



Although our results as indicated in plate B are nearly a duplicate of the results of Heller, our interpretation is quite the opposite of his. He asserts that decapitation decreases skin permeability to water, while our results indicate that decapitation increases skin permeability to water, and that the reason for the decrease in water uptake resulting from pitressin injections after a certain period of time, is that the frogs have already reached a state of edema.

Although these experiments do not offer much information as to the exact function of pitressin in its relation to skin permeability, we feel that the immediate results of decapitation show that the brain may serve as a regulatory mechanism for skin permeability.

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Vagus Stimulation and Rate Changes in the Turtle Heart.

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Observations previously reported¹ showed that stimulation of either vagus nerve of a turtle might be adjusted to produce some slowing of the rate of the sinus beat although only a part, if any, of

¹ Gilson, A. S., and Irvine-Jones, E., *Am. J. Physiol.*, 1929, 90, 361.

the sinus impulses were conducted to the atria and ventricle. Further investigation of vagus stimulation in producing these phenomena are presented here.

In many preparations either the right or left vagus may be stimulated to produce atrial inotropic depression of the atria with no chronotropic effects. Only rarely is it impossible to do this by stimulation of the left vagus. With the right vagus the separation of effects is rarely as pronounced as with the left.

If right vagus stimulation of strength just sufficient to produce definite chronotropic changes be used, continued stimulation usually produces inotropic depression of the sinus and slowing to a rate somewhat more than half the normal rate. Frequently the pacemaker, normally on the right side, then shifts to an abnormal locus, usually to a region in the left side of the sinus symmetrical with the normal pacemaker. This beat may be propagated so that the atria and ventricle respond regularly or with occasional dropped beats. With somewhat stronger stimulation the aberrant pacemaker may continue active but sino-atrial block prevents propagation to the atria and ventricle.

With left vagus stimulation, the interpretation of records because of the aberrant pacemaker is avoided and the chronotropic effect is much reduced. In most preparations, the left vagus contributes but few fibers to the normal pacemaker region. Evidence for this is, for example, the fact that in the majority of preparations, low stimulation rates (ca. 5 per sec.) produce little or no slowing of the heart and no visible inotropic depression of the sinus at any strength of stimulation used. With more rapid stimulation rates there occurs summation of effect and the heart may be slowed and stopped. With properly adjusted strength and rate the heart may be kept for considerable time in a state such that there is a regular sinus beat, somewhat slower than normal and a fractionate response of the atria and ventricle. This fractionation is due to an extremely long sino-atrial conduction time and consequent functional block.

If the heart be divided by a median sagittal cut, the right and left sides will each beat rhythmically, each side being driven by its own pacemaker. All crossed vagus effects are removed. Under these conditions stimulation of either vagus will cause depression of the corresponding side of the heart, the distribution of effects being similar on the two sides. Frequently an atrial inotropic effect may be obtained without change of rate. Sinus inotropic effect and chronotropic effects on either side appear at nearly the same

time though usually there is depression of strength of the sinus contraction before there is measurable slowing of rate.

By one method or another, it is usually possible to produce atrial inotropic effects in the turtle heart without accompanying chronotropic effects. The usual interpretation placed on the Engelmann hypothesis is that the "chronotropic fibers" produce only chronotropic effects, while "inotropic fibers" produce only inotropic effects. Our experiments on the turtle heart do not exclude the possibility that the sinus venosus and the pacemaker within the sinus are innervated by inotropic and chronotropic fibers of different function and differing from each other either by number or by threshold. Using the heart as our only indicator, however, we have not been able to find any consistent method of differentiating fibers causing sinus inotropic effects from fibers causing slowing of the pacemaker.

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Change in Viscosity of Mucin with pH.

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For many years physiologists have known that mucin plays a lubricating, protective, and soothing rôle in gastro-intestinal function. It is synthesized in the mucous cells and is the characteristic constituent of mucus. The slimy, viscid mucus spreads over the surface of the mucosa and facilitates the passage of food particles over the mucosa with minimum of injury.

Fogelson¹ and Atkinson² have shown that when patients with peptic ulcer are given mucin, there is prompt relief of the subjective symptoms without recurrence in most patients for as long as one year.

Since mucin is a physiological secretory product of the gastro-intestinal tract and since mucin administered orally to ulcer patients gives every indication of healing, it suggests that the metabolic difficulty leading to ulcer formation may be a disturbance of mucin metabolism.

¹ Fogelson, S. J., *J. Am. Med. Assn.*, 1931, **96**, 673.

² Atkinson, A. J., *J. Am. Med. Assn.*, 1932, **98**, 1153.