

the cotton-seed *proteins* are notably deficient for the purposes of nutrition, we have conducted feeding experiments on rats in which these proteins furnished practically all of the food nitrogen and in which the other essential dietary components were supplied by adding to the products to be tested a suitable mixture of "protein-free milk," butter fat and starch which, with the addition of adequate protein, has been shown in hundreds of experiments to be sufficient for perfect growth. In this way we have found that satisfactory growth can be made by rats when either cotton-seed globulin or the total cotton-seed protein precipitated from alkali extracts of cotton-seed meal is employed without other significant protein sources in the mixture. No toxic symptoms have appeared, even when the supposedly harmful *meal* also was used, during a period in which the animals reached a large size. In experiments in which the inorganic components were furnished by our "artificial protein-free milk" there was no failure of growth when the cotton-seed meal was used, thus suggesting that the latter contains the equivalent of the "determinant," "food accessory," or "vitamin" deemed essential for nutrition and furnished in fat-free milk. These results corroborate the conclusions of Richardson and Green¹ soon to be published.

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The early responses of frog embryos to tactile stimulation.

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In the course of some experiments on the regeneration of the spinal cord of frog embryos, it became necessary to establish certain facts in regard to their early tactile responses, as has been done for *Diemyctylus* and *Amblystoma* by Coghill. The results of this study are briefly summarized here.

The frog embryo exhibits a reaction toward the side stimulated as its first response to tactile stimulation with a fine human hair. This occurs so constantly that it must be regarded as normal for the frog, though only an occasional and aberrant reaction in the

¹ *Loc. cit.*

salamanders. This first response is followed by an avoiding-, a double-coil-, an S-reaction and the swimming movement, in order.

In a number of embryos, the cord was cut at different levels to determine the location in the cord where stimuli are transferred from one side of the body to the other. The results are, briefly, as follows: (1) when the cut passes through the brain, the portion anterior to the cut never responds to stimuli, while that posterior to it exhibits the usual series of reactions; (2) when the cut passes through the medulla, the same results are obtained; (3) when the cut passes through the middle of the body at a point just behind the medulla, both parts usually go through the normal series of reactions; (4) when the cut passes just anterior to the tail or (5) through the tail itself, the part of the body anterior to the cut goes through the normal series of responses, while that posterior to it remains negative. From these results it is evident that in the middle of the embryo there is a region about a millimeter in length which includes the upper part of the spinal cord and the lower part of the medulla, in which the decussations of the primary spinal nerve-paths take place, enabling the transfer of stimuli from one side of the body to the other.

A large series of experiments on this particular region show that the crossing does not take place at any one easily localizable point, but rather throughout the entire region. When the cord has been cut here, the two portions of the body thus isolated from each other go through the normal series of responses to stimuli independently of one another, the part in front of the cut usually being somewhat in advance of that behind it. Further, reversal of this region in no way affects the appearance of the responses, nor is it possible to differentiate between the time of appearance of reactions in the two extremities of the reversed piece.

Coghill suggests that the reaction toward the side stimulated, which appears as an aberrant form of response in *Amblystoma*, may be due to the transmission of the stimuli along the collaterals to the muscles of the same side before the main path to those of the opposite side is fully awakened. That this is actually the case in the frog is apparently demonstrated by the nature of the responses obtained as the embryo enters the second or avoiding-

reaction stage. At this time the embryos when first stimulated almost always give a reaction toward the side stimulated and only exhibit the avoiding reaction after several responses of the more primitive type. This would seem to indicate that connections across the body occur only as a summation of stimuli.

In conclusion, it may be stated that the early tactile responses in the frog embryo are very similar to those of *Amblystoma* except that they are preceded by a constant response toward the side stimulated. The localization of the decussation in the cord seems to cover a wider region than that described by Coghill for the salamander and in this region to appear simultaneously over a length of one half to one millimeter.

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Permeability vs. tolerance of the kidneys for sugar in diabetes mellitus.

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In the study of the relation of hyperglycemia to glycosuria in diabetic and non-diabetic conditions, the following facts have been elicited:

1. In diabetic individuals possessing healthy kidneys the glycosuria bears a definite relationship to the hyperglycemia.¹

2. Cases of diabetes with definite renal disease, frequently show no relationship between the hyperglycemia and the glycosuria.² The hyperglycemia in such individuals is usually greater in proportion to the glycosuria than it is in those with normal kidneys. Means which promote renal secretion, increase the urinary output of sugar, with a consequent reduction of the hyperglycemia.

3. Acute impairment of renal function in clinical and experi-

¹ Epstein, Albert A., "Studies on Hyperglycemia in Relation to Glycosuria," Monograph, 1916, New York. PROC. SOC. EXPER. BIOL. AND MED., Vol. XIII, p. 67, 1916.

² Id.