

## *Fact Sheet of Common Asked Questions Genetic Condition Developmental Duplication (DD)*

### **What is Developmental Duplication (DD)?**

DD is an abnormality recently identified through DNA testing research of Angus cattle. The genetic condition is a simply inherited recessive genetic condition passed through particular lines of Angus cattle that may result in cattle being born with an extra limb or part of an extra limb.

### **Is Developmental Duplication (DD) known by any other name?**

DD may also be called polyelia in some research literature.

### **What type of inheritance is involved with the condition?**

It is identified as a simply inherited trait suggesting only one pair of genes will determine the animal's phenotype for the condition. Therefore, an animal must inherit the recessive form of the gene from both the sire and the dam for the condition to be present. This would be considered a homozygous recessive animal for the trait. Further research has suggested that incomplete penetrance is also involved in this genetic condition. This may explain why some homozygous recessive (DDA) animals don't show visible signs of a defect but have both bad copies of the gene.

### **What animals need to be tested?**

Fortunately the majority of registered Brangus cattle are not potential carriers (PC) for the DD condition. Only animals that are potential carriers for DD should be considered for testing. An animal will be classified as a potential carrier if an ancestor is a known carrier (DDPC) or known to be affected (DDC).

### **How will I know that my animal is a potential carrier?**

The IBBA registration paper will designate the potential carrier animals with a "DDPC" notation. Additionally, all "tested affected", "tested carrier" and "tested free" animals within the pedigree will have DDA, DDC, DDF and DDPC notation, respectively. The same notation will also be included in the BARN portal with added colors for each level of the condition. Green will indicate a DD "tested free" animal, red will indicate a DD "tested carrier" animal and yellow will indicate a DD potential carrier animal that has not been tested.

### **How do I know for sure if my animal is a carrier?**

If an animal is designated DDPC, the only way to know for certain whether it is free or a carrier is to have it genetically tested using DNA. Possible sample types include blood (on an official blood card), hair root samples, tissue samples from ears and semen samples.

### **What do the test results mean?**

Possibilities for DD test results are DDF (the animal carries zero copies of the recessive gene), DDC (the animal carries one copy of the recessive gene), or DDA (the animal carries two copies of the recessive gene). If the animal is DDF you can breed it with no fear of having an affected calf. DDC and DDA animals should be used with caution and a sound breeding and testing strategy applied to avoid producing affected progeny.

### **What does a DD carrier (DDC) look like?**

A DD carrier animal looks normal with no visible evidence of the genetic condition. Also, some known homozygous recessive (DDA) animals have been in production with no visible signs of the genetic condition whereas other DDA animals have one or more visible signs of the disorder. Again, incomplete penetrance may explain why a DNA test must be performed to prove or disprove presence of the condition.

### **How do I manage the DDC and DDA females in my herd?**

In order to avoid having affected calves, breed them to bulls that are not carriers. This can include bulls that do not have carrier ancestors or those confirmed DDF by genetic testing.

### **What is the IBBA registration policy regarding DD?**

International Brangus Breeders Association Board of Directors genetic condition policy does not require the testing of potential carriers of DD as a precondition of registry. However, the policy does state that all AI sires and donor dams must be DNA tested for the DD condition if they are potential carrier animals.

### **If I breed a DD-carrier cow to a non-carrier bull, what is the risk of having a carrier calf (see chart below)?**

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

- A 50% risk of having a DDC calf (normal-appearing; carries the DD mutation); and
- A 50% chance you will have a non-carrier calf (DDF).

### **What is the risk of having a DDA calf if I breed a DD carrier cow to a DD carrier bull (see chart below)?**

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

- A 25% risk of having a DDA genotype that may or may not be expressed visibly in the calf because of incomplete penetrance;
- A 50% risk of having a DDC calf (otherwise normal-appearing calf that carries the DD mutation); and
- A 25% chance of having a DDF calf (normal-appearing, non-carrier calf).

**Can DD free cows produce a DD-affected calf (see chart below)?**

Not if the cow is bred to a DD free bull. However, she may have a carrier calf if she bred to a DDA or DDC bull.

	<b>DDF</b>	<b>DDC</b>	<b>DDA</b>
<b>DDF</b>	<b>100% DDF</b>	<b>½ DDF, ½ DDC</b>	<b>100% DDC</b>
<b>DDC</b>	<b>½ DDF, ½ DDC</b>	<b>½ DDF, ½ DDC</b>	<b>½ DDA, ½ DDC</b>
<b>DDA</b>	<b>100% DDC</b>	<b>½ DDA, ½ DDC</b>	<b>100%DDA</b>

**Definitions**

DDA - DD Affected, has been tested and carries two copies of the DD gene.

DDC - DD Carrier, has been tested and carries the one copy of the DD gene.

DDF - DD Free, has been tested and does not carry the DD mutation.

DDPC - DD Potential Carrier, animal traces to one or more confirmed tested carrier or affected animals in its pedigree that have no intervening ancestors that have been tested free of the DD mutation.

**The following labs are authorized for DD testing for IBBA breeders:**

**Zoetis**

333 Portage Road, Bdg. 300

Kalamazoo, MI 49007-9970

877-233-3362

Fax: 269-833-4711

<http://www.zoetis.com>

**GeneSeek**

4665 Innovation Dr. Suite 120

Lincoln NE 68521

402-435-0665

Fax: 402-435-0664

[www.geneseek.com](http://www.geneseek.com)