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Means to control diarrhea in early-weaned pigs and to allow use of pea protein isolate in pig starter diets as an inexpensive protein source

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Introduction

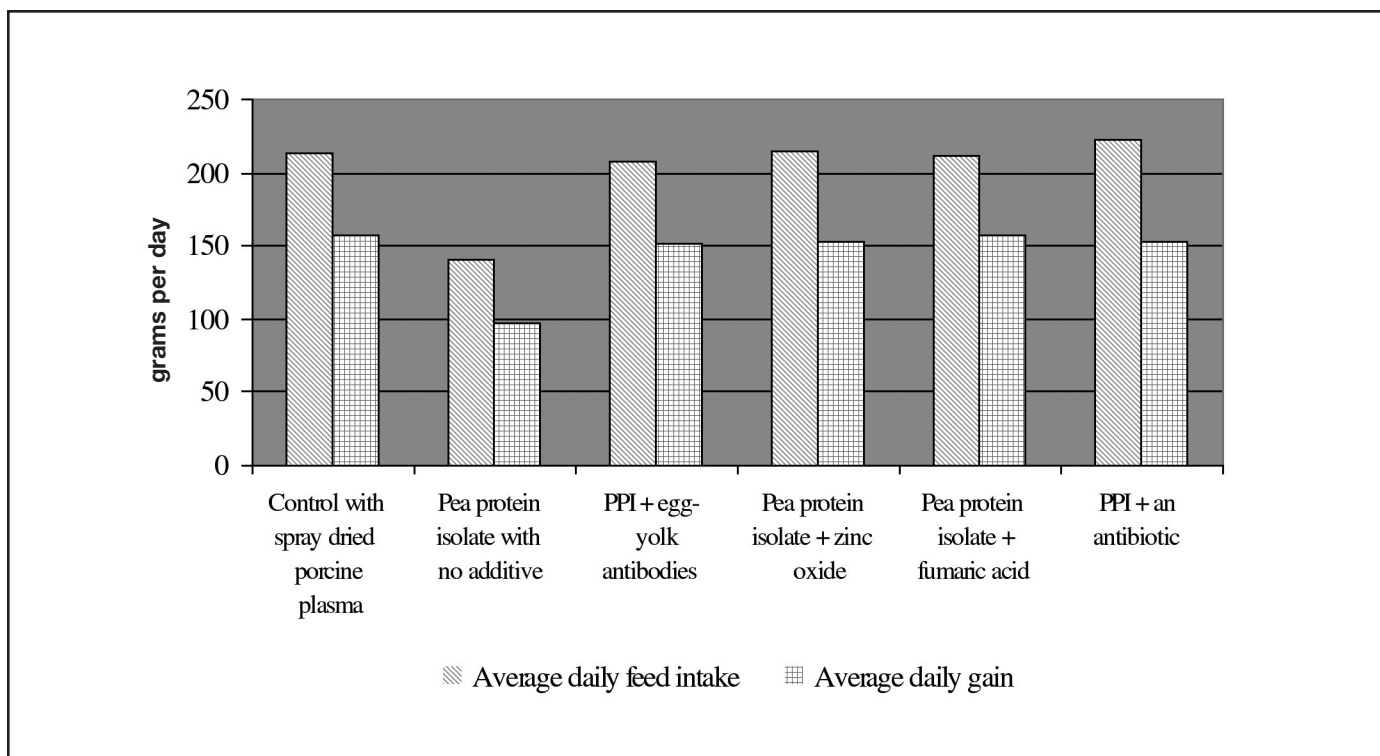
Economic losses in the swine industry associated with intestinal diseases are extremely

high. Diarrhea represents 11 per cent of all post-weaning piglet mortality and the form caused by *E. coli* bacteria is the most common intestinal disease in piglets, accounting for 50 per cent of the 10 million piglets that die annually worldwide. Therefore, a major challenge currently facing the swine industry is to identify means for

controlling diarrhea in young pigs that are not only cost-effective but also suitable for sustainable pork production.

Thus far, various strategies including use of in-feed antibiotics, spray-dried plasma proteins, pro- and pre-biotics, organic acids and zinc and copper salts have been tried with mixed results.

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MANAGING WEANLING PIGS

By: John Maltman
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Getting pigs properly started on feed after weaning still presents us with a challenge. Piglet scours, poor growth and behavioral vices such as navel and flank sucking are some of the problems. In addition, our industry is facing increasing pressure to reduce and ultimately eliminate antibiotic use.

Newly weaned piglets vary in size and dealing with the lighter group separately is well worth the effort. New strategies involve using milk replacers or some other liquid feeding regime. Specialized equipment is available to deliver a gruel feed in a 2:1 ratio of water to feed. Research is showing improved rates of gain and less erosion of intestinal villi for piglets on liquid diets.

For piglets on dry diets, the debate continues as to the best form. A properly formulated diet offered in a good quality pellet should produce better results than a mash diet. In practical farm use, though, a good mash diet will produce better results than a poor pellet. For producers making all their rations, pellets aren't an option as the additional cost of pelleting and transporting is not justified. Making a good pellet is a difficult task. The factors influencing pellet quality have been broken down to :

- 40 per cent diet formulation
- 20 per cent grinding

- 20 per cent conditioning
- 15 per cent pellet die
- 5 per cent drying and cooling

(Source: Reimer 1992 from Feed Tech V5N4, 2001)

Dr. Reimer's work shows that 80 per cent of pellet quality is influenced by factors other than handling and pelleting. Some ingredients commonly used for young pigs are difficult to pellet without damage from excessive heat either through the conditioning or pelleting process. Pellet durability tends to increase as particle size approaches 400 microns. However, this size can cause digestive upsets, so grinding this fine is usually avoided in pelleted feeds. It sometimes causes pellets to fall apart during delivery and handling. High levels of fat can also cause soft pellets. Unfortunately, the ingredients that make a good ration for young pigs aren't always good for pellet quality. For grow/finish pigs, pelleted feed will give better performance than mash diets where pellet quality is good.

Adequate water intake is critical to maintain feed intake and growth. While mini-nipple drinkers are common in the farrowing crate, many farmers are using bowl drinkers. Piglets seem to use bowls more quickly and more often, improving water balance. Research by Dr. Varley recommends that flow rates be 0.5 to 1.0 litre per minute and the drinker heights must be properly adjusted for easy access. His studies showed that

the average piglet took between 15 to 35 hours to take a drink of water. For groups of 100 piglets or more, poultry waterers are successful in reducing time to first water consumption.

Diet formulation is also important in achieving top growth. The basic target is 90 per cent or more digestibility with the buffering potential of the diet at a minimum. These are achieved with attention to ration ingredients. Excessive protein should also be avoided as it tends to reduce feed intake. Proper stocking density needs to be observed since crowded pens reduce water and feed intake.

Probiotics, prebiotics, antibiotics, all exist to help us battle piglet scours. A prebiotic is meant to create conditions that stimulate the growth of positive intestinal bacteria. In particular, several products, which are basically soluble dietary fibre, are being offered for ration addition. They can improve the development of bifido and lactobacillus bacteria which promote health.

Probiotics are classes of positive bacteria that can be added to rations under certain conditions. The hope is to repopulate the digestive tract with helpful bacteria to improve digestion and guard against pathogens. Limited success has been achieved under research conditions so this approach is still being studied. Lactobacillus bacteria are the most commonly studied for this purpose.

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Reducing the Impact of Heat Stress on Breeding Herd Infertility

By: Mike Yacentiuk
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Elevated temperatures and humidity during the summer and early fall may cause some sows reproductive problems such as anestrus, extended wean to estrus interval, lower conception rates and lower farrowing rates. Boars are also affected during this time and can show lower semen output and quality. Semen suppliers correct for this occurrence.

Incorporating artificial insemination into a breeding program can help offset some of the negative affects of elevated apparent temperature on herd reproductive performance.

Several factors may cause seasonal infertility, though heat stress on animals seems to be the primary reason. Heat stress usually occurs when the ambient temperature is above 27 degrees Celsius. The normal respiration rate of older animals is 15 to 25 breaths per minute however when this rate exceeds 40 the animals are at risk of heat stress. Before periods of elevated temperatures and humidity occur, take steps to avoid heat stress and increase the comfort of the animals.

Some methods of reducing the effects of heat stress include:

- 1) Ensure ventilation systems are properly maintained and delivering the required air rates.

Remember pigs are sensitive to a combination of heat and humidity (apparent temperature) and do not sweat to keep cool. Monitor ventilation and cooling at the level of the pig.

- 2) Supplemental systems such as drip cooling can cool lactating sows during periods of high seasonal temperatures. Don't overlook the gilt pool, gestating sows and boars for cooling strategies as well.

- 3) Position heat lamps at a maximum distance away from the sow. Heat lamps may need to be on timers especially during elevated ambient temperature. To maintain the comfort of the nursing piglets include alternatives such as heat pads and covered creep areas.

- 4) Photoperiod may have less effect on sow reproductive performance than temperature. However, there have been positive responses to the estrus interval by reducing the photoperiod. The breeding area should have 10 to 14 hours light at 150 Lux. Lighting in the farrowing rooms should have 14 to 16 hours at 110 Lux. This may stimulate sow feed intake and increase piglet weaning weight over lower lighting periods.

- 5) Increase lactation feeding frequency to three or four times

a day. This may increase feed intake by 10 to 15 per cent.

- 6) Keep feed fresh and add fat to the diet. Diets should be properly balanced. Top-dressing first parity sows with 340 grams of soybean meal once a day starting three or four days after farrowing can increase protein intake and compensate for the animals' growth requirement.

- 7) Ensure water is readily available. Sows can become frustrated if flow rate is low and lose their appetite. Water flow rate for lactating sows should be 2000 ml per minute. Pigs will consume almost double the quantity of cool water (10° C) as warm water (27° C).

- 8) If possible, schedule human and animal activity in the cooler part of the day.

- 9) Overcompensate for increased seasonal anestrus by having 10 to 15 per cent more gilts available for breeding. Plan far ahead, especially if an isolation/acclimatization program is in place. Do not crowd the additional gilts in existing pens and provide 1.1 sq. metres (12 square feet) per gilt.

For more information, contact your nearest Manitoba Agriculture and Food swine specialist.

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Furthermore, serious concerns including antibiotic resistance associated with use of in-feed antibiotics, effect of plasma proteins on human health and toxicity and environmental implications of excess zinc and copper have been raised regarding the use of some of these products. To address these concerns, a recent study at the University of Manitoba has assessed the effectiveness of an egg-yolk additive containing antibodies against the bacteria that cause diarrhea as a means to control diarrhea in early-weaned pigs fed pea protein isolate-based diets.

Results of a recent University of Manitoba study

In this study 90 piglets weaned at 10 days of age (3.8 kg body weight) were fed a phase 1 nursery diet based on wheat, oat groats, whey and soybean meal as the main ingredients and formulated to contain 1.6 per cent lysine in a 14-day experiment. Also, this diet contained either spray dried porcine plasma or pea protein isolate. The diet containing pea protein isolate was fed as is or supplemented with egg-yolk antibodies, zinc oxide, fumaric acid or an in-feed antibiotic. After one week piglets were experimentally infected with *E. coli*, the bacteria that cause diarrhea in piglets. Piglet performance and incidences of diarrhea were monitored.

As shown on page 1, piglets fed the diet containing pea protein isolate with egg-yolk antibodies, zinc oxide, fumaric acid, or antibiotic supplementation performed as well as those fed the control diet containing spray dried porcine plasma. Piglets fed the diet containing 10 per cent pea protein isolate (PPI) without any of the additives tested had poor feed intake levels and growth performance. After the experimental infection, scours appeared in all pigs but it only lasted for 3 to 5 days in piglets fed diets containing spray dried porcine plasma or pea protein isolate with egg-yolk antibodies, zinc oxide, fumaric acid or antibiotic supplementation. However, those piglets fed pea protein isolate-containing diet without any additive continued to have severe diarrhea beyond 5 days resulting in 40 per cent mortality.

Take home message: The results of this research suggest that:

1. Diarrhea in early-weaned pigs can be controlled by including egg-yolk containing antibodies against diarrhea-causing bacteria, zinc oxide, fumaric acid, spray dried porcine plasma or an antibiotic in pig starter diets.
2. Egg-yolk containing antibodies against diarrhea-causing bacteria, fumaric acid or zinc oxide supplementation will allow the use of less expensive plant based proteins, such as pea protein isolate in diets for early-weaned pigs.

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Maintaining high levels of healthy bacteria to subdue harmful bacteria is referred to as "competitive exclusion".

Antibiotics are familiar and predictably effective. Experiences with resistant organisms illustrate the need to continue examining alternatives to pharmacological products. European experiences banning antibiotics have been successful with most farm species, except for continued difficulties with piglet scours.

Appropriate action in these areas will help increase the performance of young pigs.

Upcoming Events

Mark your calendar for the following events:

Hog and Poultry Days is scheduled for December 4 and 5, 2002 at the Winnipeg Convention Centre in Winnipeg. For more information, please contact Dr. Ian Seddon at 204-945-0353 or e-mail: iseddon@gov.mb.ca

The *Manitoba Swine Seminar* is scheduled for January 29 and 30, 2003 at the Best Western Victoria Inn in Winnipeg. For more information, please contact Dr. Ian Seddon, Manitoba Swine Seminar co-chair, at 204-945-0353 or e-mail: iseddon@gov.mb.ca