

A TWELFTH LINKAGE GROUP OF THE HOUSE MOUSE

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IN 1941 a new gene mutation was introduced under the name of "jerker," *je*, in a note by Grüneberg, Burnett and Snell. The mutant was recessive and a close mimic of the longest-known mutant of the kind, "waltzer," *v*. It was tested for linkage much more thoroughly than is usually possible with a new factor. The note gives *prima facie* evidence for inheritance independent of the following factors, to which where possible the number of the chromosome has been added :

<i>Factor</i>			
Agouti (V)	.	.	Dominant and recessive pied (III)
Brown (VIII)	.	.	Brachyury (IX)
Albino (I)	.	.	Flexed
Caracul (VI)	.	.	Leaden
Dilution (II)	.	.	Waltzer (X)
Rex (VII)	.	.	Wavy-one (XI)

In spite of these thorough tests, no linkage was found, a fact which is not surprising when we consider that the total length of chromosome excluded was perhaps only about a quarter of the entire range of sites possible.

The factor Dunn's ruby was reported by Dunn in 1945 from stock obtained from Dr C. H. Danforth. Dunn showed that this factor, while phenotypically equivalent to the ruby reported previously by So and Imai (*p^r*), was not an allelomorph of pink-eye (*p*), or of pallid (*pa*), or of albinism (*c*). It was apparently inherited independently of *p*, and therefore not in the first chromosome.

In January 1947 two intercross matings were made between double heterozygotes for jerker and Dunn's ruby, with a view to introducing these two factors into Line number 3 of the lines set up at the Genetical Department at Cambridge. One of these matings, though not the other, threw an apparent excess of double recessives, and attracted attention to the possibility that these two factors, neither of which had previously been assigned to any linkage group, were mutually linked, and therefore constituted the foundation of a new group. To this group, and to the chromosome which is its physical basis, the Roman numeral XII has been assigned, on the assumption that XI will be used for white and wavy-one. It is of course probable

that the numbering of chromosomes in this way may later require revision, owing to the discovery that groups previously regarded as independent are in reality loosely linked. The provisional use of such numbers has, however, a certain temporary convenience.

In consequence of this observation a series of backcross matings was built up, in the first place in coupling and later, by reason of the delay required for preparation matings, in repulsion also.

About the end of November, seeing that the evidence accumulated to that date had continued to favour the hypothesis of linkage, though with a somewhat high percentage of recombination, the information was sent to Dr G. D. Snell at Bar Harbor who, without the knowledge of the workers at Cambridge, had also come to suspect the existence of this linkage, and had already obtained data somewhat more favourable to its demonstration.

At this date the evidence of the two bodies of material was summarised as in the table, which has been amended to include some further data accumulated in time for publication.

TABLE

		++	je	ru	ruje	T	Scored at				
							43 per cent.	44 per cent.	45 per cent.	50 per cent.	
Intercrosses											
Coupling	Cambridge	147	53	43	19	262	-25.3235	-17.6244	-12.0789	+13.3333	
	Bar Harbor	4	1	2	1	8	+0.4042	+0.6127	+0.8161	+1.7778	
Repulsion	Bar Harbor	86	31	35	5	157	+12.5293	+14.7952	+17.1186	+29.7778	
All intercrosses . . .							-12.3900	-2.2165	+5.8558	+44.8889	
Backcrosses											
♀ C.	Cambridge	51	48	30	44	173	-14.7286	-7.8298	-0.6060	+34.0000	
	Bar Harbor	32	30	31	47	140	-3.2640	+2.4350	+8.0808	+36.0000	
♂ C.	Cambridge	17	12	15	17	61	-3.1416	-0.6493	+1.8182	+14.0000	
	Bar Harbor	20	13	13	14	60	-0.8160	+1.6234	+4.0404	+16.0000	
♀ R.	Cambridge	4	4	6	4	18	-1.0608	-0.3247	+0.4040	+4.0000	
♂ R.	Cambridge	5	5	4	8	22	-14.4431	-13.4741	-12.5253	-8.0000	
All backcrosses . . .							-37.4541	-18.2195	+1.2121	+96.0000	
All matings . . .							-49.8441	-20.4360	+7.0679	+140.8888	
Total information : 2750.39 . . .											from Bar Harbor about 1050 from Cambridge about 1700
Standard error of score											±.52
Significant difference from 50 per cent.											χ ² =7.18

It will be seen that nearly all the separate portions here compiled favour linkage, as shown by the positive values at 50 per cent. More data from the repulsion backcrosses are, however, still needed.

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REFERENCES

- GRÜNEBERG, H., BURNETT, J. B., AND SNELL, G. D. 1941.
The origin of Jerker, a new gene mutation in the House Mouse, and linkage studies made with it.
Proc. Nat. Acad. Sci. 27, 12, 562-565.
- DUNN, L. C. 1945.
A new eye color mutant in the mouse with asymmetrical expression.
Proc. Nat. Acad. Sci. 31, 11, 343-346.
- SNELL, G. D., AND BUNKER, HELEN. 1948.
Linkage of white and waved-1.
Jour. Hered. (in press).
- GROBMAN, ARNOLD G., AND CHARLES, DONALD R. 1947.
A new dominant autosomal mutant affecting coat colour in the mouse, *Mus. musculus*.
Jour. Hered. 38, 12, 381-384.