

Arthrogryposis Multiplex: Q&A

Story by

AMERICAN ANGUS ASSOCIATION

On Saturday, Nov. 15, 2008, the Board of Directors of the Association, through a series of unanimous votes, adopted a new policy and related set of rules governing the handling of genetic defects within the breed. These actions concluded an eight-week examination of the Association's prior policy and rules dealing with the subjects of genetic defects generally and arthrogryposis multiplex (AM) in particular.

At its November meeting, the Board:

- Adopted a new policy related to its handling of genetic defects and amended Rules 300 to 307. (To see the amended rules, visit www.angus.org/PolicyandRelatedRules.pdf or see the *Breeder's Reference Guide* scheduled to be inserted in the March *Angus Journal*.)
- Adopted a specific policy relating to the registration status of potential and known carriers of arthrogryposis multiplex (AM). (For the policy, visit www.angus.org/AMPolicy.pdf or see "AM: Registration Policy" on page 34).
- Amended Rule 103(d) to recognize AM and prohibit the registration of affected animals (Note: This amendment does not apply to carriers of a genetic defect but instead to actual animals physically afflicted by the recognized abnormalities. For the rule, refer to www.angus.org/NewRule103d.pdf or the *Breeder's Reference Guide*.)
- Rescinded Rule 806, relating to the showing of cattle that are carriers of a recognized genetic defect. (Refer to the 2008 *Breeder's Reference Guide* inserted in the March 2008 *Angus Journal* for a copy of the rule, which has been rescinded.)
- The Association's rule relating to "genetic factors," as opposed to genetic defects, remains unchanged

and is now set forth as Rule 350 GE. (For the rule refer to www.angus.org/Rule350GE.pdf or the *Breeder's Reference Guide*.)

Please take note that both the new policies and rules emphasize the Association's ability to convey timely and accurate information through its web site (www.angus.org). Members should check that web site regularly to access the names and registration numbers of carrier animals, as well as animals tested free of the genetic defect. A printed listing of such animals will be made available to any requesting member without charge, but the most up-to-date version of such listings is available at the Association web site.

Editor's Note: *The above notice was posted to the American Angus Association web site, www.angus.org, Nov. 20, 2008. The Q&A was posted Nov. 25.*

Commonly asked questions

The following summary was developed to respond to questions commonly asked by American Angus Association members. Both the questions and the answers are based on the operating assumption that AM is a genetic defect with a simple recessive pattern of inheritance and that the test developed by Jon Beever of the University of Illinois and licensed for use by multiple laboratories (see below) can determine whether an animal is a carrier of the mutation or free of it.

What is an AM calf?

Calves are born dead or die shortly after birth. The spine and legs appear crooked or twisted and the joints of the legs are often fixed in position. Front legs are contracted and rear limbs may be contracted or extended. Calves are small and appear thin due to limited muscle development. There may be a cleft affecting the nose or palate. (see photos on page 34).

What is an AM carrier?

For purposes of this response, an AM

A video is available of Jon Beever's presentation given during the Angus Education Center conducted in conjunction with the Association's 125th Annual Meeting in Louisville, Ky. To access the presentation, visit www.angus.org/ccs_info.html.

carrier is an Angus or Angus-cross cow, heifer, bull, or steer that carries the recessive AM mutation in its DNA.

Why are carriers of AM important?

Carriers of AM used in breeding programs (registered or commercial) are responsible for propagating the recessive mutation within the cattle population.

What does an AM carrier look like?

An AM carrier looks perfectly normal; there is nothing in the way the animal looks (its phenotype) that indicates that the animal is a carrier of the AM mutation.

If a cow has an AM calf, what does that mean?

If a cow has an AM calf, and if it is the cow's natural calf, it means that the cow is a carrier of the AM mutation and the sire of the calf is also an AM carrier.

If a recipient cow has an AM calf, what does that mean?

If a recipient cow has an AM calf, it means only that both the donor cow and the sire of the calf are carriers of the AM mutation. It doesn't tell you anything about the AM carrier status of the recipient cow.

If a bull sires an AM calf, what does that mean?

If a bull sires an AM calf, it means that the bull is a carrier of the AM mutation and the dam of the calf is also an AM carrier.

I have never had an AM calf. Does that mean my cows are non-carriers?

Not necessarily.

What is the risk of having an AM calf if I breed an AM carrier cow to an AM carrier bull?

Every time you breed a carrier to a carrier, there is:

- a 25% risk of having a dead AM calf;
- 50% risk of having an otherwise normal-looking calf that carries the AM mutation;
- 25% chance that you will have a non-carrier calf.

If I breed an AM carrier cow to an AM carrier bull and have three live calves, will the fourth calf have AM?

The risk is the same every time you breed a carrier to a carrier. There is always a 25% risk of having a dead AM calf, a 50% risk of having a carrier calf, and a 25% chance of having a non-carrier calf.

If I breed an AM carrier cow to a non-carrier bull, what is the chance of having an AM calf?

Zero. You will never have an AM calf if you breed a carrier cow to a non-carrier bull.*

If I breed an AM carrier cow to a non-carrier bull, what is the risk of having a carrier calf?

Every time you breed a carrier cow to a non-carrier bull there is:

- a 50% risk of having a normal-looking calf that carries the AM mutation; and
- 50% chance you will have a non-carrier calf.

If I breed a non-carrier cow to a carrier bull, does that change the risks?

Association-authorized labs for AM testing

Below are the labs authorized as of Jan. 14, 2009, for AM testing by the American Angus Association. Consult the respective web sites for information on preferred sample types, sample submission forms, pricing information and complete instructions on how and where to submit samples for testing. In choosing a lab, members of the Association are urged to read and carefully consider any language on a given lab's submission form (for the AM test) or on its accompanying "Terms and Conditions" that relates to any lab's alternative use of the DNA samples being submitted. For updates to this list, visit www.angus.org/AMLabs.html.

AgriGenomics

2399 N. 1000 E. Rd.
Mansfield, IL 61854
217-762-9808

GeneSeek

4665 Innovation Dr.
Suite 120
Lincoln, NE 68521
402-435-0665
www.geneseek.com

Igenity

4701 Innovation Dr.
CB 101
Lincoln, NE 68521
1-877-IGENITY
1-877-443-6489
www.igenity.com

MMI Genomics

1756 Picasso Ave.
Davis, CA 95618
1-800-311-8808 ext 3016
www.mmigenomics.com/Curly_Calf.html

Pfizer Animal Genetics

250 Plaque St.
Harahan, LA 70123
1-877-BEEF DNA
1-877-233-3362
www.pfizeranimalgenetics.com

No. The risks do not change. A carrier mated to a non-carrier always produces a 50% chance of a non-carrier calf and 50% risk of a carrier calf.

I have many cows that have AM carriers in their pedigrees. Until they are tested, I won't know if they are AM carriers or non-carriers. How should I breed them?

The goal would be to use bulls without any AM genetics in their pedigree. If you breed your AM-influenced cows to unrelated or AM-tested free bulls, your risk of having an AM calf is eliminated.

What do I do with confirmed non-carrier females in my herd?

If the females are tested non-carriers and they are bred to non-carrier bulls, they will never produce affected AM calves or carriers. These non-carrier females can be used throughout your breeding program with no risk of propagating the AM mutation.

What do I do with confirmed female carriers in my herd?

You have several options:

- If you have a cow that carries the AM mutation and you want to produce calves from her, you must make a commitment to test all offspring retained for breeding;
- If you have both a registered and a commercial herd, retain your carrier cows in the commercial herd, breed to a non-carrier bull, and test any calves retained for breeding purposes;
- If you always breed your carrier cows to a non-carrier bull, you will never have an AM calf. Then, treat the resulting calves as market animals, not as breeding stock.
- Use your AM carrier cows as ET recipients. As a recipient female, she has no genetic effect on the embryo calf she raises.



**These answers exclude the possibility of a spontaneous mutation occurring.*

Definitions

AM carrier: Any animal that carries the recessive AM mutation in its DNA.

AM non-carrier: Any animal that has been determined to be free of and without the AM mutation.

AM calf: An affected calf born dead (or that dies shortly after birth) with a spine that is bent or twisted, that appears small and thin and has legs that are often rigid and may be hyperextended.

AM potential carrier report

AAA Login users can access an interactive tool to generate a report of owned animals and their arthrogryposis multiplex (AM) status based on the AM test results received to date. From the AAA Login menu, go to the "Interactive" section and click on "AM Potential Carrier Report." If you are not a current AAA Login user, you can sign up to create an online profile at www.angusonline.com.