36. A New Mutant, Rough Hair(*rh*), developed spontaneously in the F-344 Strain Rat

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Hypotrichosis or hairless and the curry mutants as the hair abnormality of the rat have been reported by several investigators (see Robinson 1978; Altman and Katz 1979), but the rough hair mutant which showed the thin and scattered hairs in the whole body has not yet been reported so far. As a new hypotrichosis mutant, bared (*ba*), the present author (Yosida 1981) has described in the LEM strain rat having the inversion of the no. 1 chromosome. The present mutant developed spontaneously in the normal F-344 strain rats maintained in the Ohmura Experimental Animal Farm. The mutant was sent to this institute and then the genetical analysis was carried out by us. In the present paper the characteristics of the rough hair mutant and the results of the genetical analysis are to be reported.

Material and methods. The F-344 strain rats maintained at the Ohmura Experimental Animal Farm were originally obtained from the National Institute of Health, Bethesda, in 1983, and then they were bred at the Farm by the brother and sister matings for about ten generations. The rough hair mutant occurred in two rats among 11 youngs (one litter) at the F-133 inbreeding

Table I. Segregation of the rough hair mutant in each litter by several combinations of the mating

Litter no. (OM-)	Parents		Litter size	Segregation	
	Female	× Male		Rough	Normal
1	OM- 0/b*	OM- 0/B**	8(♀6 : ♂2)	4(♀3 : ♂1)	14(♀3 : ♂1)
2	OM- 0/a*	OM- 0/A	5(1 : 4)	0	5(1 : 4)
3	OM- 0/d	OM- 0/D	10(6 : 4)	0	10(6 : 4)
4	"	"	6(2 : 4)	0	6(2 : 4)
5	OM- 0/a*	OM- 0/A	4(3 : 1)	0	4(3 : 1)
6	OM- 1/b*	OM- 1/B**	9(2 : 7)	4(1 : 3)	5(1 : 4)
7	"	"	6(4 : 2)	2(1 : 1)	4(2 : 2)
8	OM- 0/a*	OM- 0/A	3(3 : 0)	0	3(3 : 0)
9	OM- 2/a	OM- 2/A	8(6 : 2)	0	8(6 : 2)
10	OM- 1/a*	OM- 1/A*	7(3 : 4)	7(3 : 4)	0
11	OM- 1/b*	OM- 1/B**	11(6 : 5)	8(5 : 3)	3(1 : 2)
12	OM- 5/a*	OM- 5/A**	11(8 : 3)	2(1 : 1)	9(7 : 2)
14	OM- 1/a*	OM- 1/A*	9(5 : 4)	9(5 : 4)	0
15	OM-10/b*	OM-10/B*	7(1 : 6)	7(1 : 6)	0
16	OM-10/a*	OM-10/A*	6(3 : 3)	6(3 : 3)	0
17	OM-10/c*	OM-10/D*	6(2 : 4)	6(2 : 4)	0

* Mutant rat (*rh/rh*). ** Supposed mutant heterozygous rat (*rh/+*).

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generation. All 11 youngs were sent to us in May, 1983 and then bred them in our laboratory by brother and sister matings. The matings between the hair and the normal ones, between the normal and normal ones and between the mutant and mutant rats from the same litter were carried out for three generations (F-134 to 136) (Fig. 1, Table I).

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Fig. 1. Pedigree of the rat carrying the rough hair mutants. Litters with the mutant rats are shown by the asterisks (refer Table I).

Results and discussion. 1) The external feature of the hair mutant: This mutant showed the rough hair condition having the thin and scattered growing of hairs in the whole body. This character was found clearly at about one month after born by showing the rough and scattered hair. In the adult the rough hair was not changed through the life. The whole body, especially the back side of the abdomen showed the rough hair (Fig. 2). The microscopical structure of the rough hair mutant was not so different from that of the normal hair. The mutant would be due to the decrease of the density of the hair growth.

2) Segregation of the rough and normal hair rats by several combinations of matings. (a) Matings between the rough and the normal hair rats: Thirty four rats (18:16) in 4 litters born after matings between the rough(♀) and the normal rats(♂) were segregated to 18 rough(♀10:♂8) and 16 normals (♀7:♂9). This segregation ratio was almost coincided to the segregation ratio, 17.0:17.0 ($\chi^2=0.69$, $p\geq 0.9$) which was expected by matings between the recessive homologous mutant(*rh/rh*) and the heterologous mutant(*rh/+*). Other 12 specimens(♀7:♂5) from 3 litters obtained by matings between the rough

Fig. 2. The rough hair mutant (*rh*) appeared in the F-344 strain rat (left). The normal litter mate is in the right.

and the normal rats were all normals. This is suggested to be due to mating between the mutants(*rh/rh*) and the normal homologous rats(+/+).

(b) Mating between both normal rats: Twenty four rats(♀14:♂10) from 3 litters obtained by mating between the normal females and males showed all the normal hair. In this case the parents should have any one of the following three gene combinations; both parents had not any mutant gene(+/+), the female parent had the heterologous mutant gene(*rh*/+), but the male parent did not have the mutant gene(+/+), and the reciprocal combination from the above mating (Table II). The other 11 specimens from one litter born after

Table II. Segregation of the rough hair mutant in the 3 different combinations (rough × normal, normal × normal and rough × rough)

Combinations		Litter no.	Total no.	Segregation	
Female	Male			Rough	Normal
Rough	× Normal		♀ ♂	♀ ♂	♀ ♂
<i>rh/rh</i>	<i>rh</i> /+	4	34(18 : 16)	18(10 : 8)	16(7 : 9)
<i>rh/rh</i>	+/+	3	12(7 : 5)	0	12(7 : 5)
Normal	× Normal				
+/+	+/+	3	24(14 : 10)	0	24(14 : 10)
<i>rh</i> /+	+/+				
+/+	<i>rh</i> /+				
<i>rh</i> /+	<i>rh</i> /+	1	11(6 : 5)	2(1 : 1)	9(7 : 2)
Rough	× Rough				
<i>rh/rh</i>	<i>rh/rh</i>	5	35(14 : 21)	35(14 : 21)	0

mating between both normals, however, were segregated to 2 mutants(♀1:♂1) and 9 normals(♀7:♂2). In this case both the parents should have the mutant gene in the heterologous condition(*rh*/+).

(c) Mating between both mutant rats: Thirty five rats(♀14:♂21) from 5 litters born after matings between both the rough mutant rats showed all the rough hair. This seems to be due to that both the parents had the homologous mutant gene(*rh/rh*).

Based on the above mating results it could be concluded that the rough mutant was due to a simple and recessive mutant gene, and it would be tentatively named as the rough hair mutant(*rh*). The relation between the rough hair mutant and the other hair mutants such as the trichosis or curry has not yet been examined, and also any linkage test of the mutant gene to the other mutant was not carried out at present. These problems remain to be studied further.

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