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Prevention of Peritoneal Adhesions by Use of Vegetable Ferments.*

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Many operative technics and the use of numerous substances have been advocated in order to prevent the re-formation of adhesions in patients. All, however, have given about the same negative results. Kubota, in 1924, working with vegetable ferments of the papain group, found that it was possible to prevent the formation of adhesions by introducing vegetable ferments into the peritoneal cavity. Quite recently Buchbinder, using intraperitoneal glucose, and Johnson, using amniotic fluid, report brilliant results in the prevention of peritoneal adhesions.

In order to test the efficiency of the vegetable digestants, the following experimental work was carried out: a series of 39 rabbits and 16 dogs was used, and an attempt made to determine the effect of vegetable digestants on the formation and re-formation of peritoneal adhesions. A peritonitis was produced at laparotomy by rubbing the peritoneum covering the loop of the small bowel with a piece of dry gauze until bleeding occurred. Following this a 7% solution of tincture of iodine was applied over the denuded surfaces.

Series 1. 39 rabbits. At the original laparotomy, and at the time of the production of the peritonitis, solutions of papain or substances of the papain group were introduced into the peritoneal cavity. Animals, used as controls, which had no vegetable digestants added to the peritoneal cavity, as well as those to which the ferment was added, were killed on the 4th, 7th, 10th, 15th days post-

* The major portion of this work was carried out at the University of Wisconsin.

operatively and also 7 weeks after operation. At autopsy the control animals showed evidence of extensive adhesion formation, whereas those treated with the ferment showed either no evidence of adhesion or the adhesions which were formed were fine and veil-like. Control experiments were also carried out using the ferment alone; varying strengths from 1-1000 to 1-400,000 were used, and in none were there any evidences of irritation when papain solution or any of its associated substances were employed. This was studied both macroscopically and microscopically.

Series 2. 16 dogs. The effect of the vegetable digestion on the re-formation of adhesions. In this series a peritonitis was produced as in series 1. Nothing was added to the peritoneal cavity. The animals were allowed to live. Forty-three days later the animals were re-laparotomized and definite peritoneal adhesions found. These were divided. In half of the animals vegetable digestants were added to the peritoneal cavity. This was used in varying strengths. The other half of the animals were used as controls. The animals were sacrificed on the 4th, 7th, 10th, 13th days and 7 weeks after the second laparotomy. Invariably in control animals evidence of numerous adhesions, matting together the loops of the bowels and also extending between the bowel and the parietal peritoneum was found. One animal died of intestinal obstruction due to adhesions. Those animals treated with vegetable digestants in 3 instances showed very fine adhesions, between the operative wound and several loops of intestine, which could easily be broken with the finger. In the remaining dogs no evidence of adhesions was found.

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The Treppe in Excitability in the Turtle Ventricle.

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In earlier reports, we have demonstrated a treppe in conduction through compressed cardiac muscle, *i. e.*, after a period of quiescence, the conduction times for a series of impulses, more or less rapidly elicited, may show a progressive decrease. In attempting further to elucidate this phenomenon, it became necessary to determine whether, with repeated stimulation, the excitability would