Diarrhoea in the post-weaning period – etiology and diagnostics

Ken Steen Pedersen

CEO, DVM, PhD, Dipl. ECPHM

In this key note lecture, practical experience will be shared from work with pig consultancy around Europe and, where relevant, scientific evidence concerning diarrhoea from weaning and until transfer to the finisher pig unit.

First of all, it is important to define what diarrhoea is. Diarrhoea is a clinical sign of an underlying, pathophysiological condition. Diarrhoea and faeces score can be defined and classified in many different ways and there is a clear lack of consensus in practice and sciences. We have traditionally used a score with 4 different categories. It is also important to draw attention to the fact that besides consistency it is also a question of added content of for example mucous, necrotic material and blood. These conditions are independent of the consistency.

The most objective method of defining diarrhoea is by using dry matter measurements, and previously a limit has been set of 18% dry matter in a faecal sample.

The use of zinc oxide has been to prevent post-weaning diarrhoea. The definition of post-weaning diarrhoea varies slightly from country to country, but traditionally it has been the diarrhoea that occurs the first 2 weeks after weaning while others include the first 3 weeks.

Conditions causing diarrhoea are multifactorial. *E. coli* can in itself cause diarrhoea. Likewise, intake of a high protein level of a poor quality can also in itself cause diarrhoea without an infection being present – a so-called dietetic diarrhoea. These things can also cause diarrhoea in a combination such as more low-virulent *E. coli* plus a normal protein intake combined with cold and draught.

There is therefore a whole series of different things that either have a positive or negative effect on the development of diarrhoea during the post-weaning period. Examples of negative things are the well-known low weaning weight, low age, simultaneous virus infections such as PRRS, low and fluctuating temperatures and low feed intake of piglets during lactation.

The present situation in Denmark and other parts of Europe is that zinc oxide is used to a wide extent the first 2 weeks after weaning. Therefore, we have not seen much of the classic post-weaning diarrhoea during the first 2 weeks. It is therefore also a common misunderstanding amongst those that do not work in a veterinary practice that the antibiotic consumption and diarrhoea occur during the first 2 weeks. This is not the case. The most significant diarrhoea problems currently occur in weeks 3-7 after weaning. However, we do see post-weaning diarrhoea on some farms even when using zinc oxide.

The clinical signs that occur from week 3 to 7 after weaning are typically normal and nice looking pigs with diarrhoea which could be of various consistency and colour. More serious manifestations of these intestinal diseases are for example death and emaciation. There will also be situations where diarrhoea does not occur but only sub-clinical enteritis that affect the pigs' growth and feed conversion.

Years ago in Denmark, a large study was made which examined the causes of diarrhoea in weeks 3 to 7 after weaning. Here it turned out that in most herds there was a mixed infection condition. This could for example be *E. coli* in combination with *Lawsonia intracellularis* or *Brachyspira* spp. in combination with *L. intracellularis*.

Another interesting thing was that in 10% of the herds no infections at all were detected despite the pigs having diarrhoea. In several of the herds, there was also a large number of pigs that did not have any detectable enteritis or colitis even though they had diarrhoea.

It must be assumed that the diarrhoea in these herds was caused by a feed-induced condition, that is a dietetic diarrhoea. Alternatively, it would have to be infections that are not known.

In other countries, there are other infections which are relevant including swine dysentery, salmonella, PCV2 virus, rotavirus, TGE virus and PED virus. Besides this, unspecific colitis has been described in a number of countries.

Due to the very widespread mixed infections, it is important that laboratory tests are carried out to determine the cause of the diarrhoea in each herd. This can both be in order to confirm whether there is an infection at all or which infections are involved.

Neither clinical nor microscopical pathology is particularly valuable in respect of digging deep to find the cause. This requires laboratory tests in the form of cultivations, PCR tests, various histological techniques etc. These tests can be carried out on faecal samples or intestinal tissue removed during necropsy of pigs.

Some years ago, a so-called “sock method” was developed in Denmark where it is possible to carry out a quantitative PCR examination on sock samples taken in a section with pigs suffering from diarrhoea. It is on this basis possible to say which infections are involved in the diarrhoea in that section and also to perform antibiotic sensitivity testing for *E. coli*.

In any event, it is extremely important that the samples (no matter what they are) are taken in the relevant situations. This means that it must be the diarrhoea that is treated with antibiotics if that is the purpose of the diagnostic test.

In the future, we have to expect that there will be a bigger occurrence of the more classic *E. coli* diarrhoea or at least post-weaning diarrhoea the first 2 weeks after weaning due to the fact that zinc oxide should no longer be used. However, we must admit that we do not know this for certain. On the farms that do presently not use zinc oxide, there is an occurrence of post-weaning diarrhoea but there is a variation between farms.

Worst case scenario is that some of the farms will experience what is described as the classic *E. coli* post-weaning diarrhoea caused by enterotoxigenic *E. coli*, which was described already back in the 70s. Here morbidity can be very high with 85% of the animals getting diarrhoea and a mortality of up to 26% if the animals are not treated with antibiotics.

However, the picture on farms that do not use zinc oxide varies a lot as described above, and we also see herds where the animals look nice and thrifty at weaning but still have a bit of diarrhoea, either watery or more creamy.

There is also new scientific research from Denmark that shows that in some of these herds enterotoxigenic *E. coli* is not detected despite the animals do have diarrhoea. The question is if there are other infectious causes of the diarrhoea in these herds or if it is solely caused by a dietetic condition. Other potential

infections that could cause diarrhoea in this age group are salmonella infections, rotavirus and finally coccidiosis..

Of course, due to the various possible causes of diarrhoea also in this age group, laboratory confirmation is also necessary here. These should again involve all infections relevant in a given region or country. In any event, here it also seems that solely based on clinical and macroscopical, bacteriological conditions, it is difficult to distinguish between the causes of diarrhoea and therefore laboratory tests are necessary.

Another significant thing is the type of virulence of the *E. coli* isolates detected as there is a large number of so-called commensal *E. coli* which are not the cause of diarrhoea.

Finally, we must admit that we lack diagnostic markers for dietetic diarrhoea. Here, a scientific effort is needed in the future so it will be possible to differentiate to a higher degree between the pigs that need antibiotics and those that do not on a daily basis on the farms.

The most significant conclusions are therefore that we should remember

- that diarrhoea is a clinical sign of an underlying, pathophysiological condition in the intestines,
- that diarrhoea after weaning has various infectious and non-infectious causes
- that diarrhoea after weaning is a multifactorial disease
- and that laboratory tests are necessary in order to determine the cause both in practice and in science.