Bull selection: A Visual Cue

Facial hair-whorl patterns may provide a visual indication of bull fertility.

by ***Corinne Blender***

A producer's ability to identify good Angus bull prospects while the bulls are young may be improved by the visual appraisal of facial hair whorls, according to a Colorado State University (CSU) study that was led by graduate student Melissa Meola and livestock-handling specialist Temple Grandin.

Their research found that hair-whorl characteristics may be correlated with scrotal circumference, sperm motility and sperm morphology — parameters measured in a breeding soundness exam (often referred to as a BSE). This theory is based on the fact that the patterning of hair follicles and testicular development occur at approximately the same time during fetal development.

"I've been in the packing plant, and you can get a very small calf fetus, a Holstein for example, and you'll see the black-and-white pattern. That hair pattern develops early, when the nervous system is forming," Grandin says. "As soon as the fetus looks like a calf, you're starting to get hair-whorl patterns."

Research has shown that the patterning of hair follicles occurs 10-18 weeks after fertilization, while testicular development begins eight weeks after fertilization and is complete at 16 weeks, say Meola and Grandin.

"There is research that shows that abnormal [hair] patterns are related to mental retardation and other developmental abnormalities in humans," Grandin says of the information that made her wonder about these types of relationships in cattle.

Studying the relationship between hair-whorl patterns and semen morphology is easily done, she points out. "We have to semen-test the bulls anyway."

The process

The CSU research team, including Grandin, Meola, Patrick Burns and Robert Mortimer, began their study in 2002 with 150 Angus yearling bulls. Bulls with no facial hair whorls were excluded from the analysis. The bulls in the study all passed a physical exam before semen was collected during a routine breeding soundness exam. Scrotal circumference measurements were taken, and semen was evaluated for motility and morphology.

For the morphology evaluation, approximately 100 sperm from each bull were evaluated using a staining technique. The sperm were individually classified as either normal or abnormal, noting defects such as bent tails and abnormal heads. Grandin says the microscope work was very tedious.

PHOTOS BY MELISSA MEOLA

►Temple Grandin, Colorado State University livestock-handling specialist, says hair-whorl patterns are related to sperm morphology. The bull pictured here provides an example of a normal hair whorl with a round epicenter. A higher percentage of bulls with the normal pattern passed the breeding soundness exam in Grandin's 2002 study.

►The bull pictured here has an abnormally long whorl pattern. Grandin says bulls with an abnormal pattern were more apt to have poorer semen quality.

"When a veterinarian looks at the abnormalities, he's basically estimating the percentage of abnormalities. He's not getting in there and counting 100 sperm. It's like a professional estimate," Grandin says of the traditional sperm morphology exam.

"What we did was bring the slides back to the lab, and they were counted like blood cells. So it was a highly accurate counting, which would be more accurate than the way a veterinarian would do it at the chute," she adds, pointing out that it would not be practical for a

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veterinarian to do this for a regular breeding soundness exam. "It takes half an hour or longer per slide to count the sperm." The morphology samples were evaluated twice, and the results were averaged to get the most accurate result possible.

Hair-whorl patterns were documented by an observer who drew pictures of each animal's hair-whorl pattern. Hair whorls were classified as having a round epicenter or a non-round epicenter. Hair whorls were also classified into two extreme categories: (1) perfect round spirals with rotation or (2) facial whorls with a line that was longer than the diameter of the bull's eye. Grandin says they did notice some bulls with double whorls, but she says that's still a good pattern as long as the epicenters are round.

Research findings

Bulls with normal, round epicenters were more likely to have a higher percentage of normal sperm and were also more likely to have satisfactory sperm morphology scores than bulls with facial hair whorls with non-round epicenters. Bulls with one or two facial hair whorls with a round epicenter had a higher percentage of normal sperm (79% ± 1.5%) than bulls with one or two facial hair whorls with non-round epicenters (71% ± 2.1%; P=0.005).

Grandin says the data was evaluated further, and bulls were separated into a group of perfectly round whorls with rotation. Of the 29 bulls that qualified for that group, 24 had satisfactory morphology scores (83%; P=0.02).

A group of 18 bulls in the study had facial hair whorls with very long epicenters, longer than the diameter of their eye. Only nine bulls in that group had satisfactory semen scores.

Age did not have a significant effect on the percentage of normal sperm.

Practical application

The ability to apply research findings in daily operations can be the most important aspect to ranchers. Grandin says from a practical standpoint, the best way for ranchers to look at this is by evaluating the hair-whorl pattern on the bull's forehead. A nice, normal, round hair whorl is a good sign that the bull will have quality semen, she says. "If he's got some distorted ugly line — an abnormal type of pattern — he'll be the one more likely to have bad semen."

"We have only done this study with Angus cattle, so I am not going to make any claims about any other breed right now," she points out. "It is not an absolute thing. It is a probability thing. Nothing in biology is absolute."

Breeders may wonder if hair-whorl patterns are highly heritable, but Grandin says there is more research to be done. The CSU study was the first of its kind.

"There's a lot of things that have not been studied. We did do some analysis looking at sire lines, but there were so many different sires that there were not more than five calves per sire, so you couldn't look at anything in terms of sires."

Grandin says pictures taken of two different bulls (see pictures on page 111) in the study provide good examples of normal and abnormal facial hair-whorl patterns.

"When you look at those pictures — the one with the nice, round spiral — see what a nice masculine head he's got," she points out. The other picture shows a bull with a long, abnormal pattern, and she says he has an ugly, feminized head.

"We need to be doing a little more visual appraisal," she adds. "I'm horrified at all the lameness that is showing up in beef cattle. People are just blindly looking at EPDs (expected progeny differences) without looking at their animals."

Visual appraisal still important

The visual appraisal of livestock can still offer insight on how cattle will perform. "In general we need to be taking a much more holistic approach," Grandin says. "We need EPDs, but you also need to just look at an animal and ask questions. Is he structurally correct in his feet? Does a bull look like a bull? I think a bull ought to look like a bull, and a cow ought to look like a cow."

By looking at facial hair-whorl patterns producers may be able to make better selections on bulls to keep and those to castrate.

She says, "Say you had 20 little bull calves and want to keep 10 intact and not castrate them. If they've got an ugly line, I think they are going to get in the early castrate group."

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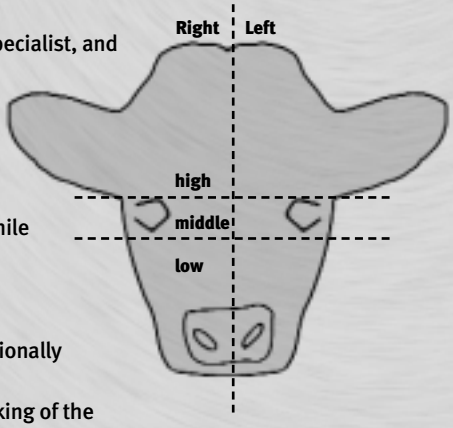
Editor's Note: *For more information, see "Quality of Sperm Morphology in Angus Yearling Bulls May be Related to Hair Whorl Shape," on pages 124-126 of the proceedings to the 2002 Western Section Meeting of the American Society of Animal Science (Vol. 53, 2002).*

Facial hair whorls and temperament

Hair-whorl position on the forehead of cattle has been correlated with temperament and may be of value in selective breeding for a calm temperament, say Colorado State University (CSU) researchers.

Temple Grandin, a livestock-handling specialist, and other CSU livestock specialists did a study in 1995 to evaluate the relationship of facial hair-whorl position to temperament.



A four-point rating system was used to assess the temperament of 1,500 cattle while they were restrained in a squeeze chute:

(1) calm, no movement;

(2) restless, shifting weight;

(3) head throwing, squirming and occasionally shaking the squeeze chute; and

(4) lunging and continuous, violent shaking of the chute.

The observations concluded that cattle with whorls above the eyes were more agitated in the squeeze chute compared to animals with whorls below the eyes. Their report offers as a possible explanation the fact that hair patterns develop in the fetus at the same time the brain forms.

Grandin and other specialists continue to evaluate hair-whorl patterns in relation to livestock abnormalities. She says her current findings show that temperament is related to position, and sperm morphology is related to the shape or the pattern of the hair whorl.