

American Angus Association® Arthrogryposis Multiplex (AM) Fact Sheet

ANGUS
THE BUSINESS BREED

The following fact sheet was developed to respond to questions commonly asked by American Angus Association members. Additional information may be found online at www.angus.org.

What is Arthrogryposis Multiplex (AM)?

AM was recognized as a genetic condition on September 16, 2008. 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.



Figure 1



Figure 2

What causes AM?

AM is caused by a recessive mutation on a single cattle chromosome. Cattle that are homozygous for the mutated gene will exhibit AM.

What is an AM carrier?

For the purpose of this response, an AM carrier is an Angus or Angus-cross cow, heifer, bull or steer that carries the recessive AM mutation in their 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 an 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 that 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;
- A 50% risk of having an otherwise normal-appearing calf that carries the AM mutation;
- A 25% chance that you will have a normal-appearing, 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 affected calf?

Zero. You will never have an AM affected calf if you breed a carrier cow to a non-carrier bull. (excluding the possibility of a spontaneous mutation)

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-appearing calf that carries the AM mutation; and
- A 50% chance you will have a non-carrier calf.

Is there a test to identify AM carriers?

Yes. A DNA test is available to determine if an animal carries the AM mutation in their DNA. The type of DNA sample required to perform the test varies from lab to lab but includes; hair root samples, blood-spot or FTA cards, whole blood in "purple-top" tubes, tissue samples from ears and semen samples.

A video on www.angus.org explaining how to collect the sample can be found [here](#).

What do I do with the 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; (check policy regarding registration requirements)
- 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.
- Use your AM carrier cows as ET recipients. As a recipient female, she has no genetic effect on the embryo calf she raises.

AM potential carrier report & potential carrier management tool

AAA Login users can access interactive tools 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 "Potential Carrier Report AM/NH/CA/DD/M1/D2" or "Potential Carrier Management Tool (PCMT)." The PCMT can identify those animals in your herd that have the most descendants in your herd and would be the most logical animal to start a testing scheme should you decide to test for a particular genetic condition. If you are not a current AAA Login user, you can sign up to create an online profile at www.angusonline.org.

What is the AAA registration policy regarding AM?

	If a calf is a potential carrier submitted for registration after 9-13-12.
Heifers	Must be tested and can be registered regardless of the test outcome.
Bulls	Must be tested and only those that test AMF can be registered.
E.T. Calves	Registration is based on sex of calf and if they are sired by a bull that is an A.I. sire as described below.
Steers	No test required.
A.I. Sires that are confirmed carriers	Calves cannot be registered that are conceived more than 60 days after the date a non-owned bull (a bull that would require an A.I. Service Certificate) is listed as a carrier animal (AMC).
Definitions	AMC – AM Carrier, has been tested and carries the AM mutation. AMF – AM Free, has been tested and does not carry the AM mutation. AMP – AM Potential Carrier, animal that traces to one or more confirmed tested carrier animals in its pedigree that have no intervening ancestors that have been tested free of AM.

Two Testing Options

1. Submit Samples through American Angus Association/AGI

Use [AAA Login](#) to order tests. Samples are submitted to the American Angus Association and archived for future testing requests. Login at www.angusonline.org and use menu option: Order--Testing for AM/NH/CA/DD/D2/M1



2. Additional Authorized Labs for Arthrogryposis Multiplex (AM) Testing

Below are the labs currently authorized for AM testing by the American Angus Association. Consult the respective lab web sites for information on DNA 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.

The following labs are authorized for AM:

GeneSeek

4665 Innovation Dr. Suite 120
Lincoln, NE 68521
402-435-0665
Fax: 402-435-0664
www.geneseek.com

Zoetis

333 Portage Road, Bldg 300
Kalamazoo, MI 49007-9970
877-233-3362
Fax: 269-833-4711
<http://www.zoetis.com>