

# APPROACHES TO REDUCING FEED INTAKE AND GROWTH RATE IN MARKET HOGS DURING INTERRUPTION OF ANIMAL MOVEMENT

## Contacts:

Dr. John Patience: [jfp@iastate.edu](mailto:jfp@iastate.edu)

Dr. Laura Greiner: [greinerl@iastate.edu](mailto:greinerl@iastate.edu)

## THE CHALLENGE

Sometimes, there is a need to reduce feed intake to conserve feed and/or to slow growth rate. This might occur when feed supply is going to be interrupted for an extended period of time. It might also occur when the movement of animals to market is delayed or impaired due to an animal movement standstill, such as could occur during a suspected outbreak of a FAD. It might also take place when access to harvest facilities is temporarily suspended or delayed. The objective then would be to humanely reduce feed intake, or energy and/or nutrient intake, in order to slow or suspend growth until the problem is resolved.

## OPTIONS

To develop a strategy to reduce feed or nutrient intake, we must reverse our thinking. Normally we try to maximize feed and nutrient intake, as this is the way to maximize barn throughput; now, we must think of the practices we normally try to avoid when maximizing feed intake and actually employ them in our barns when we want to conserve feed and slow animal growth.

Because these strategies run counter to our normal approaches to raising pigs, none of them are ideal. Most critically, the well-being of the animals is our highest priority. Therefore, as examples, elevating barn temperatures to lower feed intake, as discussed below, must be done in moderation so that the pigs are not overly stressed. Or restricting access to feed is managed so pigs can maintain body weight; we might think of it as feeding market hogs like we feed gestating sows – restricting intake to prevent excess weight gain which in itself may not be healthy for the pigs.

At the same time, adopting any of these options requires a detailed economic analysis first, to ensure that the impact on net income is positive, or the least negative, depending on the circumstances. For example, it is quite easy to actually increase the cost of feeding the pigs in order to slow their growth rate down – which is clearly counterproductive.

1. Perhaps the easiest approach is to use highly fibrous ingredients such as DDGS (NDF~30%), wheat midds (NDF~35%), corn germ meal (NDF~45%) or soy hulls (NDF~60%). When fiber is increased slightly (< 10% add rate), pigs may actually increase feed intake as they attempt to maintain their daily energy intake. But if fiber is elevated enough, the pigs will simply not have sufficient gut capacity, so feed intake and growth rate will decline. We believe that the NDF content of the diet needs to be at least 16% but higher – greater than 20% - is preferred to truly impact growth rate (Dean Boyd, Personal Communication).

The impact of the higher fiber diet will be greatest in hot weather as the fermentation of fiber in the gut of the pig will generate body heat which will increase the impact of heat stress, and further reduce feed intake

and growth rate. For this approach to be successful, the energy content of the diet must be allowed to float; if diets are formulated with higher fiber levels but equal energy content, some of the benefits of reducing growth will be reduced.

Cautions:

- High DDGS could cause problems with high iodine value (IV) in the carcass which may trigger penalties by the packer. This will depend on the quantity of fat in the DDGS, with higher fat levels leading to greater problems.
  - Mycotoxins could also be problematic if the DDGS contains higher levels of vomitoxin or zearalenone in years when corn is contaminated.
  - Depending on the cost of these fiber sources, this approach could be quite costly. If too many producers take this approach, higher fiber ingredients could become very costly. Due to the shuttering of a number of ethanol plants, DDGS are in short supply so the price of DDGS is currently prohibitive – if you can source them at all.
  - Feeding higher levels of fiber in the diet prior to market will decrease carcass yield due to increased gut fill and the growth of the intestinal tissues. Carcass yield can be reduced by ~1 percentage point.
2. Reducing crude protein and essential amino acid levels will reduce growth rate and feed intake, but the nutrient reduction has to be in the range of perhaps 30 to 40%. Small reductions, in the range of 10 to 15%, especially of lysine, may reduce growth rate but is not likely to reduce feed intake. Tryptophan appears to be quite different; any deficiency in tryptophan appears to lower feed intake as well as growth rate.

We know how pigs will respond to modest reductions in amino acids, but we simply do not know how the modern pig will respond to very low amino acid levels. But if a significant change in performance is desired, SID lysine – along with other limiting amino acids - should probably decline by at least a quarter to a third.

Cautions:

- In all cases, diets must be properly balanced for minerals and vitamins. Remember, significantly lowering soybean meal could put potassium below requirement, so care must be taken. If minerals and vitamins fall below requirement, tail biting and other vices could result. So, even if protein and amino acid levels are reduced, mineral and vitamins levels should be maintained at or above requirement.
  - There are not a lot data out there on feeding very low protein diets to modern genetics. So there is some degree of uncertainty associated with this approach. It will definitely lower feed cost per pound and reduce growth rate, but we do not know by how much.
  - If pigs remain on this diet for any length of time, there is a risk of pigs depositing a lot of fat on the carcass.
3. A type of salt called anhydrous calcium chloride can be added to the diet to reduce feed intake. This is a fairly technical issue, so a qualified nutritionist will be needed to formulate the diets. The equation to use is called dietary undetermined anion and is calculated as sodium plus potassium plus magnesium plus calcium minus chloride minus phosphate minus sulfate ( $\text{Na}^+ + \text{K}^+ + \text{Mg}^{++} + \text{Ca}^{++} - \text{Cl}^- - \text{H}_2\text{PO}_4^- - \text{HPO}_4^{--} - \text{SO}_4^{--}$ ) and is calculated in milli-equivalents per kg (mEq/kg); lowering dUA to about 100 mEq/kg will reduce feed intake by about 15%; lowering it further, by 200 to 300 mEq/kg, will reduce feed intake by 30% or more.

Intake during the first week on such diets will be even lower than expected as the pigs adjust to the change in their feed. Anhydrous calcium chloride typically contains about 34% calcium and 60% chloride. While this approach is known to be effective, it may not be cost competitive.

### Caution

- This is a very technical topic, so a qualified nutritionist will be needed to properly formulate the diets.
  - When calcium chloride is added to the diet, an equal amount of calcium from limestone must be removed from the diet. Otherwise, the diet will contain excess calcium. The addition of sodium phosphate is undertaken to maintain a proper ration of calcium to phosphorus.
  - Based on research by Dr. J.T. Yen and colleagues, 4% anhydrous calcium chloride and 2.3% monosodium phosphate will reduce feed intake by about 30%.
  - The response by pigs can be quite variable, as some pigs over-respond to calcium chloride and eat very little feed and others are unaffected, so the response will be variable – but it is an effective way to lower feed intake overall in a group of pigs.
  - Plenty of fresh drinking water will be required by the pigs when calcium chloride is used.
  - This approach should not be used for more than 3-4 weeks, because calcium chloride can weaken bones if used for a prolonged period of time.
4. Restrict feed delivery to the pigs. This can be accomplished in a number of ways, but all of them require considerable labor. Restricting flow of feed through the feeder by tightening the feeder may be the most effective. Excessive restriction will lead to fighting and possibly other undesirable behaviors like tail-biting. Turning feeders off and on is time consuming and can lead to numerous problems ranging from aggressive behavior around the feeder to an increase in gastrointestinal disease.

### Cautions

- Restricting feed allowance greatly increases the risk of unwanted social behaviors such as fighting and tail-biting.
  - Restricting feed in a pen generally means that dominant pigs get to eat all they want, and submissive pigs get to eat much less. This leads to increased variation in weight at marketing.
  - Intermittent out of feed events could lead to digestive upset, such as ileitis.
5. We know pigs do not eat well in hot weather, so allowing the barn to warm up will reduce feed intake. Every 2°F above the pig's thermoneutral zone is estimated to reduce feed intake by about 0.1 lb/day. The impact will be much greater if the humidity is high. For example, one study showed that a 10% increase in humidity by itself, with no change in temperature, lowered feed intake by 1 to 2 percent.

### Cautions:

- The only practical way to increase barn temperature is to reduce ventilation rates. This will not only increase temperature but also humidity, so the impact will be greater. If ventilation rates are reduced too much, this could result in 1) higher moisture levels in the barn, and 2) higher noxious gas levels in the barn. Neither of these is good for the health of the pig, or for the health of people working in the barn, or for the integrity of the barn itself. Thus, this approach works best in the summer, and not nearly as well in the winter. In all cases, ensure that the minimum necessary air exchange is always achieved to maintain animal well-being and human safety. Consultation with an engineer with ventilation expertise is advised if this approach is considered.
  - Pigs will adapt to hot weather, especially by eating in the cooler part of the day. Therefore, increasing barn temperature will work best if the same temperature can be maintained 24 hours a day.
6. Keeping animals crowded certainly lowers feed intake but due to its potential impact on pig well-being, is **not recommended**. The effect of crowding will be especially great in hot weather.

7. Restricting water supply to lower feed intake is **not recommended**. Placing waters on timers and restricting water supply to the pigs will reduce feed intake, but at great risk. Therefore, this is not considered to be an acceptable approach to this problem.

#### Cautions

- Restricting water can compromise pig well-being, especially in hot weather.
  - Restricting water will lead to increased mortality if the water restriction is excessive.
  - Restricting water can lead to an increase in social vices, and especially fighting.
  - If restriction is severe, it can lead to salt poisoning.
8. Reduced salt level in the diet is another option which is also very risky and therefore is **not recommended**. Lowered salt intake, and especially chloride intake, will reduce feed intake. It is a tricky approach, because we do not have good data on how much to lower salt. It is better to reduce only chloride, which is an effective appetite suppressant, so sodium bicarbonate can replace part of the sodium chloride (salt) in the diet.

#### Cautions

- Lowering salt will lead to tail-biting and other vices. Replacing sodium chloride with sodium bicarbonate will reduce, but not eliminate, the risk of increase tail-biting.
9. Studies have shown that certain bitter tasting compounds will reduce feed intake in pigs. Unfortunately, we do not have any information on the availability, GRAS (generally recognized as safe) status or cost of such compounds, but they include things like caffeine, denatonium benzoate and quinine sulfate.

Finally, there are commercial products available on the market that purport to reduce feed intake. Since no public data could be found on these products, they are not included in this list.

**Disclaimer: The scenarios presented in this document represent potential strategies that could be employed to influence feed intake and growth in unique situations. Producers need to ensure that any production practice utilized maintains their ability to follow production standards, guidelines, laws, etc. to which they are subject and/or governed by and in particular maintain animal well-being.**