



# NEWS

## Curly Calf Recessive Gene Identified

**T**he Ayrshire Breeders Association received confirmation in August 2021 that a new detrimental recessive was found in bloodlines derived from the Swedish bull Peterslund AYSWEM91213. The abnormality has been called Curly Calf and is recognized by the abbreviated letters AM which stands for Arthrogryposis Multiplex.

If a tested individual is not a carrier of this simple recessive, they are designated AMF (free of the gene). If a tested individual is a carrier of the gene, it will be labeled AMC (Carrier of the gene).

This defect causes calves to not develop properly in the womb because there are proteins missing that direct muscular and bone development. Affected calves will most likely be still born; and if not, they die soon after birth. These calves normally carry to term, there is very little early embryonic death with this condition; and it is not known to be related or linked to any other recessives we are aware of. The calves will be smaller than expected and thin.

The most striking trait however is the twisted and rigid limbs and spine. Severity of the contorted limbs varies, but most often the calves are not able to be presented in the birth canal and c-sections are necessary to extract the calves. The birth is complicated more if you do not realize you are dealing with a severely deformed calf that can not pass through the birth canal. Often the cow is stressed to the point she

is lost as well as the calf.

This recessive deformity has potential for huge economic impacts once you realize you will most likely lose both the calf and cow. This recessive is transmitted in the same fashion as red coat color in the Holstein breed.

If a mating is between two non-carriers, there is no problem, and calves will of course be normal. If a mating is made between a non-carrier and a carrier, you can expect 50% of the calves to not carry the affected gene and 50% would have the affected gene. The calves that are carriers will not show the abnormality but will be able to pass that defective gene on to their offspring. If two carriers are mated, 25% of the time the offspring will be a non-carrier, 50% of the time the offspring will be a carrier and show no signs of the deformity, but 25% of the time you will get an affected deformed calf. Remember if an animal is "Purebred" or has no Peterslund in its pedigree, they will not be affected.

As we know, there are a growing number of detrimental recessive traits that have been identified by the use of genomic testing. Unfortunately, there will be more found in the future but because of the science available to us we will find these problems and learn to deal with them more quickly than in the past. This Curly Calf syndrome can be controlled with diligence, cooperation and dedication to our breed. There will be individual animals that have attractive pedigrees and traits that will be a disappointment to ex-

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- Affected calves will most likely be still born; and if not, they die soon after birth.

- Some recessives will have far less impact on the development and future of the breed than Curly Calf, but this one is dangerous and can cause irreparable damage if not controlled.

### ***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 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:

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clude, but it is necessary to eradicate this problem. Some recessives will have far less impact on the development and future of the breed than Curly Calf, but this one is dangerous and can cause irreparable damage if not controlled.

At this time, the US has been relatively unaffected by Curly Calf Syndrome. US Animals that have been tested have resulted in a very low incidence of carrier animals, and we have only been informed of one affected birth. Of course, there could be significantly more carriers in our population that have not yet been tested. If we are proactive, we can keep it from polluting our population and causing problems we cannot afford to incorporate into our herdbook. Testing will be imperative to conquer this problem.

The US AI organizations have been very proactive and have initiated testing of all of their bulls that could be carriers. They are actively identifying those found to be carriers so breeders can make informed decisions about choosing to use these sires in their programs (a list of known carriers marketed in the US is included). They have pledged to not bring any carrier bulls into their programs in the future. Statistics show that simply by using these two steps over a 5-generation time period, we can reduce the incidence of this gene in our population to 3% of those individuals with Peterslund in their pedigree. It has been done with many other detrimental recessives in other breeds!

The Angus breed has been dealing with Curly Calf since the 1980's and has developed policies for testing and registry that have greatly reduced the incidence in their population. Ayrshire has been in contact with the Angus Association, and they have been an invaluable resource for us. We are including a fact sheet from Angus that does an excellent job providing information. Jerry Cassady, Angus Director of Member Services says, "Regarding the genetic disorder Arthrogyposis Multiplex (AM), also referred to as Curly Calf Syndrome, is not to be taken lightly. As with any other lethal defect with recessive inheritance, this defect can linger within a population for years, unknowingly



**Curly Calf is a dangerous recessive that is fatal for calves.**

crippling a breed from within. My experience with this particular genetic condition is all too familiar, and I would recommend to any breed association to be very fearful of this lethal defect."

Ayrshire has been working with Dr. John Beevers of the University of Tennessee (who directed Angus' research) to develop a very sensitive and highly accurate genomic test for our breeders to use. We are hoping this test will be available soon after the first of the year. We encourage every breeder who has animals with Peterslund blood to conduct tests so you know the status of your animals, and you can make educated matings that will reduce the possibility of passing this gene on in the population.

"With proper testing protocol, a breed association can put monitoring and tracking of lethal defects in place in order to reduce the economic loss to a breed and its members. The goal for any breed association dealing with a lethal defect which there is a commercial test available to the membership would be to help eliminate the defect from the population as a service to the membership and their respective customers," says Jerry Cassady, American Angus Association.

Ayrshire is a small breed that cannot afford not to know about this destructive defect. Testing will preserve our integrity.

We invite any Ayrshire breeder to contact us with questions or concerns.

*Sincerely,*

*Mary Creek, Breed Improvement  
Committee Chair*

*Becky Payne, Executive Director*

## **KNOWN CURLY CALF CARRIER SIRES SOLD IN THE US**

*(This is the currently known  
carrier list and may not be complete.)*

### **Distributed by Semex**

Peterslund  
Hauptre Kansas  
Kamouraska Rockstar  
Kamouraska Decaf  
Kamouraska Volvo  
Selwood Viserdale Sunspot  
Des Coteaux Miquelon  
DeLa Plaine Blink  
La Sapihiere Chelyote  
Ruisseau Clair Tuxedo  
Des Fleurs Paraguay  
Margot Player

### **Distributed by Blondin Sires**

Marilie Autograph

### **Distributed by Sexing Technologies**

Des Fleurs Saguenay  
Bold Durango Calder-P

### **Distributed by Select Sires**

Ruisseau Clair Aslan Americo  
Good-Vue Chaos

***The final deadline for the  
2022 REWARDS program  
is approaching!***

***Applications must be  
submitted by March 31,  
2022. REWARDS is the  
solution for breeders looking  
for convenience and  
cost-savings to enhance  
the value of their  
Registered Ayrshires.***

***Registrations for herds  
enrolled in the 2021  
program must be received at  
the ABA by March 1, 2022.***

# 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](http://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](http://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 Arthrogyrosis 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](http://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.

<b>Heifers</b>	Must be tested and can be registered regardless of the test outcome.
<b>Bulls</b>	Must be tested and only those that test AMF can be registered.
<b>E.T. Calves</b>	Registration is based on sex of calf and if they are sired by a bull that is an A.I. sire as described below.
<b>Steers</b>	No test required.
<b>A.I. Sires that are confirmed carriers</b>	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).
<b>Definitions</b>	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.