What is this research about?

Weaning is the gradual transition of an infant mammal from a diet of its mother’s milk to adult food. It is an important step in the development of the digestive system. Pork producers have long recognized that weaning piglets experience delays in growth, more frequent intestinal diseases and diarrhea, and a decreased ability to digest foods. During weaning, researchers have found a wide range of changes that affect the intestinal lining. These changes also affect the function of enzymes that break down food. One such digestive enzyme, called small intestinal alkaline phosphatase (IAP), is an important indicator of the state of the small intestine. IAP has several key digestive functions, which include transporting nutrients, absorbing fat, and neutralizing stomach acids that pass into the small intestine. IAP also plays an important defense role by protecting the gut lining from harmful intestinal bacteria. The goal of this research is to study how IAP production and activity change after weaning.

What you need to know:

In piglets, early weaning harms gut development by decreasing the activity of IAP, an important digestive enzyme. This also makes the piglets more susceptible to gut diseases. Not only did early-weaned piglets have less IAP in their intestines, but their IAP was also less effective at breaking down nutrients and bacterial toxins.

About the University of Guelph Researchers:

Dale Lackeyram was a graduate student at the University of Guelph, and this piece of research formed part of his Ph.D. thesis. Dr. Lackeyram is currently working in the Ontario Veterinary College at the University of Guelph.

Tania Archbold is a research associate working with Dr. Fan.

Ming Fan is a Professor in the Department of Animal and Poultry Science, at the University of Guelph. Email: mfan@uoguelph.ca.
What did the researchers do?

A total of 24 Yorkshire piglets (12 male, 12 female) were randomly selected. At 10 days of age, 12 of these piglets were weaned and fed a diet based on corn and soybean meal, while the other 12 continued suckling from sows. After 12 days, the piglets underwent surgery to obtain samples from four different sections of the intestinal lining. The physical characteristics of these samples were determined using a microscope. Next, the researchers isolated and measured the activity of IAP in the different intestinal sections. Finally, the researchers measured the rate at which IAP was produced and the overall amount of IAP in the cells of the intestines.

What did the researchers find?

Over the 12 day period, weaned piglets gained weight more slowly than suckling piglets, and the intestines of the weaned piglets showed several abnormalities. Weaned piglets produced the IAP enzyme more slowly, and produced less IAP enzyme overall. The activity of IAP in weaned piglets was lower in all the intestinal samples, but it was most drastically reduced in the proximal section of the small intestine (closer to the stomach). The IAP of weaned piglets was also less effective at breaking down its target, resulting in impaired food digestion.

Keywords:
Pigs, weaning, suckling, gut development, intestinal lining, digestive enzymes, alkaline phosphatase

How can you use this research?

Pork producers can use this research to better understand how early weaning can affect the development and health of the intestinal tract of piglets. Scientists can continue to investigate the effects of weaning on gut development, in order to find strategies to counteract the negative effects of weaning on growth and nutrition in piglets.

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