STUDIES ON TRANSPLANTATIONS OF ADULT MOUSE LIVER AND KIDNEY INTO CHICK EMBRYOS

by LEELA MULHERKAR, *University of Poona, Poona 7*

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ABSTRACT

Grafts of fresh adult mouse liver and kidney were made into chick embryos at the primitive streak stage in the manner described by Waddington (1932).

The grafted embryos were cultured *in vitro* by the technique described by New (1955). The results of the experiments seem to show that fresh adult mouse liver and kidney do not produce inductions into the reacting chick ectoderm.

The influence of kidney grafts on the host tissue has been described here. It appears that the kidney graft upsets the formation of somites in the host.

INTRODUCTION

Induction by grafts of *Triton* liver, adult mouse kidney and guinea pig kidney in Amphibia has been reported by Chuang (1938) and Toivonen (1940) respectively in connection with regional differentiation of the organiser shown by Spemann (1931). Although much experimental work on chick embryo has been done both in Europe and in America, the progress of Avian Epigenetics has been impeded by technical difficulties. Very recently New(1955) has introduced a simple *technique* for *in vitro* culture, which has facilitated the study of a variety of grafts on the reacting chick ectoderm.

In the present paper grafts of fresh adult mouse liver and kidney were made into chick embryos.

MATERIALS AND METHODS

Fertilized fresh hen's eggs obtained from the Government Poultry Farm, Poona, were incubated in an electrically regulated incubator at 37°C to get the primitive streak stage. Necessary precautions were observed by sterilising the glass-ware, instruments etc., and by autoclaving the solutions to avoid contamination.

Fresh liver and kidney of an adult mouse were taken out and washed separately several times in Compton solution to remove blood. A small piece of about 0.3 mm. each, both of liver and kidney, was grafted separately into a chick embryo at the primitive streak stage, in the manner described by Waddington (1932). The embryos were then cultured *in vitro* by the technique described by New (1955). After about **20** hours of culturing, the embryos were fixed in acetic alcohol and serially sectioned at 10μ. The sections were stained in Delafield's haematoxylin and differentiated in acid-alcohol.

In all, 20 grafts each of liver and kidney were made and histologically examined.

DESCRIPTION OF EXPERIMENTS

Grafts of Mouse Liver

In the section shown in Plate **XXVII**, Fig. 1, the graft (GL) is seen to consist of a mass of hepatic cells. Although the graft is in contact with the host ectoderm, no induction seems to have been caused.

The graft in Plate XXVII,, Fig. 2, seems to lie between the endoderm and mesoderm of the host. The graft appears to consist of hepatic cells arranged round the capillaries. As the graft lies between the endoderm and mesoderm, the contact between it and the reacting host ectoderm is prevented and therefore probably no induction is produced.

Grafts of Kidney

The graft in Plate XXVII, Fig. 3, is situated between the ectoderm and mesoderm of the host. The urinary tubules seem to have cut across at several places and are lined by small cubical cells surrounding a small cavity. No induction is caused, although the graft is in contact with the reacting ectoderm of the host. The graft in Plate XXVII, Fig. 4, lies in the coelomic cavity thus preventing the contact between it and the reacting host ectoderm.

In the section shown in Plate XXVII, Fig. 5, the graft lies in between the two mesodermal layers of the host. No induction is produced but the graft seems to have upset the formation of somites. The doubling of somite (S1,S2) is clearly seen on the side occupied by the graft. These somites appear to be bigger than the normal somite seen on the other side. Similar upsetting in the size of the somite was also seen in the sections of some other specimens not shown here. This naturally raises the question as to what is the influence of graft on host tissues which may now beconsidered.

Discussion

Working with fresh *Triton* liver and mouse kidney in Amphibia, Chuang (1938) found that the *Triton* liver induced trunk structures while the mouse kidney induced cephalic structures. On the contrary, Toivonen (1940) using alcohol treated kidney of the adult guinea-pig, obtained mesodermal inductions. Both believed that different organs are induced by qualitatively different substances. The results of the present work make it probable that the adult fresh mouse liver and kidney do not produce inductions into the reacting chick ectoderm. In several cases (Plate XXVII, Fig. 4) the graft entered the coelomic cavity of the host thus preventing contact between the ectoderm and the graft ; but in some other cases (Plate XXVII, Figs, 1. 3), although the graft was in contact with the host ectoderm, induction was not produced. Similarly, in experiments where embryonic *Calotes* liver and kidney were grafted into the chick embryo instead of adult mouse liver and kidney, no induction was caused. It thus appears that the chick ectoderm does not easily react to the evocatory stimulus as does that of Amphibia.

The mutual influence of graft and host on each other is noticeable in Plate XXVII, Fig. 5, where the presence of kidney graft has upset the formation of somites. The doubling of the somite (S1,S2), on the side of which the graft is situated, is clearly seen in Pl. XXVII, Fig. 5. Whether this doubling is due to any specific effect of the graft on the tissues of the host or whether it is merely due to mechanical effect is difficult to state with certainty. However, it may be stated here that such mutual influence of host and graft has been studied in detail by Abercrombie and Waddington (1937), who found a considerable tendency on the part of the graft to become harmoniously incorporated into the host. Waddington (1952) has also recently suggested the possibility of complete incorporation of graft tissue into host's body, causing increase in the size of certain organs.

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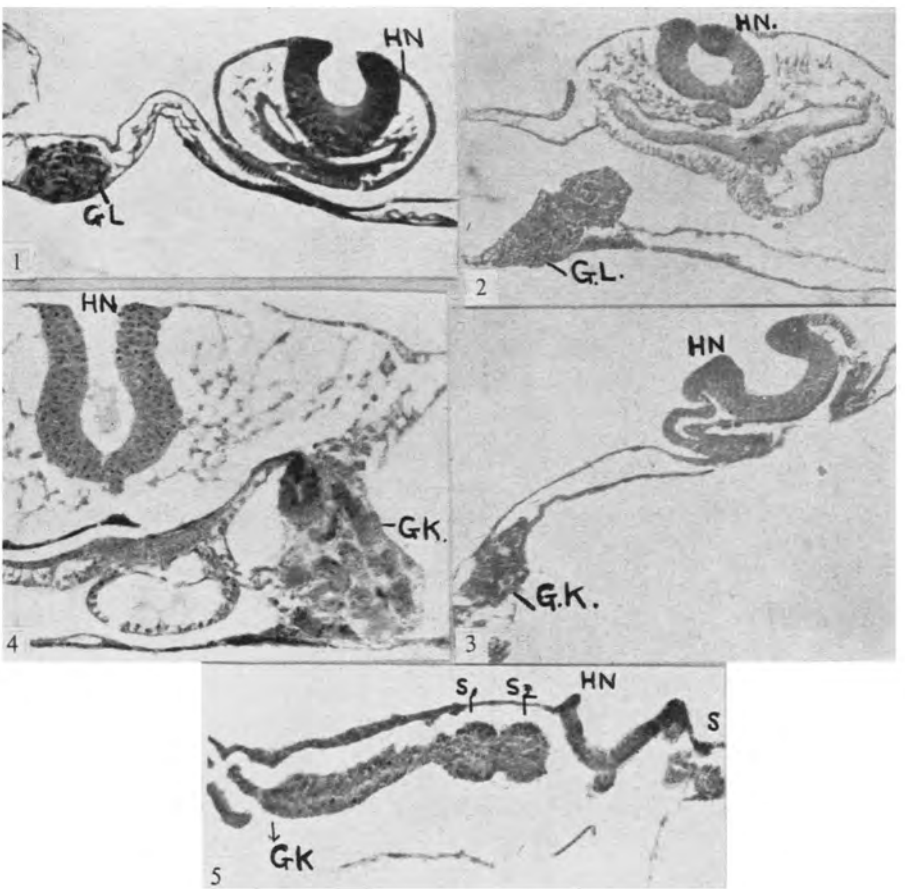

Abbreviations :— G. L. graft of liver ; G. K. graft of kidney ;
H. N., host neural tube ; S, normal somite ;
S1, S2 doubling of the somite.

Fig. 1. Section through the graft and the host neural tube × 130.
Fig. 2. Section showing the graft in the coelomic cavity of the host × 130.
Fig. 3-4 Section through the graft and the host. × 220 and × 140 respectively.
Fig. 5. Section showing the doubling of the somites. × 220.

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