The alterations in dimensional relations resultant from age, from the incorporation of salts in concentrations within the range of occurrence in the cell, and from hydration in various solutions are to be included in the possibilities of conditions affecting growth and cytological procedure.

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## Is glycogen the source of acids developed in autolysis?

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In the following communication, an attempt is made to answer the question whether glycogen contributes to the rise in acidity in an autolyzing digest.

*Method.*—Beef liver from the butcher was ground in sand, diluted with Ringer's Solution to make a 20 per cent. digest by weight and divided into two portions, I (control) and II, to which one gram of glycogen obtained from liver was added for every 250 c.c. digest. In order to follow the rate and extent of digestion, the following procedure was used: Fifty c.c. of the well-mixed digest were transferred to a 100 c.c. volumetric flask and made up to the mark with 5 per cent. trichloracetic acid. The mixture was left until precipitation was completed (4 to 12 hrs.) and then filtered. The nitrogen in 20 c.c. of the filtrate was then determined by Sorensen formol-titration. The reaction of medium was studied by the following method: Fifty c.c. of the digest were placed in fish-bladder dialyzing sacs and dialysis was made against Ringer's Solution for 10 hrs. Hydrogen ion concentration was then determined by the gas chain method, a Leeds and Northrup Type "K" potentiometer, Weston standard cell and platinum needle contact electrode being used. For the privilege of using the Government apparatus in the West Virginia Experiment Station, the writer thanks Professors McIlvane and Morgan.

In the following protocol, the averages of triplicate experiments are given. The rate is given in cubic centimeters of decinormal nitrogen, the hydrogen ion concentration in the Sorensen nomenclature ($P_H$):

| | Initial. | 24 Hours. | Eleven Days. |
|---|---|---|---|
| I..... | 3.8 c.c. | 5.25 c.c. | 9.00 c.c. |
| $P_H$ =..... | 6.42 | 7.00 | 6.04 |
| II..... | 3.60 c.c. | 6.50 c.c. | 10.60 c.c. |
| $P_H$ =..... | 6.60 | 6.77 | 5.79 |

At the end of the period (eleven days), the remaining glycogen, if any, was sought and it was found that 13 milligrams computed as glucose from Benedict determinations on the hydrolyzed (acid) filtrates, remained of the gram introduced, at the beginning.

*Discussion.*—It is evident from the results of the experiment that we may look to glycogen as one of the precursors of substances concerned with the development of acidity in autolyzing tissues. These substances are probably hydroxy acids, such as lactic and keto-acids, such as pyruvic. Obviously, it is possible for such acids to form from other sources, as for instance, from the carbohydrate moiety of nucleosides, from the deaminized residue of amino-acids and doubtless neutral fats and phospholipines likewise may contribute. The interest in glycogen for the writer centers about the increased metabolism at the inception of starvation. A well-fed guinea pig will exhibit a sudden increase in amino-nitrogen when its carbohydrate food is limited or replaced by nitrogenous diet. The disappearance of glycogen from the liver is remarkably fast. Thus a guinea pig whose diet had been controlled from February 16 to February 23, having been given a full carbohydrate diet during this period was permitted to starve three days and an examination of the liver showed the complete absence of glycogen. The fat of the pig does not seem to change correspondingly with the change in diet and the suggestion is made that the rapid rise in nitrogenous excretion, expecially of amino-nitrogen may be due to the contribution of glycogen to the increase in hydrogen ion concentration with the concomitant appearance of the optimum reaction for tissue enzyme action which Dernby has shown to occur. Intra vitam autolysis then proceeds.

Aside from the reports of Bradley, Dernby and of the present writer, this phase of the dynamics of tissue enzyme action does not seem to have been examined.

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