Frizzy-like; a Hair Mutation on Chromosome 7 in the Mouse

Patricia F. Ward-Bailey, Richard M.Samples, Son Yong Karst, Leah Rae Donahue, Roderick T. Bronson, Kenneth Johnson, and Muriel T. Davisson

Source of Support: This research was supported by grants RR01183 to the Mouse Mutant Resource (M.T. Davisson, PI) and Cancer Core Grant CA34196.

Mutation (allele): symbol: *frzl*

Mutation (allele): name: frizzy-like

Strain of origin*:* C57BLKS/J-*m* +/+ *Lepr*^{db}/J

Current strain name*:* BKS(Cg)-*frzl*/GrsrJ

Stock #003606 (jaxmice.jax.org)

Phenotype categories: skin and hair

Abstract
An autosomal recessive hair mutation named frizzy-like (*frzl*) has been characterized in the Mouse Mutant Resource (MMR) at The Jackson Laboratory. Mice homozygous for the *frzl* mutation are recognized by a wavy coat that is observed at 7-9 days of age, when the first coat of hair can be observed. The *frzl* mutation maps to Chromosome 7 between *D7Mit105* (NCBIm36 position 128.3 Mb) and *D7Mit43* (NCBIm36 position 130.1 Mb).

A *frzl* homozygote is shown on the right (note the wavy coat) and a control littermate is shown on the left.

Origin and Description
The new spontaneous *frzl* mutation was found by Suzanne Sullivan in a production

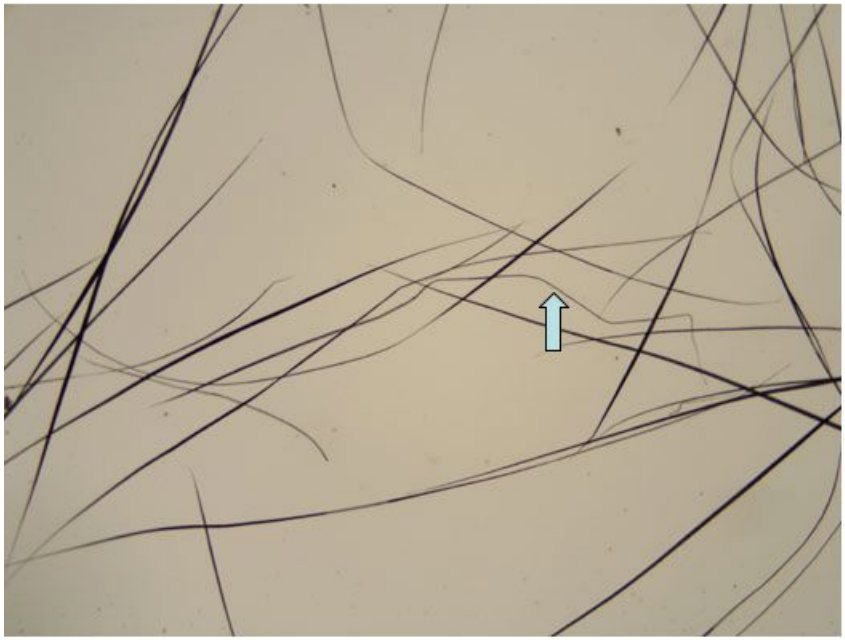
colony of C57BLKS/J-*m* +/+ *Lepr*^{db}/J mice at The Jackson Laboratory. Mice homozygous for the *frzl* mutation are recognized by their wavy coats and curly whiskers. After a few weeks of age the amount of curl in the hair is reduced, but the whiskers remain curly. Heterozygote (*frzl*/+) mice mated to heterozygote (*frzl*/+) mice produce 25% homozygotes, as expected. Both sexes are viable and fertile. Mice homozygous for the new *frzl* mutation have a phenotype and chromosomal location similar to the previously described mutant named frizzy (*fr*). A test for allelism was not done as *fr* is available only as frozen embryos.

Genetic Analysis

Using The Mouse Mutant Resource standard mapping procedures, we utilized an intercross to CAST to map the *frzl* mutation to Chromosome 7. Mutation segregation ruled out Chromosome X linkage. A genome sweep using controls and a pooled DNA sample indicated linkage to Chromosome 7 with *D7Mit43*. Individual DNA samples from 20 F2 progeny from the intercross to CAST were then typed with *D7Mit43* and 4 additional Chromosome 7 markers. The best gene order is centromere -*D7Mit353* (NCBIm36 position 99.3) - *D7Mit9* (NCBIm36 position 123.1) -*D7Mit105* (NCBIm36 position 128.3) - ***frzl*** - *D7Mit43* (NCBIm36 position 130.1) - *D7Mit292* (NCBIm36 position 138.5).

Pathology

A pathological screen of two homozygous *frzl*/*frzl* mutants and two controls at 4 weeks of age and one homozygote *frzl*/*frzl* mutant and one control at 8 weeks of age showed no lesions in either the mutants or controls. Hairs taken from a 4 week old homozygote showed a deficiency of zigzag hairs and some of those zigzag hairs that were present had an excessive number of bends. All other hair types were normal.



Hair samples from a 4-week-old mouse homozygous for the frizzy-like mutation show a deficiency of zigzag hairs and some of those that are present have an excessive number of bends (see arrow). All other hair types are normal.

One of the 4-week old homozygotes had very little sperm in the testes and none in the epididymus, which is unusual at that age. However, sperm counts done on two

homozygous males at 6 weeks of age were normal.

A pelt pad sample from a 4-week old *frzl* homozygote showed no gross abnormalities. Hearing as assessed by ABR testing of two homozygous *frzl*/*frzl* mutants and a control at about 4 months of age was normal.

The eyes of five homozygous mutant mice and one control were examined with an ophthalmoscope and it was determined that the eyes of four of the mutants and the control were normal, while one mutant displayed wavy retinal vessels.

Acknowledgements
The authors wish to thank Suzanne Sullivan for discovery of the mutant, Heping Yu for hearing assessment, Norm Hawes for and Coleen Marden for excellent technical skills.