

Color Genetics of Alpacas — Mendel IS the Foundation

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The power of Mendelian genetics is easily overlooked when viewed in light of the advances in molecular genetics. The Mendelian approach brings to light many interesting and useful phenomena which can then be further explored with molecular techniques. The Mendelian approach is especially suited for studying color variation. Multiple loci each having an affect on color are well documented in a number of species, and are a useful springboard for investigating alpaca color. The *Agouti* locus is important as a major determinant of color, and has multiple alleles coding for white, fawn, red with black trim, bay, mahogany, and black (somewhat in order from dominant to recessive). Unusual results are rare, and can be attributed to rare alleles including *dominant black* (likely at *Extension*) or *recessive red* (likewise probably at *Extension*). Ironclad proof of either of these is lacking, but anecdotal evidence is abundant. Modification of base color through dilution rarely occurs, but when it does this is likely by the action of several distinct dominant dilution alleles. A recessive *brown* is tempting to propose, but phenotypic evidence is slim at this point. Anomalous color segregations or rare color phenotypes are the most likely places to spot new or rare phenomena, some of which can be very useful in producing new shades of color. These are more likely to be useful to handspinners than to industrial markets, due to their subtlety and rarity. White spotting also occurs in alpacas, and the relationships of these patterns have yet to be determined. Certainly there are multiple patterns, each under control of a separate allele (piebald, tuxedo, grey, roan, speckled, others). It is likely that several are at a single locus. Mendelian genetics also helps to understand the suri story, especially as there are exceptions to the “single dominant gene” model. Exceptions to any of the common inheritance mechanisms, rather than being annoying perturbations, can instead lead to a more complete understanding of desirable phenotypes whether this be for fleece quality or color.