CONGENITAL MALFORMATIONS IN THE CHICK
CAUSED BY ENVIRONMENTAL VARIATION

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Received September 7, 1961
(Communicated by Dr. Jacob Chandy, F.A.Sc.)

Much interest has been evinced in the recent years regarding experimental causation of abnormalities in the developing embryos. Congenital malformations of various types and degrees are responsible for the death of 1/5th of the human race before or shortly after the time of birth. It is also one of the main causes in producing ill-health in a certain proportion of the survivors.

Lyngdoh (1956) in his article on the historical aspect concerning the experimental production of congenital anomalies has reviewed vast literature regarding the work conducted by several authors in the field of teratology. Doraiswamy (1952) has surveyed in detail large fields of literature regarding the experimental teratogenesis during the nineteenth as well as the present centuries. In the treatise on the classification of teratology based on embryology, Willier, Weiss and Hamburger (1955) have made an analysis of the several causes for teratological development as follows:

They hold that any deviation from the optimum stimulus required to initiate the developmental processes in the various fields and at appropriate stages is bound to cause error in development. Another factor is the potential capacity of the embryonic tissues to respond to the stimuli.

In certain instances both the stimulus factor as well as the response are abnormal. More causes are to be found in relation to growth processes. Pathological factors leading to degeneration and error in regulating mechanisms may also occur.

The present enquiry was undertaken to determine the various types of abnormalities which might occur in the chick embryos by exposing them to known environmental variations.

The field of study contemplated was the reproductive system but after obtaining multifarious types of anomalies following typically directed experimental methods it has become incumbent on us to deal with the subject from
a general standpoint of the total embryogenesis and the malformations presented during the period under survey. This article deals with a series of experiments which were conducted in this laboratory with hen's eggs, subjected to injection of insulin into the yolk sac till the 13th day of incubation. (Eggs of white-leg-horn hens of pure breed were always obtained from the Government Poultry, Teynampet, Madras.) The external manifestations as well as the histological picture of the congenital anomalies produced are dealt with here.

MATERIALS AND METHODS

For each experiment 3 dozen eggs were incubated out of which 50% were injected with insulin of graded doses. The instruments were scrupulously sterilised before use. This work of dry sterilization was done by the technical staff of the Pathology Department, Stanley Medical College. The tuberculin syringe and needle were sterilized by boiling. Non-fertile eggs were discarded by candling and the fertile eggs were wiped off with sterilized saline before commencing the injections. A hole was burred with the help of a fine dental drill No. 6 and No. 5. The embryonic area was avoided by candling and the site of injection was chosen beyond the blastoderm or the embryo proper. Since 6 and 5 units resulted in the lethality of the embryos, 4 units of crystalline insulin B.P. with a concentration of 40 units per millilitre [prepared by Boots Pure Drug Co., India (P.) Ltd., Bombay] were introduced into the yolk throughout the experiments and the hole was sealed with a coverglass and molten wax used to stick the glass edges to the egg shell. Eggs were then returned to the incubator. Similarly the control eggs were also injected with equal volume of physiological saline and sealed in the same manner.

The eggs were examined periodically to confirm their developmental progress. Dead embryos were detected by the appearance of the blood ring during the candling test (Farris, 1957). The chicks which hatched out were subjected to examination after death and observations recorded.

OBSERVATIONS

The macroscopic observations were recorded after which these embryos were fixed, embedded in paraffin wax, sectioned and stained for microscopic examination. Harris's and Ehrlich's haematoxylin were used and the sections were counterstained with eosin.

Abnormalities Presented by Insulin-Treated Chick Embryos

Skeletal deformities: Micromelia accompanied by beak deformity.—This anomaly was observed in 2 chicks in experiment No. 2 when 10 eggs were