

The "Chestnut Gene"

By: William Page

Occasionally a chestnut foal is born to a Friesian mare. The foal is in all other respects normal, but since our breed standards require black horses, we must take appropriate steps to prevent the occurrence of these chestnuts in the Friesian population.

Background

Each living thing carries within its cells the instructions which control the growth, appearance, and, to some extent, the behavior of the organism. These instructions are encoded in the organism's *genes*. In mammals, genes are always present in pairs with one of the genes being inherited from the male parent and one from the female parent. While both members of a pair of genes control the same characteristic of the organism, they may not behave in the same way and thus cause that characteristic to be expressed in different ways. Different forms of the same gene are called *alleles*. When both copies of a particular gene are the same allele, the organism is said to be *homozygous* with respect to that gene; if the paired genes are different alleles, the organism is said to be *heterozygous*. In cases in which a gene is heterozygous, one of the alleles will be dominant over the other and will dictate the characteristics of the individual while the other allele is said to be recessive and its instructions will be masked by its dominant partner. An example of this is the gene which controls black hair pigment color in horses.

There are two basic pigment colors in horses, red and black. The black allele is dominant over the red so that if either one or both of the genes is the black allele, the horse will be black. Only if both genes of the pair are the recessive red gene, will the horse appear as a chestnut. During mating half of the genetic material is supplied by the sire and half by the dam. If, for example, a stallion is heterozygous, he will supply the black gene to his offspring 50% of the time and the red allele 50% of the time. However this red allele will only be visible if the dam was also heterozygous and her contribution was also the red allele, giving the foal only the red allele. Basic statistics tells us that in the long run if we mate a heterozygous sire with a heterozygous dam we will get:

- 25% of the foals homozygous (Black only)
- 50% of the foals heterozygous (Black and Red alleles: these horses will be carriers of the red allele but will appear black)
- 25% of the foals homozygous (Red only: Here we will see chestnut horses since only the red allele is present without the black allele to mask it)

We don't know how common the red allele is in the Friesian horse population since no systematic studies have been done. We can infer from the rarity of the birth of chestnut foals that it is quite rare.

FHANA's Position

FHANA has made a formal request to the FPS that in future no stallions will be approved if they are found to carry the red allele. Already approved stallions would not be affected. At this time no we have had no response to this request.

What you can do

The simplest thing you can do to prevent a chestnut foal is to verify that your mare does not carry the red allele. The University of California at Davis will provide a "Red Factor" test for \$50 which required only a sample of hair pulled (not cut) from the mane or tail of the horse. If your mare does not possess the red allele, she cannot produce a chestnut offspring. Another option is to breed your mare to a stallions who has been tested and found not to carry the red allele.

Further Sources of Information

There is some very good information on the "red factor" as well as some of the other genes (there are at least 10) which control the coat color in horses. Check out the UC Davis horse genetics web site at:

www.vgl.ucdavis.edu/~lvmillion/