Piglet diarrhea: different causes and where it comes from

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Diarrhea is one of the major problems in pigs especially during the neonatal and post-weaning stages. It is usually due to poor disease resistance, gastrointestinal disorder as well as environmental stress thus leading to heavy economic losses. In some cases it is responsible for high morbidity and mortality. In the past, the use of antibiotics was considered as the most effective way to control diarrhea. However, due to the emergence of microbes resistant to antibiotics which are used in animal industry, use of in-feed antibiotics has been banned in a number of countries in Europe and in South Korea demanding the renewed and concerted efforts to search for alternatives.

A series of studies has been conducted to look for suitable antibiotic growth promoter alternatives, such as organic acids, essential oils, probiotics, nucleotides and prebiotics, but the exact mechanism of how they can prevent piglet diarrhea is still unknown. Therefore, for the effective control of this malady, the first thing we must know is what factors lead to diarrhea. Generally, it is accepted that it is caused by poor hygiene, poor husbandry practice, nutritional stress, as well as inappropriate feeding strategies. Factors contributing to diarrhea in piglets include:

1. Pre-weaning period

1.1. Infectious disease as a contributing factor
The most common causes of diarrhea for 0 to 5 days old pigs are *E. coli*, transmissible gastroenteritis (TGE), *Clostridium perfringens* Type C, *Strongyloides ransomi*, and hypoglycemia. Diarrhea caused by rotavirus, coccidiosis, salmonellosis, and erysipelas occur in piglets aged from 5 to 21 days.

However, sometimes the diarrhea does not start at a certain age, but a wide range of ages are affected simultaneously. An acute onset of severe diarrhea that affects piglets over a day of age is typical of epizootic transmissible gastroenteritis and pseudorabies. Less severe diarrhea that has no clear time of onset and affects piglets of all ages can be produced by *E. coli* and rotavirus.

1.2. Non-infectious factors
There are also two main non-infectious factors that can cause diarrhea in suckling pigs. Firstly, the effective environment temperature (EET) must satisfy the requirement of the piglets. The lower critical temperature (LCT) for baby pigs is 33 ± 2°C and 28°C for weanling pigs. If the EET is lower than the LCT, pigs must utilize extra energy to maintain their body
temperatures. Especially in autumn, since the weather is cold, the cold floor without any additional bedding decreases resistance of piglets causing diarrhea by several different serotypes of pathogenic *E. coli*. The EET scheme for piglet is influenced by the air speed, floor type (straw, concrete or plastic slats), and the air to wall temperature gradients. Secondly, adequate amounts of milk are necessary to provide antibodies and nutrients for the rapid growth of piglets. Factors affecting the availability of milk to piglets such as agalactia, farrowing facilities unsuitable for nursing, and slippery floors contribute to the diarrhea or other clinical diseases.

In the production process, due to feeding of high energy diets to sows before farrowing and during lactating, fat content is increased. The suckling piglet fails to digest the fat content due to lack of well-developed gastrointestinal tract leading to diarrhea. Lactating sow illness also can lead to diarrhea in suckling piglets.

For necropsy of piglets with diarrhea, there are three main areas that should be examined: the lacteals in the mesentery, the serosal and the mucosal surfaces of the intestines.

2. Post-weaning period

Nowadays pigs are weaned at an age of three to five weeks. Piglets are not accustomed to solid feed at weaning. The sudden change from milk to solid feed in weaned piglets causes severe villus shortening and crypts-deepening in the small intestine thus leading to diarrhea. Therefore, the composition of weanling feed must be formulated properly, especially the fat content. Diarrhea easily occurs in piglets due to the low digestibility of fat. Feeding piglets with moldy feed, laxative bran and disproportionately large share of feed causes indigestion leading to diarrhea.

2.1. Diarrhea caused by microorganisms

During the weaning period, *E.coli* strains are considered to be the main bacteria causing diarrhea in piglets. Combined infections of rotavirus and *E.coli* cause more severe diarrhea than when they are present alone. There are several factors that can explain why the weaning pigs are susceptible to the viruses. First, piglets are separated from sows, thus they can’t get antibody from the milk of sows. Second, since the digestive tract of piglets is under development, the gastrointestinal enzymes are not enough to digest plant-origin nutrients. Third, the fimbriated *E.coli* may adhere easily to the epithelial enterocytes because of the dystrophy of digestive tract.

2.2. Changes in intestinal function

It has been reported that the net absorption of fluid, sodium and chloride in small intestine of weaned pigs is decreased compared to the sucking piglets. The great loss of fluid in the small intestine will cause diarrhea. It may be caused by the immature intestinal villus enterocytes and the enhanced sensitivity to bacteria during weanling. This can be prevented
by supplementary feeding of the piglets during the suckling period and/or feeding the piglets
sow's milk after weaning.

3. Solutions

The strategies to control diarrhea in piglets include the use of anti-bacterial and anti-
inflammatory agents as well as addressing the diarrhea factors from the mother. There are
several interventions that can prevent piglets from developing diarrhea.

- Firstly, provide a hygienic environment with appropriate temperature and
  humidity for piglets.
- Secondly, we must help newborn piglets consume enough colostrum to obtain
  antibodies from the mother.

It has also been demonstrated that dietary supplementation with high level of ZnO (2000
to 4000 ppm), organic acids (benzoic, citric and lactic acids, etc.), prebiotics (manna
oligosaccharide, inulin and fructan,), probiotics (Enterococcus faecium, Lactobacillus,
Streptococcus, Bacillus and Bifidobacterium ) and nucleotides could improve the health and
growth performance by improving the gut microbial ecosystem, reducing the pathogenic
bacteria, enhancing the immunity, or producing components able to positively affect mucosa
development of the weanling pigs.