

Woolly Mammoth Mice: What are they? And can fanciers make them?

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A mouse fancier is likely to wonder about the genes behind these new "mammoth mice" produced by Colossal from a different perspective than the scientists who created them. Luckily, the paper published on these mice clearly outlines all of the genes that compose them. All that needs to be done is to translate the gene names to the loci names.

First off, these mice are not particularly unique based on the mutations themselves. They are a combination of 10 different mutations (1), all of which previously existed in labs. The number of mutations is the surprising factor, but the concept of stacking multiple mutations should be familiar to breeders. Of these 10 mutations, only 1 solely impacts metabolism, leaving the other 9 to impact the coat.

In the US fancy, we do have about half of the mutations already; 5 out of the 9. We could create about 55% of a mammoth mouse, visually. The genes we likely have mutations of are: *Astn2*, *Fzd6*, *Fgf5*, *Mc1r*, *Krt25*.

These may sound like nonsense, but *Astn2* and *Fzd6* are likely how abyssinian is created. *Fzd6* "rst" is proven to be the recessive that allows for the hair follicles to grow in different directions (2). With *Astn2* "ridge" likely being the semi-dominant modifier creating the rosettes/whorls (3).

Fgf5 is the Go locus (4). This is likely our angora, but technically unproven. *Mc1r* is the E locus: recessive yellow (5). *Krt25* is the Re locus: rex (6). A recessive yellow abyssinian texel would be halfway to a mammoth mouse.

What's the other half then? Mostly more curly coat mutations. The genes left are: *Fam83g*, *Tgm3*, *Fabp2*, *Tgfa*, and *Krt27*.

Fam83g has a mutation known as woolly (wly) (7). This is separate from the furred expression of dominant hairless, sometimes referred to as woolly hairless. Mice with the woolly mutation have a choppy and rough coat.

(Figure 1)



Tgm3 is a curly coat mutation that produces waves similar to rex (8). The waves fall out with age, but the whiskers remain curly.

(Figure 2)



Fabp2 is a mutation that affects the metabolism, and isn't relevant to phenotype/appearance (9).

Tgfa does not have many photos so it is difficult to describe. It's also hard to interpret which mutation is used in the mammoth mice, as there are several different mutations.

"Homozygous mutants have curly vibrissae, wavy hair with misaligned hair follicles, reduced body weight, and eye defects including open eyelids at birth, corneal scarring and microphthalmia. Some heterozygotes show mild forms of the eye abnormalities." - Tgfa Gene Detail, Mouse Genome Informatics (10)

Lastly, Krt27 is similar to our rex, Krt25. They both affect keratin and produce similar waved coats. Krt27 also tends to fade with age (11). In some parts of the experiment, they mention Krt25 being used as well.

If we were to call all curly coat mutations rex, then the mammoth mice would be recessive yellow woolly abyssinian quadruple rex texels. Even if fanciers had access to all the mutations involved, being able to stack them would be very difficult without being able to genotype the mice. Even in the study, they had many mice that did not have all these mutations simultaneously. Many were variations of what breeders would call texel, Fgf5 angora + at least 1 type of curly/wavy coat mutation.

(Figure 3)



(Figure 4)



Citations:

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4. Mouse Genome Informatics. (n.d.). *Fgf5^{go}: Spontaneous Allele Detail*. <https://www.informatics.jax.org/allele/MGI:1856336>
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11. Mouse Genome Informatics. (n.d.). *Krt27: Gene Detail*. <https://www.informatics.jax.org/marker/MGI:1339999>

Figures:

1. Radden, L.A., Child, K.M., Adkins, E.B. et al. The wooly mutation (wly) on mouse chromosome 11 is associated with a genetic defect in Fam83g. BMC Res Notes 6, 189 (2013). <https://doi.org/10.1186/1756-0500-6-189>
2. This work © 2012 by John S, PLoS One is licensed under CC BY 4.0 <https://www.informatics.jax.org/image/MGI:5503315>
- 3, 4. Colossal Biosciences <https://colossal.com/>