CLXVIII. DILATOMETRIC STUDIES IN THE PROTEOCLASTIC DEGRADATION OF PROTEINS.

II. PEPTIC HYDROLYSIS.

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THE present communication relates to a dilatometric study of the peptic digestion of caseinogen and gelatin, the experimental technique employed being similar to that described in one of our earlier contributions [1932]. Hammersten's "casein," Gold Label gelatin, and Pfanstiel's pepsin (1:10,000) were the materials employed in the investigation. The reactions were conducted at p_H 2.2, employing McIlvain's citrate buffer, and at a temperature of 30°. In each case two different concentrations of the protein have been employed.

RESULTS.

Figs. 1 and 2 represent graphically the course of peptic hydrolysis of caseinogen and gelatin, as followed by the dilatometer (Fig. 1) and the determination of amino-nitrogen (Fig. 2) by Van Slyke's method. It is clear from the graphs that the kinetics of peptic digestion can be followed in the dilatometer not only with greater ease and elegance but also with greater accuracy, since the fall in volume per millimol release of amino-nitrogen is very much greater than the corresponding value obtained in the case of tryptic hydrolysis.

The relation between the dilatometric depression and the corresponding increase in amino-nitrogen at different stages of the reaction, is represented in Fig. 3 and the dilatometric fall in ml. per millimol release of amino-nitrogen at different time intervals is given in Table I.

Table I. *Dilatometric depression (μ l.) per millimol amino-nitrogen.*

Time in mins.	10	20	30	40	60	90	120	150	180
Gelatin, 3.0 %	12.9	12.5	12.0	11.6	12.9	12.6	12.8	13.4	12.9
Gelatin, 6.0 %	13.7	12.0	11.9	11.4	11.2	10.0	10.4	10.7	12.9
Caseinogen, 1.46 %	34.6	26.4	23.7	21.7	19.8	18.2	17.5	17.0	16.9
Caseinogen, 2.84 %	29.0	26.8	24.8	23.7	22.2	21.4	21.1	21.3	21.4

It will be seen from the table and the graph (Fig. 3) that in the case of caseinogen, there is no apparent proportionality between the depression and the release of amino-nitrogen, even if the abnormal changes characterising the initial stages of the reaction are not taken into account, thus confirming the observations of Rona and Fischgold [1933]. In the case of gelatin, however, a rough

proportionality between depression and amino-nitrogen can be perceived to exist. The anomalous behaviour of caseinogen is easily explained by the fact

Fig. 1. *A* 2.8 % caseinogen; *B* 1.46 % caseinogen; *C* 6 % gelatin; *D* 3 % gelatin.

Fig. 2. *A* 2.8 % caseinogen; *B* 1.46 % caseinogen; *C* 6 % gelatin; *D* 3 % gelatin.

Fig. 3. *A* 2.84 % caseinogen; *B* 1.46 % caseinogen; *C* 3 % gelatin; *D* 6 % gelatin.

that during peptic digestion a precipitate of phosphopeptone appears and thus disturbs the homogeneity of the reaction mixture.

The average depression per millimol of amino-nitrogen (14 mg.) in the case of caseinogen is 22.9 and 12.0 for gelatin. Both these values are far higher than the

corresponding figures 10·8 and 8·7 respectively obtained during tryptic digestion [1934], thus pointing to an entirely different mode of attack of these proteins by pepsin. With a view to unravelling this mechanism of attack, a dilatometric study of the subsequent hydrolysis of the peptic hydrolysate by trypsin is being made.

SUMMARY.

1. The peptic degradation of caseinogen and gelatin has been followed in the dilatometer and also independently by a determination of the amino-nitrogen by Van Slyke's method.

2. In the case of caseinogen there is no linear relationship between the dilatometric depression and the corresponding amino-nitrogen released during the hydrolysis; in the case of gelatin, however, a rough proportionality exists as can be observed from Fig. 3 and Table I.

3. The average depression per millimol release of amino-nitrogen (14 mg.) in the case of caseinogen amounts to 22·9 while the value for gelatin is 12·0. These values, which are much higher than the corresponding values for tryptic hydrolysis, point to an entirely different mode of attack of these proteins in the case of pepsin.

REFERENCES.

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