



## Color Genetics in the Karakul

aka 'BASERS'

For years the Karakul breed was important in the production of lambskins of various colors for the fashion industry. Even though that industry is no longer vital in this country, the history and genetic understanding of the newborn coat color is complicated as well as fascinating.

Since the Karakul has a 'fading' gene, i.e. coat colors change quickly, phenotypic color assessment must be done early in life; the same time as the pelt assessment is a good time. Photos help record the color patterns.

All sheep have one of two **Base** (B) loci colors, either black or brown and can be determined in the color of the nose leather, eye-lids or stripes on the hooves or horns. In the Karakul, black ( $B^+$ ) is dominant over brown ( $B^b$ ). The **Agouti** (A) Locus has several alleles that produce the many coat patterns found in our sheep. The white/tan allele ( $A^{wt}$ ) is the most dominant and has the most symmetrical white. Then with decreasing amount of white symmetrical patterning ( $A^t$  black & tan,  $A^g$  gray,  $A^{sm}$  swiss marking, etc.) all the way to no-white at all, or self ( $A^a$ ). The **Spotting** Locus (S), the wild Allele  $S^+$  results in a solid colored lamb, while  $S^s$  produces some white markings on the head/poll and tail tip with increasing white areas in the homozygous. The **Extension** Locus (E) has several alleles, the main ones are Dominant ( $E^d$ ) and Wild ( $E^+$ ). The  $E^d$  locus blocks all expression from *Agouti* locus alleles, whereas the recessive  $E^+$  locus allows for the full expression of the *Agouti* locus alleles.

Two additional loci are important in the Karakul; they are the **Sur** and the **Roan**. In the *Sur*, wild  $Su^+$  is dominant with a solid birthcoat fiber color and  $Su^s$  is recessive, the fiber has a pigmented base and a white or gold tip. The *Roan* Locus (Rn) can be rare, where a black based roan is called 'shirazi', while a brown based roan is a 'gulgas'. The infamous 'lethal gray' ( $Rn^{rn}$ ) is lethal when both parents pass this allele on to the offspring ( $Rn^{rn}Rn^{rn}$ ), the rumen in the lamb is unable to



make the conversion of a milk-based diet to a fiber-based diet and dies at weaning.

There is evidence that the *Agouti* gray ( $A^g$ ) allele can influence the gray color in a roan even in the presence of the  $E^d$  allele, resulting in a gray non-lethal lamb,  $A^gE^dRn^{rn}$

So the shorthand phenotypic notation of a solid black lamb would be  $B^+A^-S^+E^d$ ; if the lamb had a white spot on its poll and a white tip on the tail it would be  $B^+A^-S^+S^sE^d$ , where one parent was  $S^+$  and the other  $S^s$ . Since the  $E^d$  masks the *Agouti* Locus we don't know what lies beneath it, so we use the symbol  $A^-$ ; the  $-$  is used to show any unknown allele.