



## INFORMATION FOR BULL BUYERS on RECESSIVE GENETIC CONDITIONS

This is information for **bull buyers** about the undesirable genetic conditions, Arthrogyposis Multiplex (AM) and Neuropathic Hydrocephalus (NH).

### Putting Undesirable Genetic Recessive Conditions in Perspective

All breeds of cattle, in fact all mammals including humans, have undesirable genetic conditions. Fortunately, advances in molecular genetics have facilitated the development of DNA tests for their management. Angus Australia is at the forefront of development of strategies to manage undesirable genetic conditions and seedstock members are leading the industry with their uptake of this technology.

***Key point: With today's DNA tools undesirable genetic conditions can be managed!***

### What are AM and NH?

Arthrogyposis means 'curved or hooked joints'. Multiplex indicates there are multiple abnormalities associated with the condition. Animals with the NH condition have a large head. Both AM and NH affected calves are not born alive.

***Key point: The number of reported observations of AM and NH calves is very low and there is certainly no need for panic.***

### How are the conditions inherited?

Research in the U.S. and Australia indicates that AM and NH are simply inherited recessive conditions. This means that a single pair of genes controls the condition. For this mode of inheritance two copies of the undesirable gene need to be present before the condition is seen; in which case you may get a calf with AM or NH. A more common example of a trait with a simple recessive pattern of inheritance is black and red coat colour.

Animals with only one copy of the undesirable gene (and one copy of the normal form of the gene), that appear normal, are known as "carriers".

### What happens when carriers are mated to other animals?

A carrier, will on average, pass the undesirable gene form to a random half (50 %) of their progeny.

When a carrier bull and carrier cow is mated, there should be a 25% chance that the progeny produced will have two normal genes and so will never pass on the undesirable gene. There should be a 50% chance that the mating will produce a carrier. However, there could be a 25% chance that the progeny have two copies of the undesirable gene. Reports from breeders show lower than expected numbers of affected (dead) calves and therefore it appears that there may be some other factors influencing the percentages indicated above. This is under investigation.

If animals tested free of the undesirable gene are mated to carrier animals the AM or NH condition will not be expressed at all. All calves will appear normal, but approximately half (50%) could be expected to be carriers.

**Key point: For the condition to be expressed the undesirable gene needs to be present on both sides of the pedigree and both the sire and dam need to be a carrier.**

### How is the AM and NH status of animals reported?

A DNA-based test has been developed that can be used to determine whether an animal is a carrier or free of the AM or NH gene.

The AM status of animals is being reported using five categories:

<b>AMF</b>	Tested AM free
<b>AMFU</b>	Pedigree AM free
<b>AM_%</b>	_% probability that the animal may be an AM carrier
<b>AMC</b>	Tested AM-carrier
<b>AMA</b>	AM-Affected

For NH, simply replace AM in the above table with NH.

Registration certificates and the Angus Australia (AA) web-database will display these codes. This information can be accessed by conducting a "Database Search" from the Angus website and clicking on the "Genetic Test Results" link on the animal details page.

**Key point: The AM and NH status of an animal is subject to change and will be re-analysed and adjusted each week as DNA test results of relatives are received.**

### Implications for Commercial Producers

Your decision on what genetic condition statuses are acceptable will depend on the genetics of your cow herd, whether you have a straightbreeding or crossbreeding enterprise and whether female progeny will be breeders.

Angus Australia seedstock breeders are being proactive and transparent in managing these genetic conditions, endeavouring to provide the best information available at that point in time. The greatest risk to the commercial sector from undesirable genetic recessive conditions comes from unregistered bulls with unknown genetic background. The DNA testing that Angus Australia seedstock producers are investing in provides buyers of registered Angus bulls with unmatched quality assurance.

**Key point: The greatest potential cost of recessive genetic conditions is people overreacting to them. The genetic lines that the genetic recessive conditions, AM and NH have been found in, are of extremely high genetic merit.**

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### GLOSSARY

Carrier: Animals with one copy of the recessive (in this case AM or NH) gene and one copy of the normal form of the gene. The animal appears normal and is known as "a carrier".

DNA: Deoxyribonucleic acid. DNA is a complex molecule that forms the genetic code of all living things.

Gene: Genes are the basic unit of inheritance. They influence characteristics of many animals eg colour, weight and carcass quality.

Recessive condition: Two copies of the gene form (allele) are required for it to be expressed.