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Not all diarrhea cases require antibiotics

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Introduction

The digestive system is an amazing and complex system. One can quickly marvel at how a single layer of epithelial cells plays such a critical role in proper digestion and absorption of nutrients while simultaneously excluding pathogens, toxins, and unnecessary metabolites. This highly sophisticated system can however, be a very frustrating system to deal with when it is not functioning correctly.

There is quickly a loss of nutrients and fluid when the digestive system is not working well. This can result in rapid dehydration and weight loss of the pig. This also can result in poor average daily gain, poor feed conversion, and reduced livability that animal caretakers, producers, and veterinarians must deal with. The economic implications can be large with loss of productivity and increased medication and feed costs.

There are a number of ways in which the digestion and absorption process can be altered or rendered incomplete. We often think first of the infectious process that leads to diarrhea. However, there are other factors that should be considered in managing enteric cases. It is my hope in this paper to give reference to a few areas that should always have consideration in managing enteric issues in wean-to-finish (w-f).

Management practices

The weaning event is a critical and stressful time in a pig’s life. Pigs are taken from the sow farm and given a completely different diet, social group, and environment in a matter of hours. We also have the additional stress from transportation and the likelihood of some vaccinations occurring near the time of weaning. These management decisions may be necessary and right in the long-run of pig husbandry and production, but they may also come at a cost.

It is clear that this type of production-induced stress, and other stressful triggers in the pig’s life, will have an impact on digestive system integrity and enteric diseases.1 Moser et al. describes how stress at weaning leads to increased intestinal permeability, inflammation, and bacterial adhesion. This cascade of events can lead to increased infection, septicemia, and further disruption of intestinal integrity leading to poor digestion and increased fluid loss.2 Furthermore, the additive effect of multiple stresses at one time serves only to exacerbate the enteric challenges.3 Therefore, it is important to critically evaluate the stressors at weaning and look for ways to minimize their total impact.

The pig environment is a critical area to be concerned with when dealing with enteric challenges. Temperature can be a significant stress in the post-weaning period, even making a current disease challenge significantly worse. The severity and mortality associated with both transmissible gastroenteritis and rotavirus infection is much worse when pigs are chilled.4 It has also been demonstrated that cold temperature stress increased the severity of disease with Escherichia coli infections.5 Thus, temperature and temperature fluctuations are a significant management practice to understand in minimizing the impact it can have on post-weaning enteric challenges.

Biosecurity practices are another important area that must be addressed in preventing or controlling post-weaning scours. Biosecurity relates to both to the external disease pathogens we work to keep from entering the barn, but also the internal practices to prevent the spread of disease. Barn sanitation is one biosecurity practice that requires a significant amount of attention in helping minimize disease. Many of our disease pathogens are present both within in healthy populations as well as groups of animals experiencing clinical disease. Biosecurity is helpful at reducing the total quantity of pathogens that are left in the barn and carried from one group to the next. Proper cleaning and sanitation will effectively reduce both bacterial and viral load to help prevent an overwhelming disease challenge. Likewise, effective sanitation will help minimize co-infections which have been shown to enhance the severity of enteric disease.6

Piglet age can also affect the presence and outcome of enteric issues post-weaning. Moser et al. reports that weaning age has a significant impact on the stress response and thus gut permeability.7 He describes that pigs weaned at 28 days of age had less intestinal dysfunction than pigs weaned at 19 days of age. Therefore management practices aimed at having an older piglet age at weaning may help
minimize the stress at weaning and the impact stress has on post-weaning enteric challenges.

Finally, management of the diseases themselves through proper gilt acclimation and vaccination are important. This serves both to reduce the clinical disease in piglets while they are nursing, but also reduce the amount of virus and bacteria being carried with piglets to the nursery or w-f barn. Proper Colostrum intake, monitoring and is also important to be sure passive transfer of antibodies occurs correctly. Non-pathogenic E. coli vaccines are helpful at competitively binding for receptors in the pigs gut and preventing toxigenic strains from getting a foot-hold. Vaccine timing is important to competitively block the toxigenic strains soon enough while repetitive dosing can be useful for high gut turnover and timid pigs that have not successfully transitioned to water the first time the oral vaccine was run.

Inappropriate antibiotic use

Antibiotics are an important and critical tool necessary to maintain the well-being and health of our pigs and livestock today. However, antibiotic-associated diarrheas have been documented in both human and veterinary medicine from disruption of normal gut flora. The normal gut flora, which helps to create a barrier against pathogens, can be altered leading to disease. Careful attention must be given to what antibiotics are being used not only for judicious and appropriate antibiotic use, but also for the potential of gut disruption or over growth. Diagnostic testing and careful diagnostic monitoring is useful to help ensure antibiotic therapy is appropriate and safe. It is the author’s experience that respiratory antibiotic therapy for PRRS or SIV diseases at weaning, may lead to an increase in bacterial challenges when resistant strains of E. coli or salmonella are present. Therefore, altering the class of antibiotic may allow for proper respiratory disease management without impacting enteric gut flora directly.

Feed

Feed represents close to 70% of the cost to raise a pig. Diet manipulation and alternative ingredient use may be quite a dynamic process in an effort to control cost. Weekly diet changes may occur in some production systems able to take advantage of bulk ingredients to lower cost. Errors in feed formulation can happen; and maybe at a higher frequency when dietary changes are being made frequently. Non-the-less, there are times when feed may be a culprit of increased scour challenges.

Let me start with a disclaimer, I am not a nutritionist. Find one or two you really trust, develop a good relationship with them, and rely on their collective wisdom. The areas I will focus on are zinc oxide levels, soybean meal inclusion rates, crude protein levels, and high fiber diets.

Zinc oxide is commonly added to the early diets post-weaning to increase post weaning pig performance. A number of studies have demonstrated a positive impact on feed conversion and intake using high levels of zinc oxide. Zinc oxide has also been shown to decrease the incidence of scours post-weaning. Likewise, Tokach et al. described a significant problem with E. coli due to incorrect formulation of zinc oxide in the early nursery diets. This represents an important area to assess when enteric challenges present themselves. Close attention is necessary to find these type of feed errors.

Soybean meal makes up a significant portion of swine diets. Hypersensitivities to soybean meal have been described. Management of soybean meal in the early diets is necessary to minimize the impact it has on post-weaning scours and E. coli infections. Early diets should focus on alternative protein sources to make the transition to feed less severe. Creep feeding may help diminish the post-weaning impact of soybean meal hypersensitivity as well as help pigs transition to feed from sow milk. It is also important to understand total crude protein levels within the diet. High levels of crude protein should in general, also be considered as a potential cause of diarrhea, including in older animals. Dewey et al. reported higher morbidity levels due to scours in boars fed 21% CP vs. 17% CP in the absence of any pathogens.

Finally, the diet may directly affect the growth of commensals and pathogens within the gut. There is increasing concern about brachyspria-associated diarrheas in the swine industry. It is known that diets high in fiber increase the fermentation of the hindgut. This has been suggested to increase the colonization of anaerobes including pathogens such as Brachyspira spp. Research attempts at reproducing dysentery were successful when fermentation in the large intestine was established with Brachyspira hydrosyenteriae (B. hyo) inoculation versus just inoculating with B. hyo alone. Therefore it may be helpful at attempting to reduce large intestinal fermentation even for short periods of time with diet manipulation. Likewise, pathogens targeting the small intestine may increase the availability of nutrient substrate to the large intestine and therefore contribute to the overgrowth of pathogens there. The control of small intestinal pathogens through measures described may also further aid in the reduction of large intestinal pathogen growth or dysbacteriosis.

Water

Water is a critical element of pig production. This key resource can be overlooked or too quickly disregarded as component of enteric challenges. There are a number of areas that should be assessed in determining water quality and its potential impact on gut health. It is important first to
understand the water quality and type for each production site and system. Many producers may be using well water or even surface pond water for their livestock. Surface water may contain additional bacteria or parasites such as giardia contributing to scours. Similarly high coliform counts can develop in the water lines or the water source itself contributing to poorer growth and feed conversion.\textsuperscript{16} 

Another area of concern with water quality is the mineral content and salinity. It has been well documented that high sulfates can cause an osmotic diarrhea in pigs.\textsuperscript{17} There is little to no impact that an antibiotic would have on these types of diarrheas; it would be a waste of time and producers money. Most report that there is no adverse performance impact associated with these type of osmotic diarrhea. However, recently Flohr et al. did find that high sulfate water (sodium sulfate was mixed in a stock solution to a target level of 3000 ppm) did negatively impact feed intake, average daily gain, and feed conversion during days 10-24 of the trial.\textsuperscript{18} 

A word of caution is worth giving at this point. It is important to understand how you interpret the water quality findings. Many laboratories use human drinking water standards. In doing so they report levels as cautionary or concerning at levels that will not impact livestock health and production. One would do well to develop a relationship with a toxicologist or water quality expert to make any final decisions on how water may be influencing livestock performance. It is the author’s observation that producers and growers will run into high sulfates and osmotic diarrheas with some frustration. A lot of wasted time and medication is put forth in trying to control the scours. Water should be tested and documented to help understand its role in the present clinical situation. It has not been economically viable to spend large capital expenditures to change the sulfate concentrations. Recent documentation of the negative impacts on growth and feed conversion seen with high sulfates may provide new justification and a better understanding of the financial returns that are possible targeting lower sulfates. Some producers may have more than one water source available and can simply switch to a higher quality of water during the first couple weeks post-placement to minimize the additional stress and depressed feed intake during this critical time.

**Summary**

Enteric diseases and challenges are still a big problem for animal caretakers, growers, and veterinarians in the swine industry. There are a lot of factors that increase the piglet’s susceptibility to disease and clinical expression of diarrhea, especially at weaning. The post-weaning period represents a critical time in a pig’s life often filled with multiple stressors. It is critical to address all areas where stress can be minimized (i.e. chilling and vaccine timing), pig age can be maximized, and antibiotic use is appropriate. Likewise, it is important to look at both feed and water as potential causes or contributors to enteric challenges. Some of these may have minimal impact to performance such as higher sulfate levels in older pigs, whereas some may significantly impact health and infection such as soybean meal hypersensitivity. Overlooking these areas can lead to excessive and unnecessary antibiotic use.

**References**


