Dr. Koohmaraie on Tenderness

At the 2014 NAPA Annual Meeting, guest speaker Dr. Mohammad Koohmaraie gave an extremely interest-ing report on the biological basis of beef tenderness - specifically as it relates to inactive myostatin in the Piedmontese breed.
A general summary is included here, with some of the graphics. If you would like the complete presentation emailed as a PDF file, please contact napa.piedmontese@gmail.com

According to Dr. Koohmaraie, Piedmontese in-active myostatin is very unique with a considerable effect on tenderness.

Myostatin happens in cattle, sheep, humans ...an animal could have 0, 1 or 2 copies of the inactive gene.

In normal cattle, the calf is born with a fixed number of muscle fibers.
Because of inactive myostatin, calves are born with ***more*** muscle fibers. (As illustrated in the image below representing a bundle of muscle fibres from a 0-copy, a 1-copy and a 2-copy).

After birth, calves with or without inactive myostatin essentially grow the same.

Calves with inactive myostatin will have far higher muscle content as a percentage of carcass weight, hence significant increase in retail product yield.

In the USDA Germplasm Evaulations (GPE), Piedmontese were back-crossed to create 0-copy, 1-copy and 2-copy animals with varying percentages of Piedmontese-blood (from 25 - 75%). Of these crosses, the 0-copy Piedmontese-influenced animals produced 64.4% retail product yield; the 1-copy animals produced 71.5% retail product yield and the 2-copy animals produced 85% retail product yield. This clearly illuminates the effect on carcass performance from inactive myostatin.

(continued next page)

Pictured left, Piedmontese 0, 1 and 2-copy beef and carcasses from the USDA MARC GermPlasm Evaluation Project.

Dr. Koohmaraie on Tenderness (cont.)

The USDA research on tenderness includes measurements conducted in two different ways: Warner Bratzler Shear Force (a mechanical measure of pounds pressure required to cut through a core of beef); and Trained Sensory Panel.

Dr. Koohmaraie explained that shear force is unable to take into account the influence of connective tissue, or juiciness, and therefore Sensory Panel reviews can be a much more complete investigation into beef tenderness.

Especially for Piedmontese, where the majority of positive effect on tenderness appears to be due to the significant reduction in connective tissue (collagen) from the inactive myostatin gene, Dr. Koohmaraie recommended the use of Trained Sensory Panel review.

The conclusions reached by the USDA GPE research were that the percentage of Piedmontese heritage had no effect on carcass performance or meat quality, but that all of the effects were due to the inactivated myostatin gene.

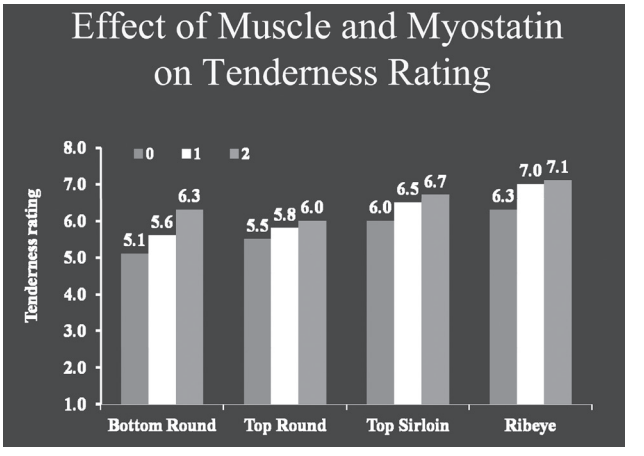
The 1-copy beef was more tender than 0-copy for all muscle groups.
The 1-copy beef was essentially equal in tenderness to the 2-copy beef in all muscle groups, except bottom round (where 2-copy beef was slightly more tender than 1-copy).

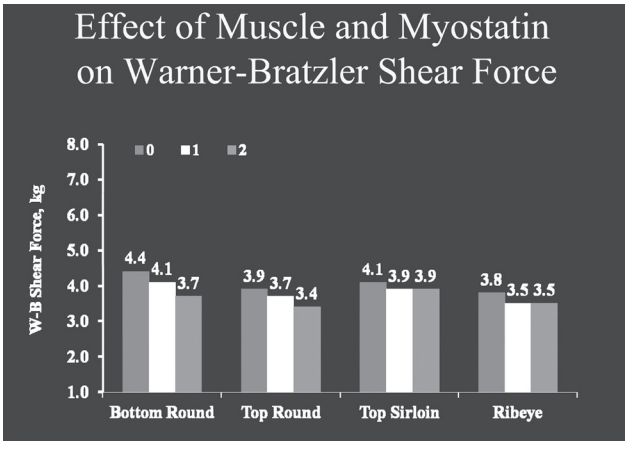
The objective of Dr. Koohmaraie's presentation was to address concerns over the use of genetic marker tests to predict tenderness in Piedmontese cattle.

Dr. Koohmaraie reported, "The effect of inactive myostatin (1 or 2 copy) versus 'active myostatin' (0-copy) is 1.1 to 0.8 units (depending on which muscle group) for trained sensory panel tenderness rating on an 8-point scale. This is a very large effect on tenderness. Shear force will underestimate the effect of myostatin on tenderness due to connective tissue effect of myostatin.
Homozygous tender versus homozygous tough for calpain / calpastatin marker results in about 0.3 unit of trained sensory panel tenderness rating improvement for longissimus. Ranking / rating Piedmontese for tenderness based on calpain / calpistatin markers or even shear force underestimates their tenderness level if they are known to have at least 1-copy inactive myostatin."

[Editors note: to clarify the units of difference on an 8-point scale of tenderness, as described by Dr. Koohmaraie:
1.1 units difference = 13.75% difference; 0.8 units = 10% difference; and 0.3 units = 3.75% difference.
Piedmontese 1 and 2-copy beef rated between 10% to 13.75% better than 0-copy beef for tenderness.
0-copy (non-Piedmontese) beef from "homozygous tender" calpain / calpastatin marker test rated 3.75% better than 0-copy (non-Piedmontese) beef from "homozygous tough" calpain / calpastatin marker test. This gives a clear example of why commercially available tenderness tests based on calpain / calpastatin, that do not also consider inactive myostatin as an indicator of tenderness, should not be used for Piedmontese 1 or 2-copy animals as valid indicators of tenderness.]

**From 1987 until 2008, Dr. Koohmaraie had various roles at the U.S. Meat Animal Research Center, as scientist, Department Head and then Director of the Center. In 2008, Dr. Koohmaraie joined IEH Laboratories and Consulting Group as its Chief Executive Officer of the Meat Division. In 2012, Dr. Koohmaraie was inducted into the Meat Industry Hall of Fame.
He is truly a knowledgeable fan of Piedmontese Beef.**





In the two charts above, tenderness on the 8-point scale is scored with 1 being extremely tough and 8 being extremely tender.