LETTERS TO THE EDITORS

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Nuclear Uptake of Glycine-2-^{14}C in the Newt Embryo

EXPERIMENTS with early amphibian embryos, using glycine-1-^{14}C as a tracer and the autoradiographic technique of Doniach and Pelc[1], have shown that the nuclei take up this substance into high-molecular weight compounds more rapidly than does the cytoplasm[2]. Ficq[3] has also observed a greater activity in the nuclei, using orotic acid-2-^{14}C as well as glycine-1-^{14}C. She points out that, by the neural-tube stage, incorporation has occurred in all tissues which are actively engaged in morphogenesis; and she has shown that the labelled substances were taken up into nucleic acids as well as protein.

In some recent experiments, late blastulæ of *Triturus palmatus* were kept in a solution of glycine-2-^{14}C (1·4 μc./ml.) until they reached the late yolk-plug stage, and early to mid-gastrulæ were kept similarly until the neural-plate stage. They were then fixed in 10 per cent trichloracetic acid, sectioned at 5 μ, coated with Kodak autoradiographic film and exposed for 10–35 days; after development they were lightly stained with Mayer's hæmalum. The autoradiographs of the late yolk-plug embryos show strong incorporation into the nuclei of the mesoderm, both that which had already invaginated to form the archenteron roof and that which still remained on the surface. There was also a somewhat high incorporation into the nuclei of the presumptive neural plate; but in the epidermis and endoderm there is no appreciable difference in activity between the nucleus and cytoplasm. In the neural-plate embryos, heavily charged nuclei are found in the archenteron roof and more lateral mesoderm, and also in the neural plate itself (Fig. 1). Some endoderm nuclei are beginning to be charged at this stage; but there is still no sign of high activity in the epidermis, although this is very obvious at a rather later stage in *Xenopus*[2]. We thus have clear evidence of a high metabolic activity of the nuclei, beginning in the organizer region and spreading to the neural tissue which it induces. Work is proceeding on the characterization of the substances into which the glycine is incorporated.

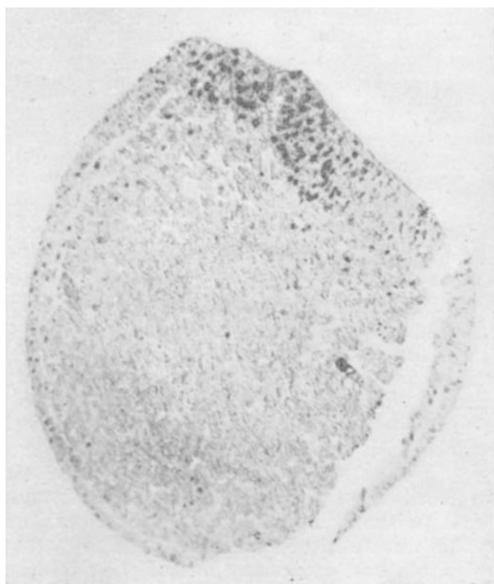

Fig. 1. Autoradiograph of a neural-plate embryo. (× 60)

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[1] Doniach, I., and Pelc, S. R., *Brit. J. Radiol.*, **23**, 184 (1950).
[2] Waddington, C. H., and Sirlin, J. L. (in the press). cf. *Nature*, **173**, 517 (1954).
[3] Ficq, A., *Experientia*, **10**, 20 (1954).

Partial Sex Linkage in the Mouse

THE chromosomes of *Mus musculus* have a high chiasma frequency[1], and for this reason very loose linkages are to be expected. Many of the problems of linkage and independence in this species may therefore have to be solved by cytogenetic methods rather than the breeding techniques of formal genetics.

Among them is the question whether linkage group VII is carried in the pairing segment of the sex chromosome. Partial sex linkage of two group VII mutants, *waved*-2 (*wa*-2) and *shaker*-2 (*sh*-2), was reported in 1947 by Wright[2]. However, there were two unusual features in her results, namely, (*a*) recombination was in excess of 50 per cent, and (*b*) *wa*-2 and *sh*-2 showed the same recombination with sex, though they are not closely linked. As a result, the partial sex linkage interpretation has not been universally accepted. Carter and Phillips[3] repeated Wright's experiment, but failed to find any consistent evidence of sex linkage.

With the object of obtaining evidence on questions such as this we have induced a number of translocations in the mouse, using X-rays, and have identified linkage groups involved in eleven of them. One translocation, *T*8, involves groups I and VII. The linkage with group I was found by backcrossing animals heterozygous for *T*8 and for the group I marker *chinchilla* (c^{ch}) to chromosomally normal $c^{ch}c^{ch}$ homozygotes, and testing their progeny for the semi-sterility which indicates the presence of the translocation. No recombinants were found among forty-seven tested gametes. The *c*-locus was then used for 'tagging' the translocation in further linkage tests, and was found to show close linkage with *wa*-2 and loose linkage with *Rex* (*Re*), also in group VII:

Genotypes of parents	Phenotypes of progeny			
	$\frac{++}{8}$	$\frac{+wa\text{-}2}{0}$	$\frac{c^{ch}+}{1}$	$\frac{c^{ch}wa\text{-}2}{12}$
$T8++/+c^{ch}wa\text{-}2 \times +c^{ch}wa\text{-}2/+c^{ch}wa\text{-}2$	8	0	1	12
	$+Re$	$++$	$c^{ch}Re$	$c^{ch}+$
$T8++/+c^{ch}Re \times +c^{ch}+/+c^{ch}+$	5	11	14	3

Translocation *T*8 thus offers a means of settling the question whether linkage group VII is sex-linked. The translocation and the sex bivalent should be cytologically recognizable in primary spermatocytes; it should therefore be possible to establish their chromosomal independence or interdependence.

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