Flaxen Theory

Those of us who have paid much attention to horse color genetics readily accept that flaxen is expressed only on chestnut based horses, and only when homozygous. We also generally agree that what causes flaxen is a recessive mutation.

But a recessive mutation of which gene? The accepted genetic code for expressed flaxen is currently "ff." But why would red mane and tail be denoted as "F," which technically stands for "flaxen"? This has never made much sense to me, although I had never thought too deeply about it – until recently.

Recessive color genes

The only other recognized horse color gene that is expressed when homozygous recessive is the mutation for chestnut. But there is technically no "chestnut gene." There is the extension gene, which when it is in dominant form (E) allows the production of black pigment. And when it is in recessive form, its ability to produce black pigment is turned off. When the recessive form is homozygous in a horse, there is a total loss of the ability to produce black pigment, resulting in a (red) chestnut horse.

If flaxen is expressed due to homozygous recessive of a specific gene, would it not make logical sense that it might work much the same as the expression of red (chestnut) from the extension gene?

Is there a "flaxen gene"?

I would suggest that there a "mane-tail gene" which controls the expression of color in the mane and tail instead of a flaxen gene.

I would propose that this gene operates much the same way to cause the flaxen expression as the extension gene does to cause the red (chestnut) expression. When that gene is turned off (recessive form), and when it is homozygous, you get the flaxen expression. Additionally, this theory would propose that the recessive mutation acts to disable the production of red pigment.

There may also another mutation that causes the pigment to be darkened, resulting in a chestnut horse with mane and tail that is several shades darker than the shade of their body, and sometimes near-black looking.

Should flaxen be given an "f"?

With this theory the letter code of "f" no longer seems to work, especially if the gene controls more than just the expression of flaxen; therefore I would propose a new letter code designation to reflect this new theory on the expression of flaxen.

Dominant mutation "M." For lack of a better idea at this time, I will assign the letter "M" to the dominant mutation of the proposed "mane-tail gene," which would theoretically allow the mane and tail to express the same basic shade of color as that of the body of the horse.

Black based horses would have black manes and tails, and chestnut horses of varying shades would have manes and tails matching their individual shade of chestnut. Pale red chestnuts would have light red manes and tails, and liver chestnuts would have liver colored manes and tails, for instance.

Recessive mutation "m". The recessive mutation "m" results in the loss of the ability to produce red pigment in the mane and tail. However, even one copy of the dominant mutation "M" is enough to produce red pigment. Homozygous for recessive "m" would have no effect on the manes and tails of black based horses since they do not have red manes and tails.

Phaeomelanin is the scientific term for what laypersons call red pigment in horses, but is actually referred to as yellow pigment by scientists. When homozygous for the recessive mutation "m," the ability to produce enough red pigment in the mane and tail is effectively turned off completely, resulting in pale yellow colored mane and tail on a chestnut horse. Since phaeomelanin is actually yellow pigment, this is a logical line of reasoning.

Dominant mutation "Md." I would also like to propose another mutation of the "mane-tail gene" of "Md." This dominant mutation would be responsible for the production of very dark red pigment, resulting in very dark mane and tail on a chestnut horse.

The "Md" mutation would be something akin to the concept of the "At" mutation for brown agouti, in that it is an additional mutation of the gene beyond the standard one dominant and one recessive form only, and the "d" in "Md" stands for "dark", like the "t" in "At" stands for "black and tan".

Summary

While the letter codes of "F" and "f" are the currently accepted genetic coding for the gene responsible for flaxen manes and tails on chestnut horses, I am not so sure there use is accurate or correct. But this is simply a theory, and genetic research resulting in the identification of the mutation responsible is the only real answer to the question posed here.

There is a genetic research project currently under way on the search for a mutation for the flaxen expression. Perhaps we won't have to wait too long to find out if this proposed flaxen theory has merit.