9489 P

Mechanism of Anomaly Induction in Frog Eggs by Means of the Centrifuge.

A. M. SCHECHTMAN. (Introduced by B. M. Allen.)

From the Department of Zoology, University of California at Los Angeles.

The mechanism of the production of anomalies by the centrifuge has taken on new significance since the work of Spemann and his school on the organizer and related phenomena. Apparently few investigators have studied centrifuged eggs in the light of this work. The eggs of *Hyla regilla,* the tree frog, have proven especially sensitive to centrifugal force, yielding highly specific accessory structures (tails and ectodermal proctodea) in as high as 100% of the specimens, if treated at the correct stage of development. Electric and hand centrifuges were used. High percentages of accessory tails and ectod. ani appear after application of centrifugal forces corresponding to 1300-2000 revolutions per minute, continued for periods ranging from 5 to 120 seconds (centrifuge arm, 11.5 cm.). Susceptibility to these forces of the centrifuge is very limited. Secondary tails and ani are not observed until the eggs treated are *advanced blastulæ* (about 3 hours before the onset of gastrulation). From this time on the percentage of anomalous embryos increases, reaching a maximum (90-100%) at about the time when the blastopore first becomes visible. Susceptibility then drops rather abruptly and is *nil* at about 2 hours after the onset of gastrulation (at temperatures 25°-28°C.).

Secondary tails present a great variety of structures: some are quite complete with chorda, somites, nerve tube, mesenchyme, sec-

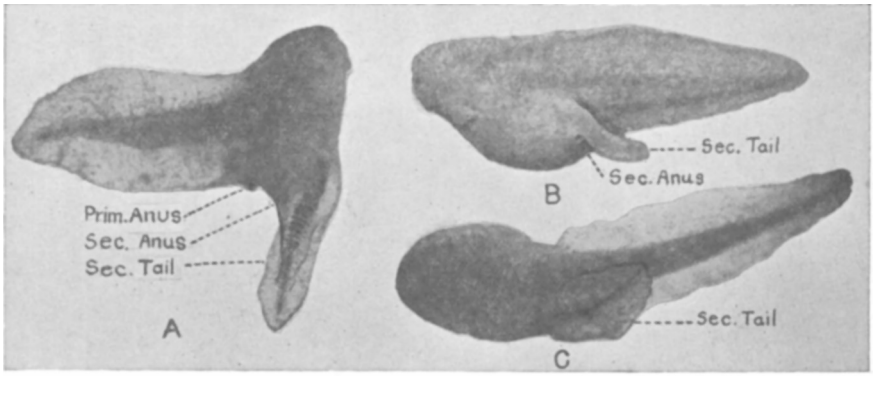

FIG. 1.

ondary anus (Fig. A); others contain only a solid axial strand (Fig. C); others consist of a flat fin with axial strand at one edge (Fig. B). Secondary ectod. ani are common (Figs. A, B).

Clear secondary tails and ectod. ani were induced by other means: (1) by pressing the presumptive ectoderm of susceptible eggs against the yolk mass, (2) by implantation of ventral or lateral blastoporal lips of the early gastrula into the blastocoele.

It seems clear from the above that the mechanism concerned in the production of the anomalies depends upon the *position* of the tail and the anal mesoderm in the blastula and gastrula. As shown by Vogt[1] the tail mesoderm is located uppermost of all the mesodermal anlagen. Collapse of the pres. ectoderm, whether by centrifuge or by mechanical pressure results in contact of the ectoderm with the organizing mesoderm. Possibly induction occurs by this contact, or portions of the mesoderm may remain adherent to the ectoderm. That the anomalies depend primarily on effects produced on the organizing centers has been suggested by others.[2, 3]

The theory of dislocation of determined ectod. anlage[4] runs counter to all recent work on the amphibia and cannot be maintained, as pointed out by Pasquini and Reverberi.[2] It seems unnecessary to postulate mal-distribution of the organizer resulting from inhibition of normal gastrulation movements,[2] since the yolk plug is engulfed in most specimens and the main axial organs are normal except for minute defects. Such inhibition, physico-chemical disturbances within the cells,[2] displacement of mitotic figures, cell injury, death,[3] or changes of cell potency, may be concerned in the production of some anomalies, especially those involving *defects,* or those arising from injury to the yolk. It is not necessary to postulate any of these factors to explain the *accessory* defects herein described.

---

1 Vogt, W., *Arch. f. Entwicklungsmech.*, 1929, **120**, 384.

2 Pasquini, P., and Reverberi, G., *Boll. Instit. di. Zool. Univ. Roma*, 1929, **7**, 1.

3 Beams, H. W., King, R. L., and Risley, P. L., PROC. SOC. EXP. BIOL. AND MED., 1934, **32**, 181.

4 Bagini, M., *Arch. Ital. Anat. e Embr.*, 1925, 22.