Chilling methods could change meat tenderness

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In a recent paper published in the *Journal of Animal Science*, meat scientists report that a method called blast chilling could affect pork tenderness. Researchers at the USDA-ARS, Roman L. Hruska US Meat Animal Research Center (USMARC) recently conducted a study that compares pork longissimus muscle (LM) tenderness and other meat quality traits between different stunning methods and carcass chilling rates at slaughter facilities.

The pigs used in this study came from one barn on a commercial finishing operation. Pigs were taken to one of three slaughter facilities. Plant A used CO2 stunning and conventional spray chilling; Plant B used CO2 stunning and blast chilling; and Plant C used electrical stunning and blast chilling.

"Blast chilling is a rapid cooling of the muscles for at least 45 minutes at less than negative ten degrees Fahrenheit," said Steven Shackelford of USMARC.

Blast-chilling systems are used to increase packing plant throughput, enhance food safety, and improve meat quality, particularly water-holding capacity of muscles from stress-susceptible pigs.

After slaughter, carcasses were cooled by blast chilling or conventional spray chilling. The researchers used a loin from the left side of the carcass for evaluation. They sent the loins to the USMARC, where the loins were refrigerated and weighed for purge loss. Purge loss is the loss

of fluid from meat.

At 15 days post mortem, the meat was cooked and the researchers measure the LM slice shear force. Slice shear force is a measurement of meat tenderness. The higher the shear force, the tougher the meat. They also tested the meat samples for marbling, muscle fiber length, moisture content, color, the break down of proteins, and intramuscular fat content.

The researchers found no loin quality advantages from blast chilling. They did find a 13-fold increase in excessively tough samples from blast chilling. This research shows that differences in chilling systems among pork packing plants can have a strong influence on loin chop tenderness.

"This study showed that blast chilling can have a very substantial negative impact on tenderness. So there are trade-offs that must be considered," said Shackelford.

The findings are surprising because past literature suggests that blast chilling had little importance. The researchers believe this is due to changes in genetics and production systems, which can affect chilling rate. The researchers also found that regardless of chilling method, CO2 stunning resulted in darker LM lean color and greater LM water-holding capacity than electrical stunning.

For the future, the researchers would like to see studies that determine whether differences exist consistently across conventional and blast-chill plants over multiple seasons of the year and multiple production systems.

"Given the real and perceived advantages of blast chilling, we think that more research is needed to determine optimal blast-chilling conditions for a balance of all meat quality traits and other economical issues," said Shackelford.

More information: This study is titled "Chilling rate effects on pork loin tenderness in commercial processing plants" by S.D. Shackelford, D.A. King, and T.L. Wheeler. It can be read in full at journalofanimalscience.org

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