



## Breeding black sheep

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*Wool growers have always looked upon black or partly black sheep that appear in the flock as a nuisance. Occasionally black lambs are born from white parents, even after many generations of culling of the black sheep. The presence of just one black fibre in a thousand can spoil wool fabrics. Although it is necessary to keep black wool out of the normal flock, uses have been found for wool from black and coloured sheep.*

A growing interest in handspinning has created a demand for black and coloured wools. The natural pigmentation makes attractive knitted garments .

### What is black wool?

A normal fleece, when scoured, is white, or nearly so. Black wool grows from the skin pure black in colour. The tip of the staple will normally fade in sunlight and in a normal black fleece as much as half of the staple may be fading to brown. Wool can be kept jet-black by rugging the sheep all year to prevent weathering. However, many spinners prefer the natural shades of faded blackwool.

Grey fleeces are produced by mixtures of black and white fibres. Grey wool also fades at the tip to a fawn colour. Grey shows the same inheritance as black wool. Black wool may go grey in older sheep.

Only two fibre colours occur in the Merino, black and white. However, varying shades of brown have been reported in other breeds and crossbreds. These colours and black wool follow a similar inheritance. Some research has been conducted into black wool in Merino sheep and the types described have been evaluated in trials. Other colours and patterns may exist, particularly in other breeds.

### Black wool in Merinos

Completely black sheep do occur in other breeds and crosses, but not in Merinos. There are two quite different and independent patterns of black pigmentation - piebald, and the three distinct types of black that occur in the Merino.

**Piebald.** Piebald sheep have black or grey spots scattered randomly over the body, head and legs.

These spots are usually round or oval. In some sheep there may be only one spot; in others, the spots may cover up to 50% of the body (figure 1).

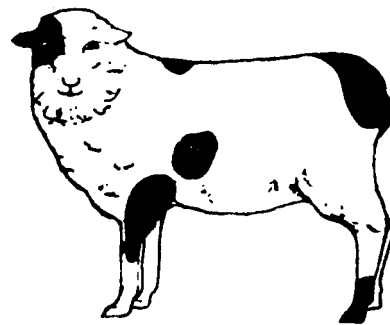


Figure 1. ("Piebald" - random spots)

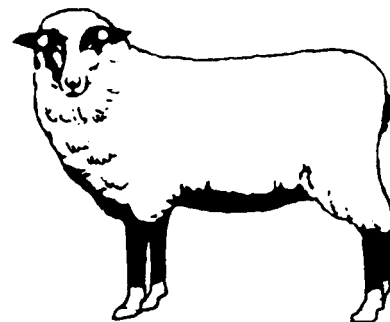


Figure 2. Type A ("Badger-face" pattern)

**Black sheep.** In the Merino and its crosses there are three distinct patterns of pigmentation.

Figures 2, 3 and 4 show these types. The identifying patterns are symmetrical on each side of the animal and are not necessarily rounded in shape. The pigmented areas may be black or grey. It is not always easy to distinguish between the three patterns of black; it is easier to distinguish between "black" and "piebald" types.

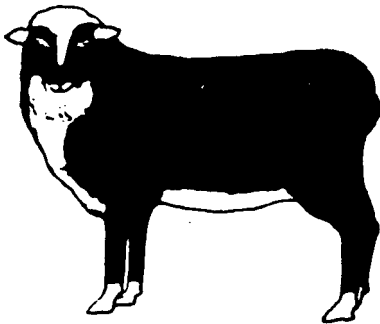


Figure 3. Type B ("Reverse badger-face" pattern)

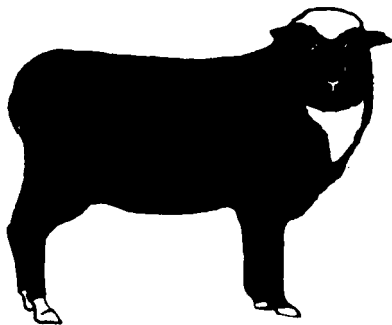


Figure 4. Type C ("Self colour" - the most common black Merino type)

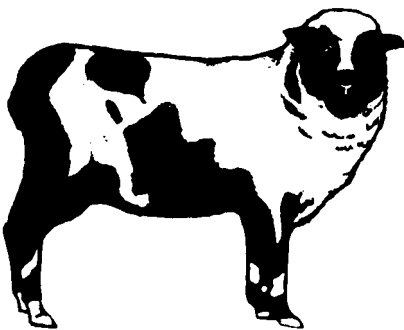


Figure 5. Not a piebald but a variation of black type C. The symmetrical head pattern shows this

## Inheritance

The mechanism of inheritance of black wool is simple. Units of inheritance called genes, are carried in pairs in the normal animal. During reproduction the genes from both parents split (or segregate) and at fertilisation they recombine at random.

A gene may be dominant or recessive to the other gene that it is paired with. A dominant gene will mask the action of a recessive gene.

The five other possible matings of different colours are shown in figure 7. You can check any of these matings using the technique in figure 6.

The white sheep will normally have a pair of white genes. We may express these as WW. However, if one of the genes is a black gene, expressed as w, the sheep will still be white. It is usually referred to as a carrier for the black gene, with the genetic make-up Ww.

The white gene W is said to be dominant to the black gene w (or the black gene w recessive to the white gene). Hence, the carrier sheep Ww is outwardly pure white and cannot be detected from the pure WW sheep. This is the reason sheep breeders have never been completely successful in eliminating black wool. They have not been able to detect and cull the "carriers" of the black gene.

While some carrier ewes and single-mated rams in a white flock can be identified by the appearance of black progeny, not all carriers will be so detected, because they may not ever mate with another carrier or if they do, the black genes from each may not happen to come together at fertilisation to produce a black lamb. But each carrier will pass on the carrier trait to half its white progeny.

A carrier ram (Ww) can be detected with reasonable certainty by test mating with six or more black ewes or 10 or more known carriers (that is, white ewes which have previously dropped a black lamb or are known to have had one black parent). However, the effort involved is more likely to be worthwhile as a means of clearing a white stud ram from suspicion that he might be a carrier than as a means of finding black genes for a coloured flock.

A simple technique can be used to estimate the chance or probability of getting black progeny from any mating. The technique can be used also to determine the likely genetic make-up of the parents. The technique involves drawing a table as shown in figure 6.

		Ram	
		W	w
Ewe	W	WW	Ww
	w	Ww	ww

Figure 6. Mating of a carrier ram and a carrier ewe

This shows the genetic make-up of the ram and ewe on two sides. The possible gene make-up of the progeny can be calculated by filling in the four squares, using, in turn, one gene from the ewe and one from the ram.

In this case, we have a 75% (or three in four) chance of a white-woolled sheep and 25% (or one in four) chance of a black-woolled lamb. However, two of the three white-woolled progeny are carriers Ww and one is a pure WW white or non-carrier.

Parents	Progeny
1. Non-carrier x non-carrier $WW$ $WW$	All non-carriers $WW$
2. Non-carrier x carrier $WW$ $Ww$	50% carriers, 50% non-carriers $Ww$ $WW$
3. Non-carrier x black $WW$ $ww$	All carriers $Ww$
4. Carrier x black $Ww$ $ww$	50% carriers, 50% black $Ww$ $ww$
5. Black x black $ww$ $ww$	All black $ww$

Figure 7. Five possible matings of black, carrier and non-carrier sheep

Sheep breeders aiming for black wool should use only black or carrier sheep. Any white ewe that has had a black lamb must be a carrier, so you can mate her to a black ram with a 50% chance of success.

### The three types of black wool

The three types of black patterns that have been found in the Merino are shown in figures 2, 3 and 4. Pure black (or nearly so) and varying shades of brown, have been reported in other breeds.

The order of dominance between the different black types is A, B, then C. Using the same technique as for black and white genes, and remembering the order of dominance, it is easy to determine the likely colour of the offspring or conversely the probable genetic make-up of the parents when mating sheep with these patterns.

### Inheritance of piebald pattern

The inheritance of the piebald pattern (figure 1) is not related to the other black or white colour genes. It is due to a separate gene acting independently of the colour genes.

The piebald gene is a recessive gene and is expressed only when the sheep has a pair of piebald genes. However, the situation is further complicated by the fact that only about 25% of sheep that have two piebald genes actually express a black spot on the sheep. This situation is called partial penetrance - only 25% of sheep that have the piebald genetic make-up actually display the piebald coat.

### Dominant black?

Several black sheep breeders have reported white lambs from black matings. This may be due to a gene mutation; the recessive black may have been replaced by a dominant black gene. This gene, if dominant to the white gene would mask the effect of the white gene in a similar way to the dominant white masking the recessive black. Dominant black has been recorded in European breeds.

### Points for the home spinner

Wool for hand-spinning should preferably be 100 mm or more in length. The easiest wool to spin is the coarser crossbred type, of 48/50s count. Finer and coarser wools are more difficult to handle and most spinners will need some practice.

The Romney, Perendale or Coopworth are suitable breeds with a good, long-stapled heavy fleece with wool count usually about 48/50s (30 micron). Corriedales and Border Leicester x Merino cross have finer wool with count averaging 56s (27 micron) which is quite suitable for hand-spinning. The British short wool breeds- Suffolk, Dorset, Hampshire and Shropshire- grow short-stapled, lighter fleeces that are not as suitable for hand-spinning. Polwarth, Zenith and Comeback wool is finer (25 microns) and shorter stapled. Merino wool is finer still and of shorter staple length.

If the sheep graze on pastures growing a high quantity of clover or medic burr, or other seeds, a considerable wastage will occur in the preparation for spinning. An effort should be made to see that the sheep graze on pastures that are low in seeds and dust. This will make the job of preparation of the wool much easier. Spring shearing will minimise seed contamination.

If black wool starts to turn grey at the base of the staple it is likely that the sheep is suffering a copper deficiency. This can be overcome by drenching with copper sulphate, injecting with slow-release copper compounds, or by adding copper sulphate with a superphosphate top dressing to the pasture. Avoid overdosing: the margin between deficient and toxic levels is fairly narrow. Seek advice from your district veterinary officer, sheep industry officer or private veterinarian before embarking on a regular treatment program.

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