

Our results demonstrate that the blood sugar is maintained at a normal level in cats following decerebration and that this level is not affected by removal or damage to the pituitary and that such animals are still able to raise their blood sugar when the circulation is failing just before death.

The degree and duration of the hyperglycemia appeared to be more correlated with the amount of blood clot found at autopsy below the tentorium than with any other factor. Blood sugar estimations were made also following decerebration in two animals with sodium veronal anesthesia (0.46 gm. per kilo) by stomach tube with similar results. A chart is given showing the blood sugar level in several animals following decerebration to demonstrate the stability of the blood sugar level. Experiments by one of us (W. Z. T.), included in another paper, demonstrate that the blood sugar level in normal cats is similar to that found in these decerebrate preparations and it is not normally as high as 0.2 per cent as Mellanby stated.

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#### **Food accessory substances in bacterial growth. II. The variations of hydrogen ion concentration occurring in bacterial cultures containing tomato extract.**

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The previous observations, 5 (2528), have demonstrated that the tomato extract is not able to promote the growth of *B. Shiga* in broth of initial pH 5.2-6.2, that it has a moderate growth accelerating effect on this microorganism at initial pH 6.6-7.8 and that it has the best effect when added to broth having a pH 8.2-8.6. However, upon studying the end reaction of cultures containing tomato extract, it was observed that the final pH of these cultures, while always markedly acid, showed considerable difference, this difference depending upon the initial pH of the medium. Thus, for example, initial pH 8.2 of the tomato extract broth gives a final reading of 5.8, whereas initial pH 7.0 gives a reading of 5.2.

In this connection the work of Cohen and Clark<sup>1</sup> was of considerable interest. These authors found that on the acid borders of optimum zones of pH, slight change in pH produces a marked inhibitory effect upon the growth of bacteria (4.7 for *B. Shiga*), but the acid border shifts with the nature of the acid and a distinct difference between the effect of HCl and that of acetic acid was noticed. When adjustments were made with acetic acid, the narrow pH zone 5.5-5.7 may be considered *critical*, while when HCl was used, this point was 4.8-5.0.

In the author's experiments, the question, therefore, arose as to whether the organic acids contained in tomato extract shift the critical point of *B. Shiga* from 4.7 to some point quickly reached by a tomato extract culture of initial pH 6.6-7.8, but much slower, or perhaps never at all reached by a culture containing tomato extract of initial pH 8.2-8.6.

Investigation of this point demonstrated in fact that the tomato extract broth, from which the growth promoting factor has been removed by process described elsewhere,<sup>2</sup> is able to inhibit completely the growth of *B. Shiga* at pH 5.4-5.6 whereas plain broth becomes inhibitory only at pH 4.8.

As cultures containing tomato extract constantly increase their hydrogen-ion concentration, systematic study of variations occurring every hour for a period of 24 hours in these cultures, having various *initial hydrogen ion concentrations*, was necessary in order to determine the curve of pH.

Such observations showed that tomato extract cultures of initial pH 5.8 reach the critical pH 5.4 very quickly and maintain a pH level 5.4-4.8 for a period of 3 to 24 hours. Tomato extract broth cultures of initial pH 7.0 reach pH 5.4 only after 10 hours. During this period of time the pH of the culture is relatively far from the critical point. Cultures containing tomato extract of initial pH 8.2 do not reach their critical pH in the period of 20 to 24 hours.

Observations, too, on the *rate of growth* of *B. Shiga* in cultures containing tomato extract of various initial hydrogen ion concentrations showed that the decline in growth is coincident with the passing of culture beyond the critical point of pH.

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<sup>1</sup> Barnett Cohen and William Mansfield Clark, *J. Bacteriology*, 4, 1919, p. 412.

<sup>2</sup> 19 (2542).

It is evident from the above mentioned observation that the logarithmic phase of growth of culture inoculated at initial pH 7.0 is shorter than that of initial pH 8.2. The logarithmic phase of cultures of initial pH 5.8 is again much shorter than that of initial pH 7.0, whereas it is completely abolished in cultures of initial pH 5.4. Hence the lower the initial pH, the greater the period during which the growth promoting properties of the tomato extract medium exert their influence.

To find more experimental proof for the above mentioned explanation of the influence of initial hydrogen ion concentration of media on growth promoting effect of tomato extract, a micro-organism with a narrower zone of optimum pH range than that of *B. Shiga*, such as Cholera V, was chosen.

The critical point for this organism in tomato extract medium was found to be pH 6.6-7.0. The critical point is higher than that of *B. Shiga*, hence the initial pH for the growth promoting effect of the tomato extract should be higher than that of *B. Shiga*, if the explanation given is correct. This in fact was found to be the case. It was observed that the rate of growth in tomato extract cultures of initial pH 8.2-9.0 showed considerable growth promotion, while these of initial pH 6.6-7.8 actually produced inhibition because as is seen, the cultures are in a pH where the constant increase in hydrogen ion concentration very quickly brings it to the unfavorable critical point.

### 19 (2542)

#### Food accessory substances in bacterial growth. III. Their fate in bacterial cultures.

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Since the previous observations have shown that bacterial cultures containing tomato extract undergo a rapid change in hydrogen ion concentration leading to a considerable increase in pH, it was decided to determine whether the pH of surrounding fluid