A BLACK-BLUE DUTCH RABBIT

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(With One Text-figure)

Cases of mammals exhibiting both the recessive and the dominant members of a pair of allelomorphic characters in their coats are by no means common but have occasionally been reported in both rabbits and mice. An instance of this condition was recorded by the writer(3) in which a rabbit showed several brown and several Angora patches in an otherwise short, black coat. Breeding tests proved the rabbit to be genetically a short-coated black animal, heterozygous for Angora and brown. No tendency to transmit the mosaic condition to its offspring was found.

The rabbit with which the present report deals was a buck, born on 22 March 1932, and presented to the Institute when about a month old by the breeder, to whom our thanks are due. The animal was one of a nest of six, the remaining five all being typical black and white Dutch. The parents were both black Dutch, the result of at least 20 years' continuous line breeding from one original pair of Dutch, a blue buck and a black doe, during which period the only outcross that had taken place was through the purchase some 12 years previously of an unrelated tortoise-shell Dutch buck which was used for one season. No fresh stock had been introduced into the stud for over 12 years prior to the birth of the rabbit now reported.

The rabbit was a fairly well-marked exhibition type black Dutch buck remarkable in that from the centre of the back down the side and immediately adjacent to the black rump, a band of blue (dilute) pigment was shown, gradually narrowing over the left shoulder and completely covering the left foreleg apart from a white tip to the foot (cf. Fig. 1). The rabbit was retained in the rabbitry until the summer of 1935 when it died. During its existence it was used fairly extensively for breeding, and the following results were recorded.

In twelve litters produced from five black Dutch does, known to be heterozygous for blue, this buck sired fifty-three youngsters, of which thirty-eight were black and fifteen blue. These matings showed a slight excess of blues above the expectation, supposing the buck to be genetic-

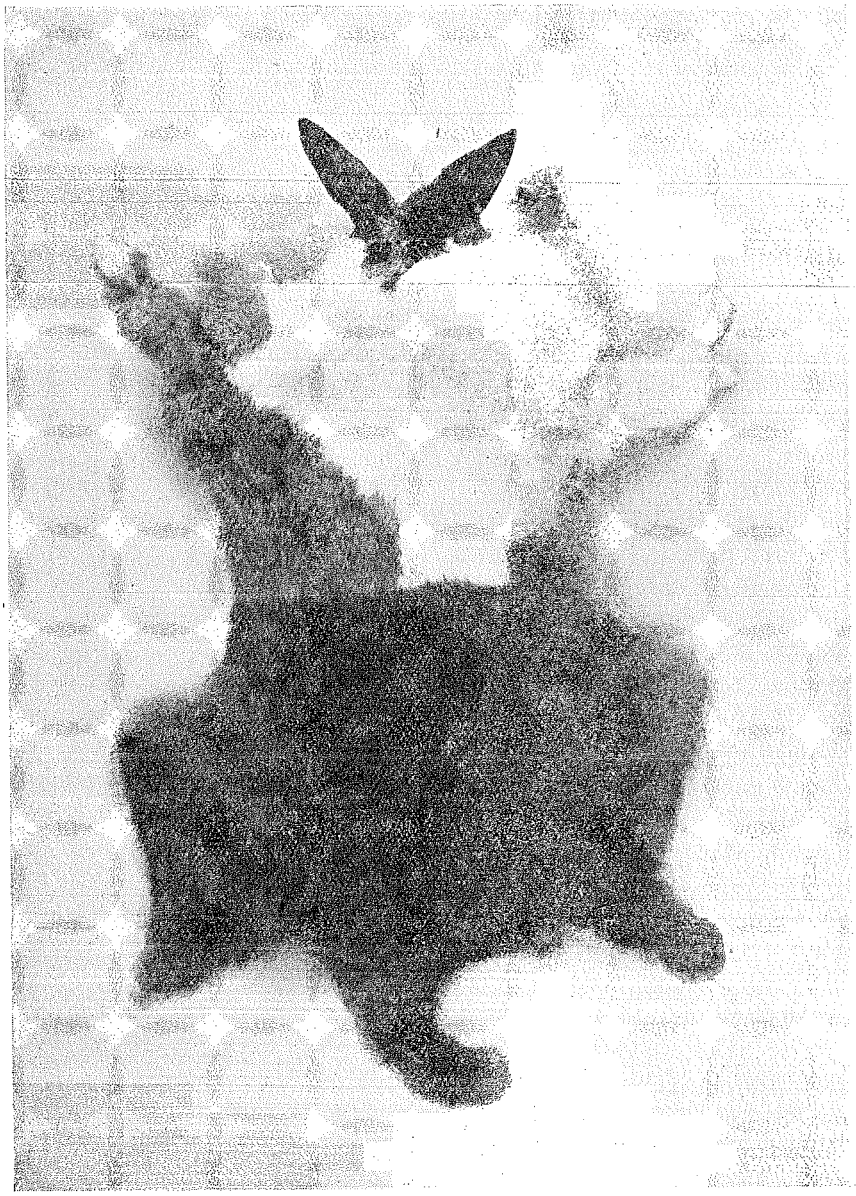

Fig. 1

ally a black, heterozygous for blue, which hypothesis further breeding tests substantiated.

The black-blue buck was also mated to three different blue does, which produced in six litters thirty youngsters of which sixteen were black and fourteen blue, a slight excess of the dominant colour.

Upon some of his daughters reaching maturity, nine of them, five blues and four blacks, were back-crossed to him, the former producing in ten litters forty-two youngsters of which twenty were blacks and twenty-two blues, a slight excess above the expectation of blues being found. From his four black daughters, he sired nineteen youngsters, all blacks excepting two blues. In this mating the doe K was later proved to be homozygous for black, whilst during her breeding life doe J produced no blues and therefore was also probably homozygous for black. Does L and M were by the present matings proved to be heterozygous for blue.

None of these 144 youngsters sired by the buck was a mosaic. It appears, therefore, conclusive that the effect of the condition had not extended to the gonads, as the proportions of his black and blue youngsters were very closely in accord with the normal Mendelian expectation.

A somewhat similar mosaic reported by Castle(1) appeared in the F_2 of a Dutch Angora cross, and was a black-blue Dutch. In this case, however, the original tricolour sired others like himself, as also did his tricolour son. In no other instance of mosaicism reported in rabbits or mice has there been any marked tendency for the condition to be transmitted, so it appears to be exceptional for the gonads to be involved.

In the case now reviewed the condition was not transmitted, and the most simple explanation, and one which meets the case, would be that at some time during development the dominant black gene was lost from a particular cell, thus allowing the recessive blue to become expressed in the affected area.

Extension of pigmentation into the normally white area is an exceedingly common failing in exhibition Dutch rabbits. These "runs" of colour are most frequently at one side and extend over the shoulder, the exact amount varying in different individuals from a small spot to an almost complete exclusion of white on one or both shoulders. Although an examination has not been completed, it seems probable that some specific gene or genes control the markings in this position and their extent, which in exhibition specimens must be absent.

In every case of mosaicism reported by Castle, as in the instance now reviewed, the exhibition of the recessive character is in a position which in typical animals is white, and in consequence the area controlled by the

gene or genes now postulated must have been affected. Similarly it has also been found in several reported instances of mosaicism in mice, that the areas normally white are most frequently affected. It seems, therefore, for some reason the genes controlling the development of colour in the normally white areas are least stable and most easily affected in cases of mosaicism.

In the cases of mosaic mice reported by Pincus(4), inbreeding had been carried on for several generations, whilst that recorded by Dunn(2) was the result of crossing two inbred strains. Castle(1) does not state in his report whether his Dutch and Angoras had been inbred for some generations prior to their having been crossed, but this is probably the case with the Dutch at least, as they "were descended from a single pair". In the present case inbreeding or close-line breeding had been undertaken for 20 years. In view of this, continued inbreeding or outcrossing of inbred strains appears to show a tendency to affect the somatic stability of a stock.

SUMMARY

A mosaic black-blue and white Dutch rabbit is reported. The condition was not transmitted to any of his 144 offspring. The possibility of the presence of genes controlling pigmentation in normally white areas is discussed, as also is the tendency for somatic instability being increased through inbreeding.

REFERENCES

(1) CASTLE, W. E. (1929). "A mosaic (intense-dilute) coat pattern in the rabbit." *J. exp. Zool.* **52**, 471–80.

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(3) PICKARD, J. N. (1929). "A brown-black rabbit." *J. Hered.* **20**, 483–4.

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BREEDING RECORDS

Black-blue buck mated to heterozygous black does

Litter	Doe's letter	Blacks	Blues	Total
1	A	4	1	5
2	B	4	—	4
3	C	2	2	4
4	D	2	3	5
5	B	5	—	5
6	A	5	1	6
7	C	3	2	5
8	E	3	1	4
9	D	4	—	4
10	B	3	1	4
11	D	2	1	3
12	E	1	3	4
		38	15	53
	Expectation	*39·75*	*13·25*	

Black-blue buck mated to blue does

Litter	Doe's letter	Blacks	Blues	Total
1	F	2	4	6
2	G	3	2	5
3	F	1	5	6
4	H	4	1	5
5	F	3	—	3
6	H	3	2	5
		16	14	30
	Expectation	*15*	*15*	

Black-blue buck mated to blue daughters

Litter	Doe's letter	Blacks	Blues	Total
1	N	2	2	4
2	P	2	3	5
3	Q	—	3	3
4	R	3	1	4
5	S	2	—	2
6	P	4	2	6
7	R	1	5	6
8	S	1	3	4
9	Q	3	2	5
10	S	2	1	3
		20	22	42
	Expectation	*21*	*21*	

Black-blue buck mated to black daughters

Litter	Doe's letter	Blacks	Blues	Total
1	J	3	—	3
2	K	4	—	4
3	L	5	1	6
4	J	4	—	4
5	M	1	1	2
		17	2	19