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Enteric colibacillosis of newborn pigs

Erwin M. Kohler and Harley Moon[1/]

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Quick Facts

- *E. coli* diarrhea, baby pig scours and colibacillosis are names used to label an intestinal disorder of newborn swine characterized by large amounts of liquid feces.
- It often is necessary to conduct laboratory tests to establish an accurate diagnosis of this disease.
- Temperature probably is the most important of all environmental influences on the well-being of pigs and it is easiest to control.
- *E. coli* bacteria have developed considerable resistance to many drugs.
- Prevention of *E. coli*-caused diarrhea is much more economical than treatment of the disease.
- Good sanitation, good management practices and increasing animal resistance are three ways to prevent scours.
- Increasing animal resistance includes vaccinating sows so they can provide better protection for pigs.

Names such as *E. coli* diarrhea or scours, baby pig scours and colibacillosis are popularly used today to label an intestinal disorder of newborn swine characterized by large amounts of liquid feces.

Research has shown that some strains of *Escherichia coli* bacteria can cause such intestinal disorders, but there also are other bacteria and viruses that can cause diseases with some more or less similar clinical signs. Within any herd, these different infectious agents may cause disorders concurrently or sequentially.

It often is necessary to conduct laboratory tests to establish an accurate diagnosis. Properly collected specimens from carefully selected pigs are required for meaningful diagnostic efforts. Even then it may be difficult to establish the diagnosis for a particular episode of diarrhea. Too frequently, costly chemotherapeutic agents are administered on the assumption that the diarrhea is being caused by *E. coli* when, in fact, the disease is being caused by a virus (such as TGE or rotavirus) or another microorganism that is completely unaffected by the drugs used.

Cause

E. coli are normal inhabitants of the intestinal tract and are present in large numbers in the large intestine but not the small intestine of normal animals. However, certain strains are classed as enteropathogenic, meaning that they produce disease by developing in the intestine without necessarily invading the other tissues of the body.

Enteropathogenic *E. coli* are found throughout the world; there is probalby at least one strain in each herd. It is important to understand that the incidence of disease caused by enteropathogenic *E. coli* is greatly influenced by the management of herd and facilities. Such strains of E. coli have the ability to propagate rapidly in the small intestine. Additionally, these strains produce toxins (enterotoxins), which cause massive fluid losses from the body.

The amount of fluid and electrolytes in the small intestine soon exceeds the absorptive capacity of the intestine. Consequently, large quantities of pale yellow, watery feces are passed. The fluids are lost at such a rapid rate that the pig becomes dehydrated and also develops acidosis because a large proportion of the electrolytes lost are basic. The liquid feces usually are quite alkaline. The pigs usually are thirsty and continue to nurse until they become too weak and depressed to do so.

This fact sheet is directed primarily to neonatal enteric colibacillosis, which is diarrhea caused by enteropathogenic *E. coli* in pigs less than 7 days old. A number of host and environmental factors affect the incidence of *E. coli*-caused diarrhea of newborn pigs. The stomach and intestine of pigs are quickly flooded with bacteria immediately after birth. Many of these are "harmless," but if large numbers of enteropathogenic *E. coli* are present, many pigs probably will be infected immediately after birth.

Large numbers of *E. coli* usually are present in the immediate environment whenever it is dirty and wet, the ventilation is poor and the humidity is high. However, the most important source of infection is other young pigs with *E. coli* diarrhea. These pigs will shed up to 1 billion *E. coli* per cubic centimeter of liquid feces.

Temperature probably is the most important of all the environmental influences on the well-being of the pigs. It also is one of the easiest to control in modern farrowing facilities. Young pigs are extremely sensitive to chilling, and this stressor lowers the resistance of pigs to infections including *E. coli*.

Newborn pigs normally have no antibodies at birth but receive them from the colostrum (first milk) of the sows. Colostrum has antibodies against many different microorganisms depending upon what the sow has been exposed to or vaccinated with. Frequently, gilts have had less exposure to the enteropathogenic *E. coli* in the herd and consequently don't protect their pigs as well as sows.

If the pigs drink colostrum (containing adequate levels of antibodies against the infecting strain) immediately after birth, and if they continue to suckle regularly, the *E. coli* usually will be inhibited sufficiently to prevent the occurrence of clinical disease. However, all protection is relative, and infection with very large numbers of enteropathogenic *E. coli* or anything that interferes with frequent suckling (such as lactation failure, injuries or other infections) increases the probability of development of clinical colibacillosis.

Pigs that develop *E. coli*-caused diahrrea must be treated very promptly with antibacterial drugs that have been shown to be effective against the enteropathogenic *E. coli* in the herd. The disease is so acute in young pigs that even with proper treatment, death and performance losses make this a very

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[1/] *Erwin M. Kohler, Ohio State University, and Harley Moon, U.S. Department of Agriculture, Ames, Iowa: This information, originally published in the* **Pork Industry Handbook,** *has been reviewed for Colorado producers by Marvin Heeney, CSU extension professor, animal sciences (4/15/79)*

costly disease. It is much more profitable to prevent this disease than to be continuously treating affected pigs.

With this introduction, it should be obvious that the best possible results in the prevention of *E. coli*-caused diarrhea of baby pigs can be attained only by a complete program using all the good management practices available.

Prevention

There are three basic approaches to the prevention of *E. coli* scours. The first approach is a good sanitation program to reduce the number of enteropathogenic *E. coli*. Sanitary farrowing facilities and adequate ventilation are essential to reduce the number of pathogenic organisms and to prevent high humidity and damp or wet floors. Promptly covering the liquid stools with dry bedding or soil can help reduce the spread of bacteria from pigs with *E. coli* diarrhea.

In addition, if *E. coli* diarrhea is diagnosed, the affected pigs should be promptly treated with antibacterial drugs known to be effective (either by laboratory tests or experience in that herd) against the particular strains present in the herd. This of course is a treatment for the affected pigs, but it is also an attempt to decrease the number of enteropathogenic *E. coli* that these pigs are shedding in the liquid feces. It is important that the antibacterial drugs not be used indiscriminately because *E. coli* often rapidly develop resistance to these drugs.

The second approach is to use good management practices to maintain the "natural" resistance of the newborn pig at the highest possible level. Attention to the nutritional and general health status of the breeding herd helps insure the delivery of vigorous pigs and satisfactory lactation. Prompt suckling after birth, and frequent suckling thereafter, is necessary for the pigs to acquire the full benefits of the specific and nonspecific protective substances in the sow's colostrum and milk.

Colostral antibodies must be swallowed every few hours to keep enough in the intestine to protect the pigs. As previously mentioned, chilling caused by drafts, and wet or cold floors or inadequate heaters must be avoided because chilling is one of the most severe stressors a young pig can encounter. Pigs should be warm enough to sleep soundly in a stretched-out position. Pigs in wet pens, or pens with inadequate heat, huddle, shiver and are restless, continually moving to find a warmer spot in the pile.

The third approach to the prevention of *E. coli* scours of baby pigs is to increase their resistance. The pig can get specific protection against infectious diseases from its dam through the colostrum and milk. This can be enhanced by vaccination of the dam. Vaccination of sows to increase the protective value of their colostrum and milk against enteropathogenic strains of *E. coli* has been attempted by many people.

One vaccination method currently being used successfully in numerous herds by veterinarians involves feeding cultures of *E. coli* to dams late in gestation. The vaccinated dams then protect their newborn pigs via antibodies in their colostrum and milk. The program must be custom-developed for each herd, partially because there are so many strains of *E. coli* that can cause scours of baby pigs. Antibodies produced against any one of these strains are not very effective against most of the other strains.

There are a number of precautions to follow. Only pure *E. coli* cultures isolated from the herd to be vaccinated should be used. The aim here is to avoid bacteria or viruses that are useless for vaccination, or even worse, feeding bacteria or viruses that could cause disease problems in the herd. This program has a number of rather detailed steps. Good results depend upon a good working relationship between a competent veterinarian and the producer.

Recent research indicates it may be possible some day to formulate effective vaccines to prevent neonatal colibacillosis in many if not all swine herds. Basically, this process involves the production of vaccines with purified virulence factors from enteropathogenic bacteria. Several such factors harvested from different pathogenic strains may need to be incorporated in a universal vaccine.

To achieve optimal benefits from any vaccination program against *E. coli* scours of baby pigs, it will still be necessary to keep the level of pathogenic *E. coli* as low as possible through good management, to insure that pigs suckle promptly and frequently, and to avoid chilling, injuries and other disease problems.

Colibacillosis in Older Pigs

The intestinal disorders characterized by yellow to white runny or smeary feces frequently observed in suckling pigs 10-35 days of age often are called white or milk scours. In contrast to those of newborn pigs with colibacillosis, these stools usually are neutral or acidic. These stools also have a different appearance from the pale yellow, watery, gassy feces of *E. coli* diarrhea of baby pigs. In many cases this syndrome also is called colibacillosis.

Current research indicates that enteropathogenic *E. coli* can be present and occasionally play a significant role in the severity of the disease. However, diagnostic methods being developed indicate that a virus (rotavirus) that is probably present in all swine herds destroys some of the epithelial cells that line the small intestine. (Although the rotavirus can affect newborn pigs, field investigations indicate that it rarely causes clinical disease in pigs less than a week of age if they're nursing healthy sows.) The resulting maldigestion and malabsorption are similar (although less severe) to those in TGE.

The role of enteropathogenic *E. coli* in these cases is secondary to the damage caused by the virus. In some cases, *E. coli* may contribute to fluid losses. In other cases, it appears that the *E. coli* become closely associated with the damaged lining of the intestine and may enter the body or release toxins (endotoxins) that are absorbed into the body and cause shock and rather sudden death. Complete diagnostic procedures are indicated, but in the absence of the demonstration of a definite role for *E. coli* in the outbreak it is difficult to justify the administration of chemotherapeutic agents. In fact, it has been repeatedly observed they are ineffective in controlling "white" or "milk" scours.

Although enteropathogenic *E. coli* undoubtedly can and do contribute to postweaning scours, the precise role and significance is not well defined. As additional research is directed toward postweaning scours, it may well be found that there is a complex interaction of etiologic agents and factors among which *E. coli* may act only in a secondary role here as well.

If a complete diagnosis has been made that definitely incriminates enteropathogenic *E. coli* as having a significant role in an outbreak of diarrhea in pigs over a week of age, the incriminated strains of *E. coli* should be tested to determine which antibacterial drugs are effective against them. The selected drug should be given orally. Good sanitation and ventilation, avoiding overcrowding, and adequate heat are important management practices. At present, further proof is needed before a vaccination program directed at preventing colibacillosis of pigs over 10 days of age can be recommended.