A new spontaneous skin and hair mutation that causes a shiny and rough coat.

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Mutation (allele) symbol: *Shar*

Mutation (allele) name: Shiny and rough

Strain of origin: C57BL/6J-*Lbr*$^{ic\text{-}J}$/J

Current strain name: C57BL/6J-*Shar*/J

Stock #005482 (jaxmice.jax.org)

Phenotype categories: skin and hair

Abstract
A new spontaneous dominant mutation affecting skin and hair has been identified and located on Chromosome 15. Mice heterozygous for the *Shar* mutation exhibit a shiny and rough coat that has a greasy appearance, and affected animals can be identified at 3 weeks of age. *Shar* maps to a region of Chr 15 where a cluster of other skin and hair mutations have been reported, however the phenotype and or chromosomal position of this mutation does not match those previously described.

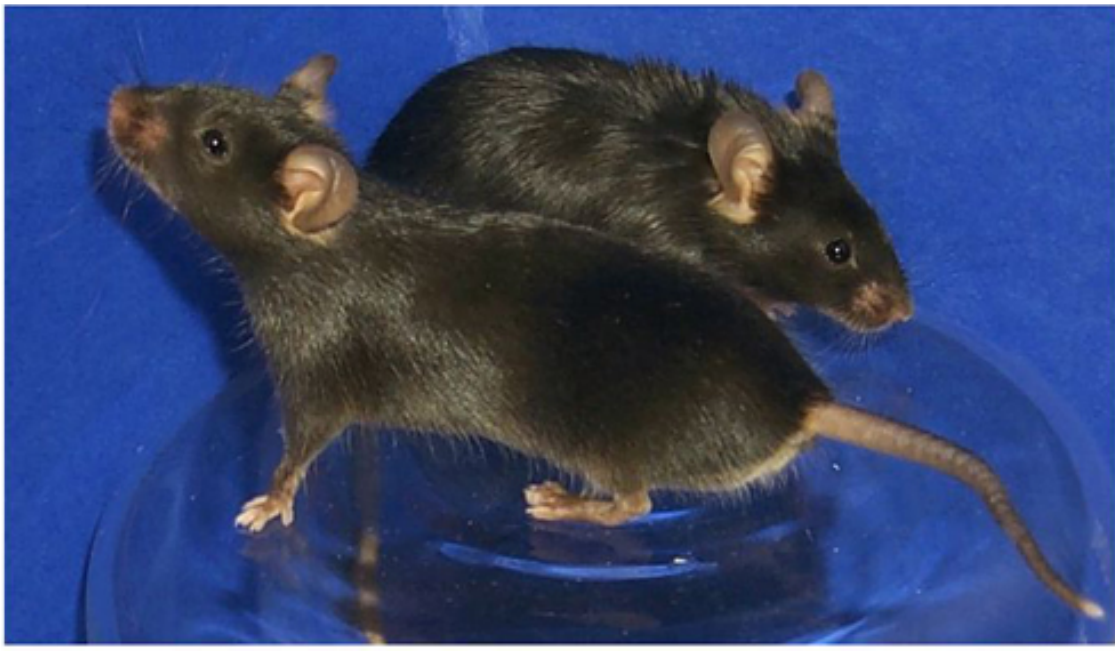


Figure 1: A normal littermate control in front and a mouse heterozygous for the *Shar* mutation in back.

Origin and Description

The *Shar* mutation arose in the C57BL/6-*Lbr*$^{ic\text{-}J}$/J strain and was discovered by Myrna Parker in 2000 in the Cryopreservation Recovery Department at The Jackson Laboratory. Mice carrying the *Shar* mutation exhibit a shiny and rough appearing coat that resembles the previously described mouse mutation greasy (*Gs*). However, *Gs* is X-linked whereas this new mutation is on Chr 15. The phenotype also resembles lustrous (*lt*) on Chr 11 and satin (*Foxq1*^{sa}) on Chr 13, however the chromosomal location of this new mutation rules out allelism with these two mutations. *Shar*/+ mice breed and live a normal lifespan.

Genetic Analysis

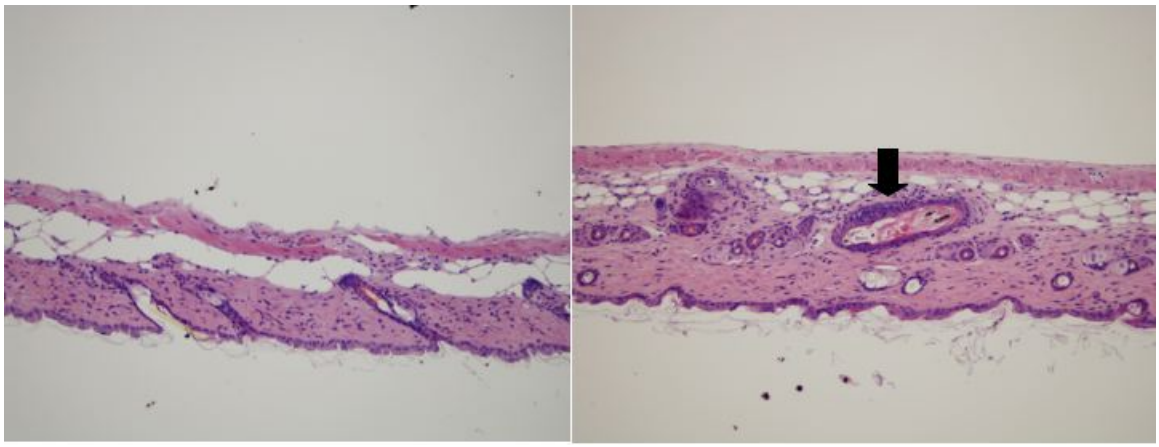
Using the standard mapping protocols of The Mouse Mutant Resource, a backcross was set up to map this new mutation. A heterozygous C57BL/6J-*Lbr*$^{ic\text{-}J}$/J female carrying this new mutation was mated to a CAST/Ei male. Mutant progeny from this cross were then backcrossed to an unrelated C57BL/6J +/+ mouse. Fifty affected progeny were collected from this backcross and used for linkage analysis.

The *Shar* mutation was mapped between *D15Mit263* (at the 99.3 Mb NCBIm34 position) and *D15Mit16* (at the 103.0 Mb NCBIm34 position). The keratin complex 2 (*Krt2*) extends from 101.5 - 102.1 Mb on Chr 15, and it is possible that *Shar* is a mutation of one of these keratin genes, which are known to underlie similar hair abnormalities. Other mouse skin and hair mutations that map to this region of Chr 15 include crimpy (*cpy*), caracul (*Krt71*^{Ca}), Naked (*N*) shaven (*Sha*), and velvet coat (*Ve*). The recessive mutation crimpy (*cpy*) causes affected mice to have a wavy and rather plushy appearing coat and curly vibrissae (Lane 1992), which is not seen in *Shar* mutants. The dominant mutation caracul (*Ca*) causes a curly coat and curved vibrissae not seen in *Shar* mutants. Mice homozygous for the semidominant mutation naked (*N*) lack the appearance of a hair coat and vibrissae, while heterozygotes develop a first hair coat but lose it between 10-14 days of age (Sundberg, 1994), whereas mice carrying the *Shar* mutation retain their hair and vibrissae and live a normal life span. *Sha* heterozygotes display a greasy coat similar to that observed in the *Shar* phenotype, but homozygotes are viable and exhibit sparse fur (Isaacson JH *et al.*1962. In contrast, *Shar* homozygotes appear to be embryonic lethal (see below) making allelism with shaven unlikely. Mutations in *Ve* affect ectoderm development causing homozygotes to die in utero (Rossant J; Vijh KM, 1981), whereas heterozygotes develop abnormal hair (Trigg MJ, 1972). The similarities in map positions and phenotypes suggest that *Ve* and *Shar* may be allelic; however, a direct test for allelism was not done because *Ve* is available only as cryoperserved embryos.

A special cross was set up to determine if C57BL/6-*Shar*/J homozygotes are dying in utero. C57BL/6-*Shar*/J mice were first mated to a C3H/HeSnJ mouse, and the resulting progeny were then intercrossed to produce F2s. The F2 progeny were typed by PCR for the closely linked markers *D15Mit161* and *D15Mit42*, which flank the *Shar* mutation thereby permitting indirect determination of *Shar* genotypes. Of the 26 progeny typed from this cross, 2 animals were +/+ and the other 24 were heterozygotes. No homozygotes were seen, indicating that they may be dying *in utero*.

NOTE: The following paper shows that *Ve* is non-recombinant with *Krt2*:
Hart CP; Compton JG; Langley SH; Hunihan L; LeClair KP; Zelent A; Roderick TH; Ruddle FH, Genetic linkage analysis of the murine developmental mutant velvet coat (Ve) and the distal chromosome 15 developmental genes Hox-3.1, Rar-g, Wnt-1, and Krt-2., J Exp Zool 1992 Aug 1;263(1):83-95

Pathology
Our standard pathological screen of the somatic organs of two heterozygous mutants and two control littermates at 3 weeks of age showed no gross lesions. Pelt and hair samples taken from a 3 week old mutant and a control littermate showed that some hair follicles were dysplastic while others are normal in the mutant; samples from controls were normal.



Skin from an *Shar*/+ animal showing an enlarged and dystrophic follicle is shown on the right panel and skin from a control littermate on the left panel. (20X)

Hearing as assessed by auditory brainstem response of two heterozygous mutants and two controls at 4 weeks of age was normal.

The eyes of three mutants and 1 control, all at 6 weeks of age, were examined with an ophthalmoscope and were determined to be normal.

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References
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Sundberg JP (Ed) Handbook of Mouse Mutations with Skin and Hair abnormalities,- Animal models and Biomedical Tools. CRC Press, Inc. 1994.

Isaacson JH *et al.*, "Hfh11" Mouse News Lett 1962;27:31

Rossant J; Vijh KM, In vivo and in vitro development of mouse embryos homozygous for the embryonic lethal velvet coat (Ve) mutation., J Embryol Exp Morphol 1981

Dec;66():43-55.

Trigg MJ, Hair growth in mouse mutants affecting coat texture., J Zool 1972;168():165-198.