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Influence of certain electrolytes upon the course of the hydrolysis of soluble starch by malt amylase.

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The rate of formation of reducing sugar (maltose) from soluble starch by purified malt amylase of diastatic power equivalent to about 1,600 on Lintner's scale, both in neutral solution containing no added electrolyte and with the addition of regulated amounts of hydrochloric or phosphoric acid or of primary potassium phosphate, was investigated from the beginning of the reaction to completion or until the hydrolysis is no longer measurable.

When the activating electrolyte was added in such amount as to give optimum or nearly optimum concentration of hydrogen ion, the action of the enzyme was increased not only in the earlier stages but throughout the entire range investigated. The greater the concentration of enzyme the less the apparent favorable effect of the added electrolyte.

The same optimum hydrogen ion concentration, $C_H 10^{-4.4}$ (P_H+4.4), was found to hold for each of the acid electrolytes tested and appears to hold throughout the course of the hydrolysis. (With neutralized starch substrate used in this laboratory the amount of acid or acid phosphate required for optimum activation is about half as much for one per cent. as for two per cent. starch.)

When more than the optimum amount of acid was added the hydrolysis proceeded at less than the optimum rate throughout; when less, the initial rate was better sustained. This difference was most pronounced in the case of hydrochloric acid; less with phosphoric acid; least in the case of acid phosphate ("buffer effect").

With initial concentrations of 1 per cent. soluble starch it was found that, throughout the first half of the hydrolysis, or up to a yield of half the theoretical amount of maltose, the rate of maltose formation from soluble starch was found to be proportional to the concentration of substrate (in the form of starch and dextrin) still remaining at any given time, at least in solutions containing avorable amounts of acid or acid phosphate.

When, in similar experiments, enzyme concentration is varied within limits suitable for such quantitative study, the rate of maltose formation is found to be directly proportional to the enzyme concentration, provided comparison is made at a point not beyond that corresponding to a yield of about half the theoretical amount of maltose. This indicates the range within which diastatic activities may be compared quantitatively.

In the action of malt amylase upon soluble starch, we find no distinct "region of linear relationship" in which the yield of reducing sugar is directly proportional to time.

Experiments with widely varied enzyme concentration show that there is no cessation of hydrolysis nor true equilibrium at a point corresponding to 80 per cent. of the theoretical yield of maltose as claimed by some previous investigators.

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The effect of coagulation of the pancreas in situ.

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By injecting 10–15 c.c. of 85–95 per cent. alcohol, usually with 0.7 per cent. glacial acetic acid, into the main pancreatic duct of dogs, we coagulated at least 95 per cent. of this organ in successful experiments. The extent of this coagulation was determined by a careful inspection at the time of injection, by reoperation after a number of weeks, and by autopsy and microscopical examination. The external secretion of the gland was abolished in all experiments.

Our material is formed by 19 dogs, of which six lived four weeks and longer; one of the four dogs still living is in excellent condition 104 days after the operation. The blood and urine were examined at frequent intervals, daily when necessary. The dogs were fed a regular mixed diet composed of about 100 grams of cooked meat scraps, 4–500 grams of bread-meat broth mush, 50 grams ground bone and occasionally 10–60 grams of lard. Water was given freely.