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Varying Hydrogen Ion Concentration upon Rate of Action of Proteolytic Enzymes in Gastric Mucous Membrane.

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All experiments were made on neutral water extracts of fresh hog stomach mucosa, prepared by suspending the finely ground mucosa in about a liter of water, and, allowing it to extract for ten to twelve hours in a cool place. The mixture was then filtered through cheese cloth to remove solid material, and the filtrate diluted with water to such a volume that the weight of mucosa in grams should be 5 per cent of the final volume in ccm. The extract was then acidified by the addition of 5 N HCl to pH 3.50, 3.00, 2.50, 2.00, 1.50, 1.00 and .90. At each of these points a small sample was removed for a control, and, a large sample for the experiments. Each of the large samples was made slightly alkaline for 30 minutes, then acidified, first, to a point near its original acidity, when a sample was removed, and finally, to pH 1.00 (approximately the optimum), when a final sample was taken. Mett's tubes containing coagulated egg white or coagulated blood plasma were placed in each of the samples, and the preparations placed in an incubator at 40° C. to digest for 24 hours. The amount of digestion was determined by measuring the column of protein dissolved.

The control series showed, generally, a very slight activity at pH 3.50, which increased slowly up to pH 2.50 or pH 2.00. Above this acidity the rate of digestion increased rapidly, reaching a maximum near pH 1.00, after which there was a definite decrease. In the series which was made alkaline, then acidified to points near the original acidities, there was shown a very slight activity or none at all. The series in which the acidity was brought to pH 1.00, after having been alkaline, showed a progressive loss in activity, the loss increasing with the increase in degree of original acidity. The loss was practically complete toward the end of this series.

Strongly alkaline solutions were found to have a destructive effect upon the unactivated enzyme in the extracts. A study of the effects of concentration of the alkali and the length of time of exposure of the extracts was made, varying the alkalinity from pH 8.06 to pH 12.73, and varying the time from 5 minutes to 1 hour. In the more weakly alkaline solutions a maximum destruction was effected in 15

minutes with no further change in an hour's exposure. The loss was about 5 per cent. In the more alkaline solutions the destruction was nearly complete (96 per cent) in 5 minutes. Much of the loss was due to NaCl formed in the reaction. In fact, about 75 per cent of the decreased action observed in the more alkaline solutions may be ascribed to the NaCl effect.

SUMMARY.

1. The inactive principles of an extract of gastric mucosa can be activated to various degrees by varying the degree of original activity.

2. The activity developed at a given degree of acidity can be destroyed by 30 minutes' exposure to a weakly alkaline solution and cannot be restored on acidification to a point below or equivalent to the original H-ion concentration.

3. Further activity can be demonstrated by acidifying to higher degrees than the primary acidity.

4. The proportionate loss in digestive power is greater, upon making the solution alkaline, the higher the degree of preliminary acidity.

5. The activity shown by an acidified extract of gastric mucosa is dependent in part upon the actual amount of active enzyme present.

6. The effect of alkalinity upon the unactivated extract is to lower the resultant activity after acidification. The effect increases rapidly with increasing alkalinity, and all digestive action may be lost around pH 12 to pH 13.

7. Except for the very slight alkalinity of pH 8.00, this destruction by alkali is rapid, reaching its maximum in a few minutes.

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Behavior of Human Gall-Bladder During Fasting and in Response to Food.

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In a recent paper by the author,[1] roentgenological evidence from patients and experimental animals was presented in support of the following conclusions: (1) the mammalian gall bladder, at least in