

Arthrogryposis Multiplex Questions and Answers

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 Arthrogryposis Multiplex (“AM”) will be identified as a genetic defect with a simple recessive pattern of inheritance and that Dr. Jon Beever, University of Illinois, will develop a test that determines whether an animal is a carrier of the mutation or free of it.

Definitions

AM carrier	Any animal that carries the recessive AM mutation in its DNA
Non-carrier	Any animal that has been determined to be free of and without the AM mutation
AM calf	An affected calf born dead with a spine that is bent or twisted, that appears small and thin and has legs that are often rigid and may be hyper-extended.

What is an AM calf?

An AM calf is a calf born dead with a spine that is bent or twisted. They also are small and appear thin because of limited muscle development. Their legs are often rigid and may be hyper-extended. *For photographs and a complete description, [click here](#).*

What is an AM carrier?

For purposes 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 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 bull 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 is also an AM carrier.

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

Not necessarily.

What about mating an AM carrier to another AM carrier?

- First, if I breed an AM carrier cow to an AM carrier bull, what is the risk of having an AM calf?

Every time you breed a carrier to a carrier, there is a 25% risk of having a dead AM calf.

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

Every time you breed a carrier to a carrier, there is a 50% risk of having an otherwise normal-looking calf that carries the AM mutation.

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

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

What about mating an AM carrier to a non-carrier?

- 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.

- If I breed an AM carrier cow to a non-carrier bull, what is the chance I will have a normal calf?

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

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 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.

After the test is available, 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 AM 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.

After the test is available, 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.