

TABLE I.
Experiment 16, Series of 1924.

Treatment before fertilization		Stage of larva after 48 hours.						
Eggs	Sperm	1	2	3	4	5	6	Average stage
control	control	—	—	—	—	10.6	89.4	5.89
x-rayed	control	—	—	.3	6.3	64.0	29.4	5.22
control	x-rayed	—	16.0	30.0	48.0	4.0	—	3.38

TABLE II.
Typical experiment selected from the two series of x-ray experiments.
milliamperes $\times$ minutes

$$D = \frac{\text{milliamperes} \times \text{minutes}}{(\text{distance from target})^2}$$

x-ray dose in "D"	Average stage after 48 hours		
	Control	Eggs x-rayed	Sperm x-rayed
2.5	5.43	5.11	5.02
10.	5.36	5.11	4.68
20.	5.24	4.15	3.51
62.	5.86	3.67	2.52
124.	5.99	3.59	2.07

12 (2535)

Conduction in the mammalian auricle as affected by changes in hydrogen ion concentration.

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(Introduced by Edmund P. Carter).

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The writers have performed a series of experiments upon the hearts of dogs perfused with oxygenated Locke's solution by a modified Langendorff method. Observations were made upon the effect of changes in (1) hydrogen ion concentration and (2) oxygen content of the perfusing fluid upon the transmission of the excitatory process in the auricle. Electrical records were obtained by placing paired non-polarizable electrodes upon the auricle in such a way that the conduction interval was recorded over a single stretch of 12-16 mm. or over consecutive portions

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of 6-8 mm each. Each pair of electrodes was connected with a galvanometer string.

The effects of changes in pH of the perfusate upon conduction in the auricle were consistent with those reported by Andrus and Carter¹ on the A-V conduction. An increase in the alkalinity of the perfusing fluid, pH 7.8, was attended by a faster rate of transmission both in the naturally beating and rhythmically driven heart. In the latter the same result was obtained whether the stimulating electrodes were placed upon the base of the auricle or upon the appendix. A pH lower than normal, pH 7.0, caused the excitatory process to be propagated more slowly, and again, this result was obtained in the auricles following the sinus rhythm or rhythmic induction shocks introduced through electrodes placed either upon the base or tip of the auricle. In the naturally beating heart an increase in rate followed change to a higher pH and a fall in rate a lower one. Both the development and propagation of the excitatory process were, then, affected by changes in reaction of the fluid bathing the tissue and in the same direction.

In certain experiments the perfusing solutions were saturated with nitrogen in place of oxygen with striking results. If the auricle was perfused with an oxygen-free solution of pH 7.0 there resulted almost immediately a profound reduction in the transmission rate. Soon there appeared a condition in which the transmission of the excitation became progressively slower the farther the wave traveled from its point of origin, so that records taken with three pairs of electrodes showed a longer transmission interval between the second and third than between the first and second. As this condition progressed the muscle under the distal contacts responded to only every second wave of excitation as recorded at the middle electrodes and finally ceased altogether to become excited. And finally there appeared a condition of 2:1 block between the proximal and middle contacts and of complete block between the middle and distal pairs. With the stimulating electrodes upon the tip of the appendix under similar conditions the same result was obtained, the tissue at the base of the auricle failing to respond while that of the appendix responded to each excitation. These effects disappeared upon return to a normal well oxygenated perfusate. As this progressive slowing of the

¹ Heart. 1924. ii. 97.

transmission rate became more pronounced the electrical complexes appeared more and more degraded.

With conditions of altered hydrogen ion concentration, then, the rate of propagation of the excitatory process in the auricular muscle undergoes definite changes, rising with increasing alkalinity and falling as the hydrogen ion concentration is increased. If, upon a state of increased hydrogen ion concentration there be superimposed one of absence of oxygen there results a condition in which the excitation wave moves slower the farther it travels and the electrical responses become progressively degraded until finally there may appear block within the auricular muscle itself. This condition bears a striking similarity to that found in nerve and described there as "decrement".

In a series of observations soon to be reported Drury has demonstrated progressive slowing of the propagation of the excitatory process beneath a pressure clamp.

13 (2536)

The sympathetic innervation of voluntary muscles.

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The experimental anatomical studies of Boeke (1913),¹ Boeke and Dusser de Barenne (1919),² and Agduhr (1919)³ indicate clearly that, in addition to somatic afferent and efferent components of the cerebrospinal nerves, nerve-fibers of sympathetic origin also terminate on voluntary muscle-fibers. Not a few physiological studies tend to corroborate this anatomical finding, others yield only negative results. Consequently, the sympathetic innervation of voluntary muscles is not yet universally accepted even as an anatomical fact.

The material on which the present study is based was obtained from three dogs in which the somatic nerve-fibers supplying cer-

¹ *Anat. Anz. Bd.*, xliv.

² *Proc. Amsterdam Akad. von Wettenschappen*, xxi, 1227.

³ *Proc. Amsterdam Akad. von Wettenschappen*, xxi, 1231.