

### Further Studies upon Development of Somatic Activity in Albino Rat Fetuses.

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As previously reported<sup>1</sup> the early development of response to stimulation in albino rat fetuses passes through 3 stages: myogenic, neuromotor, and sensory motor. Experiments are here reported which were designed to test in a more definite manner the first phase of the development of the response to stimulation, the myogenic stage.

The myogenic response was described<sup>1</sup> as follows: "The movements elicited by strong mechanical stimulation are slow and feeble, but maintained. The responses elicited by light tactile stimulation, reflex activity, are also slow and feeble, but quickly followed by relaxation." One may justly infer that maintenance of contractions is indicative of purely myogenic activity. This is not the case. The above statement is true only in relation to the strength of the stimuli used, not to the stage of development. In further experiments in which 80 fetuses from 12 different litters were studied, the mechanical stimulation was applied to the fetus with different degrees of strength. The result shows that when the stimulus was just strong enough to elicit responses, these responses were not maintained, but instead were quickly followed by relaxation. If the strength of the stimulus was increased, the contractions began to be maintained and the length of maintenance increased with the increased strength of the stimulus. However, a limit was reached beyond which this period of maintenance ceased to increase, even when the stimulus applied was strong enough to seriously damage the tissue.

Since with adequate though light stimuli the contractions were followed by quick relaxation, there seems to be, upon this basis, no marked difference between the nature of myogenic and reflex activity. Thus, at this early stage of response to stimulation the following properties occur: Latent period, summation, and contractions followed by quick relaxation are common to both myogenic as well as reflex activity. One might conclude that the earliest reaction, previously described as myogenic, might be, in fact, reflex. In order to test this the following experiments have been performed with 48 fetuses taken from 9 different litters: The fetuses were tested first

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<sup>1</sup> Angulo y Gonzalez, A. W., *Proc. Soc. Exp. Biol. and Med.*, 1933, **31**, 111.

for reflex activity by stimulating them lightly with a hair upon the snout and other areas. The younger fetuses (360 to 370 hours) did not respond to this type of stimulation. The fetuses of 378 hours to about 380 hours responded to stimulation of the snout only, and some older than 390 hours gave responses to stimulation of the snout and also the fore limb. After the fetuses had been tested for tactile responses and the results recorded, they were lightly stimulated with a porcupine quill about the region of the fore limb. The fetuses of about 360 hours did not respond. However, all the older fetuses responded, and, the responses varied in quality in respect of the strength of the stimulus. They were quick reflex-like movements when the strength of the stimulus was just adequate; and maintained responses when a stimulus somewhat stronger was applied. After these observations had been made and recorded, the fetuses were curarized.

One-tenth cc. of a 1% solution of curare injected intraperitoneally in new born rats was sufficient to produce complete curarization in 10 minutes, as indicated by complete disappearance of reflexes. This procedure was used as a norm for my early experiments. However, in the younger fetuses this dose proved to be too strong, and several of the fetuses died of heart failure, also this quantity of fluid caused great distension. Further tests were made using fetuses 17 days after insemination, to determine a more adequate norm. It was found that 0.05 cc. of a 1% solution was sufficient to cause complete curarization in 3 minutes. This new norm has been consistently used with satisfactory results.

Three minutes after the injection, the fetuses were again tested for reflexes, but the results were negative. They were then lightly tapped with the quill about the region of the fore limb, and responded in a manner identical with that observed before curarization. That is, when lightly tapped, the movements were reflex-like, and the contractions were maintained when the stimulus was stronger.

Since curarization completely destroys the physiological continuity between the central nervous system and muscles, these experiments confirm my earlier conclusion, namely, that the early response to stimulation in the albino rat fetuses induced by direct stimulation of the muscles is purely myogenic in nature.