

show a similar stepping up. Adrian,<sup>1</sup> in studying the supernormal recovery curve of the frog ventricle, determined the excitability at various intervals following a single response. There is nothing in his paper to show whether, as seemed highly probable, the excitability would have still further increased had there been 2 or more antecedent responses, *i. e.*, whether a *treppe* of more than 1 step would have appeared.

We placed a freshly excised turtle ventricle in a moist chamber, and recorded the mechanical response while varying the strength of the break induction shock by changing a resistance in the primary. Six turtles were used in these experiments. Using the quiescent ventricle and starting with the least effective stimulus, we found that the effective strength could be progressively diminished when we stimulated repeatedly at intervals varying from 2 to 30 or more seconds. In 1 typical case, when the decrements were small and the interval 2 seconds, the resistance was changed from 25 to 46 ohms before failure of response ensued. On the other hand, with intervals of 30 seconds, the muscle responded only up to 31 ohms. If the decrements were great, *e. g.*, over 0.2 ohm, failure of response appeared sooner because the *treppe* in excitability did not keep pace with the decrement in strength of stimulus. After a 3 minute rest, the least effective stimulus corresponded to 25 ohms. More prolonged rests, up to 15 minutes, did not result in increased excitability. So far as determined, the changes in mechanical response were closely parallel with those in excitability.

Other findings, as well as evidence that sympathetic stimulation did not cause the results, will be given in a later communication.

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#### Treatment of Ileus by Splanchnic Anesthesia. An Experimental Study.

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(Introduced by Henry Laurens.)

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Markowitz and Campbell<sup>1</sup> have shown that spinal anesthesia will relieve paralytic ileus produced in experimental animals. Believing that in these cases inhibitory impulses were transmitted to the in-

<sup>1</sup> Adrian, E. B., *J. Physiol.*, 1920, liv, 1.

<sup>1</sup> Markowitz, J., and Campbell, Walter R., *Am. J. Physiol.*, 1927, lxxxi, 101.

testines by way of the splanchnic and that spinal anesthesia produced a splanchnic block, we decided that spinal anesthesia was dangerous and unnecessary, as the same results could be produced by splanchnic anesthesia by the Kappis technic. Twenty-four dogs were used in this experiment to see if peristalsis could be reestablished in experimentally produced ileus.

Upon opening the abdomen of the dog and exposing the intestine there results a physiological ileus. The number of dogs used in this experiment was 14. This type of ileus was easily overcome by splanchnic block with 1% novocain by the Kappis method, producing active peristalsis in the quiescent intestine. The peristaltic waves, after splanchnic anesthesia, were recorded by kymographic tracings.

The next experiment was the production of a chemical ileus and the reestablishment of peristalsis in this chemically produced ileus. Five dogs were used in this experiment. The ileus was produced by injecting into the abdominal cavity, through the abdominal wall, iodine and potassium iodide solution. Observations were then made fluoroscopically and radiographically by contrast meal introduced into the gastro-intestinal tract. After the development of the ileus, splanchnic anesthesia was produced. Fluoroscopical and radiographical observations demonstrated the return of peristalsis in the ileus, which readily returned to the normal condition, showing that a chemical ileus could easily be overcome and peristalsis reestablished by splanchnic anesthesia.

The next experiment was to produce the mechanical ileus by obstruction of the small bowel and the use of splanchnic anesthesia to overcome this type of ileus. Six dogs were used in this experiment—3 cases of high jejunal obstruction and 3 cases of terminal ileum obstruction. The obstruction was produced under aseptic technic by tying a piece of tape around the bowel until the lumen was obliterated. The high obstruction was allowed to progress for 48 hours. Observations were then made. The terminal ileum obstruction was allowed to progress for 6 days and observations were made. At this period the abdomen was opened and there was found a marked paralytic ileus with distention. As in the physiological ileus, a rubber balloon was introduced into the intestine, in order that peristaltic waves could be obtained by kymographic tracings. In the high and low obstructed cases splanchnic anesthesia was produced and marked peristalsis occurred in both types of obstruction.

Evidence is therefore submitted that physiological, chemical, and mechanical ileus may be satisfactorily treated in experimental animals by blocking the splanchnic nerves with novocain anesthesia according to the Kappis technic.