

Breeding Polled Cattle

A. Phillips, formerly Meat and Livestock and J. Coventry, Pastoral Production, Alice Springs

INTRODUCTION

Horned cattle cause significant economic loss to the industry through bruising during transport, and at feedlots and abattoirs. They also pose a danger to handlers. For these reasons markets are placing increasing pressure on producers to produce cattle without horns. The pressure is particularly strong from the live export and feedlot trades. This means that producers must either dehorn or breed polled cattle. Otherwise they face ever-increasing penalties when selling horned cattle. In the worst-case scenario, they may not be able to sell horned cattle at all.



Figure 1. A polled steer

ADVANTAGES OF BREEDING POLLED CATTLE

Breeding polled cattle has several advantages over dehorning or tipping the horns of horned cattle. These advantages include avoiding particular costs or risks such as:

- labour associated with dehorning or tipping;
- infection to wound sites;
- blowfly strike to wound sites;
- the need for chemicals to prevent or treat infection and/or fly strike; and,
- reduced growth rates while wounds are healing.

The aim of this Agnote is to explain the genetic basis of horns in *Bos taurus* and *Bos indicus* cattle to assist producers with decisions about breeding polled cattle.

BOS TAURUS BREEDS

The genes involved

The gene that determines whether cattle are horned or polled in British and European breeds has two forms (alleles) – polled and horned. The polled form of the gene is **dominant** to the horned form. In other words it **overrides** the horned form when both are present. Because it is dominated, the horned form is called **recessive**.

For explanatory purposes, **P** represents the polled form of the gene, and **p** the horned form. Every animal has two copies of every gene—one inherited from each parent.

- Horned *Bos taurus* cattle **always** have two copies of the horned form of the gene (pp).
- Polled cattle can either have two copies of the polled form of the gene (PP) **or** one copy of each form of the gene (Pp).

The three possible gene combinations and what we see are shown in Table 1.

Table 1. *Bos taurus* horn/poll gene combinations and whether we see horned or polled cattle

Gene combinations	What we see
pp	Horned
Pp	Polled
PP	Polled*

*Often referred to as a 'true poll'

When the parents pass on the single copy of their genes, it happens randomly and can be considered the same as flipping a coin. For breeding purposes this only matters for those polled cattle that carry the recessive horned form of the gene (Pp). They have a 50% chance of passing on either form of the gene.

Outcomes of matings

If horned bulls are joined to horned cows, their progeny will all be horned. The exception is that the horned form of the gene will mutate to the polled form in about one in every 100,000 births.

There is no cost-effective way of knowing whether a polled bull has two copies of the polled form of the gene or carries the horned form before his progeny are born. DNA marker technology may offer this ability in the future.

- If a polled bull is joined to horned cows and **any of the progeny are horned**, the bull **must carry the horned form of the gene** (Pp).
- If a polled bull is joined to horned cows and all **the progeny are polled**, the bull **carries two copies of the polled form of the gene** (PP). Because genes are passed on randomly, the more polled progeny a polled bull sires out of horned cows, the more likely it is to be a true poll. Once a polled bull has sired 10 polled progeny from horned cows (and no horned progeny) there is a 99.9% likelihood that it is a true poll.

Table 2 summarises the expected results of matings from the six possible genetic combinations.

Table 2. Results of mating different genetic combinations and the proportions of expected polled and horned progeny

	Genes of parents	Genes of progeny and expected proportion	Expected proportion of polled progeny	Expected proportion of horned progeny
True polled bull over true polled cows	PP X PP	100% PP	100% polled	-
True polled bull over polled cows or vice versa	PP X Pp	75% PP 25% Pp	100% polled	-
True polled bull over horned cows or vice versa	PP X pp	100% Pp	100% polled	-
Polled bull over polled cows	Pp X Pp	25% PP 50% Pp 25% pp*	75% polled	25% horned *
Polled bull over horned cows or vice versa	Pp X pp	50% Pp 50% pp	50% polled	50% horned
Horned bull over horned cows	pp X pp	100% pp	-	100% horned

* Often referred to as a 'throwback' because both polled parents have passed on the recessive horned form of the gene to produce horned progeny.

Selecting polled breeding stock increases the proportion of polled cattle in the herd. Horned or tipped bulls often get a disproportionately high number of calves if run with polled bulls, simply because they are better equipped for fighting.

BOS INDICUS BREEDS

The genes involved

The inheritance of horns is more complex in some *Bos indicus* breeds (Brahman and Santa Gertrudis) because they have the same gene controlling horns as *Bos taurus* breeds **plus** an additional gene known as the **African horn gene**. The African horn gene has two forms represented by **A^f** for the horned form and **Aⁿ** for polled. The African horn gene is **sex influenced**, so its expression depends on the animal's sex.

If *Bos indicus* cattle with *Bos taurus* genes for being polled have:

- two copies of the horned form of the African horn gene (A^f) they will always have horns;
- one copy of the horned form of the African horn gene (A^f) and one copy of the polled form (Aⁿ), **cows will be polled and bulls will have horns**; and,
- two copies of the polled form of the African horn gene (Aⁿ) they will always be polled.

Bos indicus cattle with *Bos taurus* genes for being horned, will be horned, regardless of the combination of forms of the African horn gene.

Table 3 summarises how the African horn gene works in combination with the *Bos taurus* genes for horns in cows and bulls.

Table 3. The effect of the African horn gene on cows and bulls

What the genes are	Cows	Bulls
A^fA^fPP and A^fA^fPp	Horned	Horned
A^fA^fPP and A^fA^fpp	Polled	Horned
A^fA^fPP and A^fA^fPp	Polled	Polled
A^fA^fpp , A^fA^fpp and A^fA^fpp	Horned	Horned

Outcomes of mating

The African horn gene obviously complicates the picture. However, **polled bulls cannot have the horned form of the African horn gene (A^f)**, although they can carry one copy of the horned form of the *Bos taurus* gene. There are many examples of composite breeds based on Brahmans that are all polled, or have a very low incidence of horns, for example Droughtmaster, Braford and Brangus. This has been achieved by rigidly selecting polled bulls.

**Figure 2.** Charbray bull and Brahman x Shorthorn cow

Producers breeding or crossbreeding Brahmans or Santa Gertrudis will notice more bull calves have horns than heifers because of the African horn gene being sex linked. It is also possible to get some polled progeny from joining horned bulls to horned cows.

SCURS AND BUMPS

Scurs are the small horn-like growths that appear on some polled cattle. They are not connected to the skull by bony tissue so are generally loose and moveable. Scurs are controlled by different genes and can only occur on polled cattle as horn growth overrides any scur genes.

Bumps are bone-like protrusions on polled animals where horns or scurs would occur, but there is no evidence of growth outside the skin. As for scurs, different genes control bumps and horn growth overrides bumps.

**Figure 3.** Young bull with scurs

Cattle with scurs or bumps can be considered the same as polled cattle for breeding and management purposes because they do not have the disadvantages of horned cattle.

WORKING OUT IF AN ANIMAL HAS BEEN DEHORNED OR NOT

The shape of the top of a beast's head is a useful guide as to whether it was naturally horned or not.

- Smooth polled cattle, as shown in Figure 1, have a peak on the poll that often increases.
- Scurred cattle generally have more rounded heads, with a tendency to peak at the poll as shown in Figure 3.
- Horned cattle generally have flat or only slightly rounded heads. The flat head shape of a dehorned Brahman cow is shown in Figure 4.



Figure 4. Dehorned Brahman cow

MAXIMISING NUMBERS OF POLLED CATTLE IN COMMERCIAL HERDS

To maximise the number of polled cattle in commercial herds, producers can use as many of the following recommendations as practical in their situation:

- Use bulls that are polled, have scurs or have bumps.
- Avoid running polled bulls with horned bulls and/or bulls with tipped horns.
- Before purchase, find out if bulls are naturally polled or if they have been dehorned.
- In the absence of information on whether bulls available for purchase have been dehorned, use the shape of the top of their heads as a guide.
- Use polled cows if breeding bulls from a nucleus bull-breeding herd.
- Keep records on the horn status of parents and progeny in nucleus bull breeding herds. These records can be used to assist with working out whether individuals have genes for horns and this information can then be used for breeding decisions.

FURTHER READING

For more information on dehorning please see Agnote No. J83 'Dehorning and Castration of Calves under Six Months of Age'.

REFERENCE

Phillips, A. (2001). 'Beef Cattle Genetics Applied to Extensive Herds', Northern Territory Department of Primary Industry, Fisheries and Mines Incidental Publication No. 8. ISBN 0 7245 3086 X

Please visit us on our website at www.primaryindustry.nt.gov.au

Published: Wednesday 11 May 2005.

While all care has been taken to ensure that information contained in this Agnote is true and correct at the time of publication, the Northern Territory of Australia gives no warranty or assurance, and makes no representation as to the accuracy of any information or advice contained in this publication, or that it is suitable for your

intended use. No serious, business or investment decisions should be made in reliance on this information without obtaining independent/or professional advice in relation to your particular situation.