

Reducing Stress Response in Pigs to Enhance Meat Quality

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Research has shown that stress at marketing can reduce meat quality in several ways. The surge in adrenalin that happens as a result of fear or stress can change pH and temperature of the muscle at slaughter, which affects the colour and water-holding capacity of the meat. Prolonged stress from fatigue or fighting can also affect meat quality by depleting the energy stores necessary for the biochemical changes that ensure a good quality product. Stress during loading and transport to the slaughter plant also produces fear in the animal leading to a reduction in animal welfare. Therefore, reducing stress all the way from the farm to the point of slaughter is important for ensuring both good animal welfare and meat quality.

Calm, low stress handling of market hogs depends on a combination of properly designed handling facilities and the technique and experience of the handlers. But even in a well-designed facility skilled handlers often find that some pigs are simply harder to move than others, resulting in more stress for the pigs and the handlers. Sometimes there are large differences in handling and stress response between pigs from different farms – but even on the same farm some pigs are more difficult to handle than others. So what makes some animals more susceptible to handling problems and stress than others? Our research group is using several different approaches to find out.

One approach we are using is to explore management strategies that can be used to improve handling. Pig behavior during handling is thought to depend in large part on their previous experience with humans. One practical recommendation for getting pigs used to moving around people is to “walk the pens” during the growing and finishing phase. In one study, we investigated the effects of walking the pens on fear responses and handling of market hogs at two commercial farms and at a packing plant. Pens on those farms were walked once, twice or three times per week, or not at all, during the last 12 weeks before marketing. When walking the pens, a stockperson simply entered the pens holding a pig board and made one circuit around the pen, spending between 20 and 40 seconds there.

At both farms, walking the pens had a significant effect on pigs' behaviour. All of the pigs showed a reduction in escape behavior over time, but pens of pigs that were walked 2 or 3 times per week were less inclined to try to escape from the handler moving through the home pen than pigs whose pens were walked only once each week. By the end of the trials (weeks 11 & 12) escape behavior was significantly lower in pens walked 2 or 3 times compared to those walked only once per week. At the slaughter plant, pigs were observed as plant workers moved batches of pigs from each of the treatment groups through a crowd pen and into a chute. The frequency of jamming at the entrance to the chute and the time it took to empty the crowd pen were recorded. Handling treatment on the farm significantly reduced the frequency of jamming for pigs from Farm 1, with less jamming occurring for any of the pen walking treatments compared to pigs whose pens had not been walked. Similar results were found for the time it took to empty the crowd pen for the pigs from Farm 2. Pigs whose pens had not been walked on the farm took about twice as long to move out of the crowd pen than pen-walked pigs.

Another approach we are using to study individual pig differences in handling and stress is to measure behaviour on a variety of farms with different management and genetics to determine whether a pig's behaviour at the farm is predictive of its handling and stress at the packing plant and ultimately, of its meat quality (see Purslow this volume). We are currently using standardized tests of reactivity (fearfulness) such as time to approach a novel object or a person entering the home pen. We also assess a pig's temperament by measuring its willingness to exit their home pen when the gate is left open. "Bold" pigs are identified as those that voluntarily exit the home pen within 1 minute, "intermediate" pigs take longer, and "shy" pigs do not leave the pen at all during the test. We then observe behaviour during handling in a crowd pen immediately prior to slaughter, collect blood at slaughter to measure glucose, cortisol, lactate and creatine phosphokinase (CPK) as measures of stress, and take measurements on the hams and loins. Our behaviour data, together with stress hormones will allow us to identify meat quality issues that are associated with stress that occurs immediately before slaughter.

Our results to date indicate that measures of handling problems at the plant such as time spent in the crowd pen, frequency of interactions with the handler and avoidance behaviour of pigs (e.g. balking, jamming, piling) are all positively correlated with one-another. As expected, increases in these behavioral measures are associated with signs of acute stress response – higher blood glucose and reduced initial pH in ham. Different measures of stress are predictive of variation in measures of meat quality. Measures of blood glucose and lactate are positively correlated, and higher levels of blood glucose are associated with lower initial pH values in ham and loin, and higher shear values in ham. High lactate levels are associated with low initial pH in loin, lighter loin colour and higher drip loss levels for both ham and loin, traits which are associated with PSE pork. In contrast, elevated CPK is associated with higher initial and final pH values in ham.

Our preliminary data also indicate that there are relationships between behaviour at the home farm and measures of stress and meat quality at the plant. Significant correlations were found between the time it takes for pigs to approach a novel object and blood creatine phosphokinase (CPK), a measure of physical stress (muscle exertion or physical activity), with faster approach times relating to higher CPK values. High CPK was also associated with elevated pH_u (ultimate pH) in ham, suggesting that animals who are quick to approach a novel object are more reactive and tend towards traits associated with DFD pork. Comparison of pig temperament to meat quality measures also shows a significant correlation between temperament and drip loss in ham. Surprisingly, "bold" pigs had the highest drip losses. These data support findings from other studies indicating that individual pigs that seem to be less fearful may actually tend to have more meat quality problems.

The results from both studies indicate that behavioural differences on the farm can translate into differences in handling and stress at the packing plant, which may contribute to variation in meat quality. Behavioural responses of individual pigs and their susceptibility to stress most likely depend on a combination of experience and temperament. Our next step is to determine how pigs with different temperaments respond to different management strategies.