

Studies on Establishment of
the Neural Differentiation Pattern
in Prospective Prosencephalic Area
in
the Chick (*Gallus domesticus*) Embryo

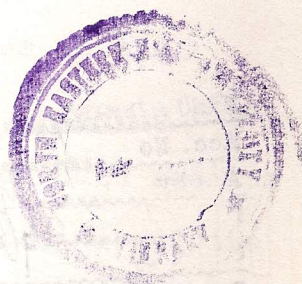
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(ABSTRACT)

to



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ABSTRACT

- (1) The present work includes an investigation on the neural differentiation pattern in the prospective prosencephalic ectoderm of the chick blastoderm at the primitive streak and head-process stages by culturing its pieces intracoelomically as per the technique described by Hara (1961, 1970 and 1971).
- (2) The endoderm and mesoderm were carefully separated from the prospective prosencephalic ectoderm. The freed ectoderm was then cut, with baseline anterior to the notochordal mesoderm, into various pieces according to the 6 operation plans. These pieces were transplanted into the coelom of 2½ days old host embryos and cultured for 12 days.
- (3) By open sandwich experiments, Hara (1961) demonstrated the differentiation tendencies in the competent ectoderm as induced by prechordal and notochordal mesoderm. Subsequently, Rao (1968) studied the appearance and extension of neural differentiation tendencies in the prospective neurectoderm. As his grafts were large in size, the present investigation was carried out with much smaller grafts (size 0.2 x 0.2 mm or 0.4 x 0.1 mm) to find out the finer mode of differentiation tendencies.
- (4) In the first 4 operation plans the grafts were excised from different central and peripheral areas of

the prospective prosencephalic ectoderm. In the other 2 operation plans 4 longitudinal grafts were prepared from one half, and 4 transverse grafts mostly from the other half of this region.

(5) A total of 1437 grafts were prepared from 448 donor blastoderms and transplanted into the coelom of 941 hosts. Of these, 206 hosts died (mortality 23%) From the 725 surviving hosts which carried 1241 grafts, 304 grafts were recovered. (recovery rate 25%) The grafts were analysed histologically to find out the differentiation tendencies.

(6) The results of the histological analysis may be summarised as follows.

(a) The grafts implanted according to the first 4 operation plans showed that the recovery of the central grafts was better than that of the peripheral grafts. The recovery and neuralization of the median longitudinal and posterior transverse grafts taken according to other 2 plans was better than the other peripheral grafts.

(b) The differentiation of all grafts taken at the primitive streak stage does not show any well defined pattern as the differentiation tendencies of the telencephalic, diencephalic and eye structures are mixed up. At this stage the grafts of the central region show better neural differentiation than those of the peripheral

region except in the first plan in which the central area was smaller in size. At the head process stage the pattern of differentiation was better defined. The eye structures (retina as well as tapetum) were found in an area measuring about 0.4 x 0.1 mm approximately 0.1 mm anterior to the head process. The structural elements of the telencephalic cortex were found mostly in the grafts of the anterior region, whereas diencephalic structures differentiated mostly in the grafts of the more posterior region.

(c) Structural elements of the lens were not observed in any graft.

(7) Interpreting the results in terms of activation - transformation hypothesis of Nieuwkoop (1952) the results of the present work are complementary to those of Hara (1961) and Rao (1968). It appears that as a result of first contact the prechordal mesoderm establishes in the prospective neural ectoderm a centrifugal neural (activation) field resulting into the induction and appearance of the prosencephalic differentiation tendencies. With the laying down of the head process, when the wave of activation is succeeded by a wave of transformation extending caudally and laterally transforming the prosencephalic differentiation tendencies in the more caudal parts of the prospective neural plate (Rao, 1968), the differentiation tendencies of telencephalic structures become localized to the anterior region of the prospective

prosencephalic area, and that of diencephalic and eye structure to its more posterior region as analysed in the present investigation.

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