suggests strongly that the tumour cells were capable of penetrating the filter but in small numbers which were with rare exception, insufficient to establish tumour growth. Similar results were obtained when small numbers of tumour cells were injected directly into mice. We found that inoculation of several thousand *L*1 cells was necessary for the establishment of the tumour in a new host, while Law[2] found that the injection of only ten *L*1210 cells was sufficient for transplantation of that tumour. This difference in the capacity of cell populations to survive may operate in aiding or hindering the establishment of new sites of growth by these tumours while they are growing in the host.

Variation in the capacity of tumour cells to survive has been interpreted as supporting the stem-line concept of tumour populations[3]. If these results are to be interpreted in the light of the stem-line concept, it would be necessary to assume that the *L*1210 tumour is made up almost entirely of stem cells while the *L*1 tumour population is remarkably devoid of stem cells.

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[1] Shelton, E., and Rice, M. E., *J. Nat. Cancer Inst.*, **21**, 137 (1958).
[2] Law, L. W. (personal communication).
[3] Hauschka, T. S., *Trans. N. Y. Acad., Sci.*, Ser. II, **16**, 64 (1953).

GENETICS

Semi-Albino: a Third Sex-linked Allelomorph of Silver and Gold in the Fowl

In 1955, among 76,542 chicks hatched from the cross, Brown Leghorn sire by Light Sussex dam, there appeared two males which, instead of having the expected white (silver) coloured down of the Light Sussex, were brown. One was sold before its genetic importance was realized. The other cock when adult was light brown in colour, being of a similar hue to that of Brown Leghorn pullets, with a few black feathers on the wings and a black tail. The black and bright brown colours which are found on the bodies of Brown Leghorn cocks were absent. The bird was strong and vigorous, and lived until killed in 1958.

The absence of silver suggested that this allelomorph (*S*) had mutated either to the allelomorph for gold (*s*) or to some third form. The results of subsequent crosses confirmed that *S* was absent and that a new sex-linked mutant s^{al} recessive to *s* had appeared and that this allelomorph gives semi-albino in the hemizygous females and homozygous males (Table 1). The mutation must have occurred in the Light Sussex dam and not in her ancestors since silver was the gene that had mutated and she herself was not semi-albino. Moreover, since two such cocks appeared in the same year but none was detected among a total of 303,334 chicks hatched between 1956 and 1958, it seems likely that a single mutant occurred during an early stage of oogenesis and that the resulting allelomorph was incorporated in at least two eggs. The mutant can be detected if it arises in the *X*-chromosome of a dam but only in half of those of a sire. Consequently we can say that the mutant has been observed in 2 out of the 379,876 *X*-chromosomes tested.

The semi-albino chicks (all descendants of the second mutant cock) were generally small at hatching, and did not grow as rapidly as the chicks of the other breeds and crosses with which they were reared. The cock chicks were slower in hatching and less active than the pullets. The first feathers were white in colour, but with increasing age many birds developed a buff tinge on the body feathers. This was particularly noticeable in the cocks. In dim light the semi-albino birds had considerable difficulty in seeing, and tended to collide with stationery objects. When adult some of these birds became practically blind due to the development of opacities in the eye lenses. In some cases the whole lens was opaque, while in others the lesions appeared as small spots. The incidence of egg peritonitis in the pullets at between twelve and fourteen months of age was high, and was the most common cause of death.

A similar semi-albino controlled by a sex-linked mutant (*al*) has been reported from America by Hutt[1]. This is almost certainly the same as ours, but since it occurred in Barred Rocks and White Leghorns and not in a stock segregating for silver and gold, its allelomorphism with silver was not detected.

We wish to record the help received from Miss D. G. Kidd, who first observed the unusual appearance of the original bird and was responsible for rearing the experimental chicks, and from Dr. F. T. W. Jordan who carried out post-mortem examinations, and reported on the eye abnormalities.

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[1] Hutt, F. B., "Genetics of the Fowl" (McGraw-Hill, New York, 1949).

Table 1

Year	Sire	Dam	Sex	Silver	Offspring gold	Semi-albino
1956	Mutant (ss^{al})	pure Light Sussex ($S-$)	♂	27 (*Ss* or Ss^{al})	0	0
			♀	0	12 ($s-$)	8 ($s^{al}-$)
1957	Mutant (ss^{al})	semi-albino (daughters) ($s^{al}-$)	♂	0	18 (ss^{al})	6 ($s^{al}s^{al}$)
			♀	0	13 ($s-$)	12 ($s^{al}-$)
			unsexed		5	2
1958	Semi-albino ($s^{al}s^{al}$)	semi-albino ($s^{al}-$)	♂	0	0	4 ($s^{al}s^{al}$)
			♀	0	0	8 ($s^{al}-$)
			unsexed	0	0	2
1958	Semi-albino ($s^{al}s^{al}$)	pure Rhode Island Red ($s-$)	♂	0	18 (ss^{al})	0
			♀	0	0	23 ($s^{al}-$)
			unsexed	0	0	3
1959	Semi-albino ($s^{al}s^{al}$) ×	Semi-albino ($s^{al}-$)	♂	0	0	2
			♀	0	0	1
1959	Silver (*Ss*) ×	Semi-albino ($s^{al}-$)	♂	1	0	0
			unsexed	0	1	0

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