenate. Negative PCR results for influenza A and European PRRS virus from a tissue homogenate. Negative PCR result for <i>M. hyopneumoniae</i> from a bronchial swab.	
Summary: Isolation of a beta-haemolytic <i>E. coli</i> .	
Comments: The toxin gene profile for the <i>E. coli</i> isolate will be determined and reported as it is completed.	
Addendum: 6/16/05 Molecular Diagnostics: Positive results for the following <i>E. coli</i> virulence factors: heat stable enterotoxin A (STA), heat stable enterotoxin B (STB), heat labile enterotoxin (LT), K88 (F4). Negative PCR results for the following <i>E. coli</i> virulence factors: F18, F41, K99 (F5), shiga toxin IIe (STX IIe) and 987P (F6).	
Jerry Torrison, DVM, PhD, Diplomate, ACVPM	

client's cases. On occasion, we have battled edema disease as a contributor to mortality, but again I would stress the importance of feeder management and feed outages contributing to this problem. The presence of feed grade antibiotics in the nursery, in my opinion, is the greatest contributor to stability among our nursery populations for enteric disease. I believe that we are right in holding fast to the need for feed grade antibiotics for the healthy gut environment of the early growing pig.

