determinable by search coil methods which do not involve magnetic measurements. It must be borne in mind, however, that all material media are aggregations of ions, each of which exercises its individual influence, so that this latter formula is only a convenient one for practical applications.

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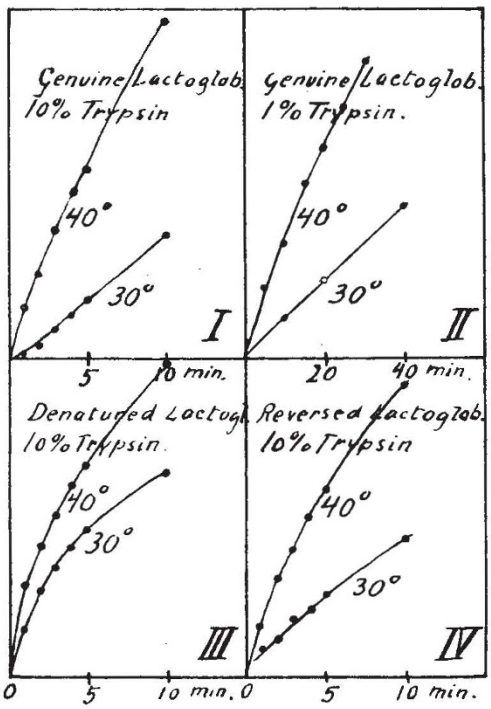
## Peptide Bonds in Globular Proteins

IT is well known that genuine proteins (at *p*H 7) are attacked by crystalline trypsin which, on the other hand, is able to split synthetic peptides. This has been taken as support for the view that these proteins contain peptide bonds in their molecules[1].




We wish, however, to point out that in the light of the following consideration, this support loses a great deal, if not all, its importance. If, according to Anson and Mirsky, denaturation is reversible, then in a solution of a given globular protein there is an equilibrium between genuine and denatured protein,

$$G \rightleftharpoons D.$$

Hence it is sufficient that $D$ and only $D$ should contain peptide bonds open to fission by trypsin, because by removal of $D$ by hydrolysis this process is forced in the direction from left to right and $G$ will gradually disappear as well. The problem is open to experimental test in two different ways.

(1) When the protein is hydrolysed with so much trypsin that the rate of the above process becomes the limiting factor in the total reaction, then we must expect the temperature coefficient for the hydrolysis to approach that of the reversible denaturation, which is presumably very high.

(2) If a protein solution is heated for a short time to a temperature at which the process is proceeding rapidly and completely from left to right and then quickly cooled down to a temperature where it is a slow process, a protein solution is obtained which contains initially more $D$ than corresponds to the equilibrium at that (low) temperature. Hence we may expect to find a more normal (that is, a lower) temperature coefficient for the hydrolysis of the protein in this solution. Upon standing, the equilibrium will slowly be reached and the temperature coefficient of the hydrolysis by much trypsin will tend to rise correspondingly.

Some preliminary results are shown in the accompanying figure.

(1) Equal volumes of 2 per cent lactoglobulin and 10 per cent trypsin (Merck) were mixed. The reaction was followed by precipitation with trichloroacetic acid and the ordinates are the values for the nitrogen soluble in this acid. The reaction temperatures chosen were 30° and 40°; *p*H was 7.

(2) As (1), but with 1 per cent trypsin.

(3) As (1), but the lactoglobulin solution was heated for 1 minute to 100° and rapidly cooled down again. Trypsin was added immediately.

(4) As (3), but the trypsin was added 20 hours later.

(Commercial trypsin was used because it contained very little substance precipitable by trichloroacetic acid under the conditions applied. In addition, it contained large quantities of enzymes which break down further the split products from the trypsin hydrolysis. This is rather an advantage, since it is possible that these split products give precipitates with trichloroacetic acid.)

(1) and (2) show that there is a small but distinct rise in the temperature coefficient of the initial hydrolysis rate, $K$, with increasing trypsin concentration (1 per cent trypsin $K_{40}/K_{30} = 3{\cdot}3$, 10 per cent trypsin $K_{40}/K_{30} = 4{\cdot}3$).

(1) and (3) show a pronounced fall in the temperature coefficient after the protein solution has been heated ($K_{40}/K_{30} = 1{\cdot}9$) and cooled again.

(3) and (4) show that this effect is partly reversible.

These experiments provide sufficient basis for giving a warning against the conclusion that genuine proteins contain peptide bonds because they are split by proteinases like trypsin. They give a certain indication that peptide bonds are formed or 'appear' (like SH-groups) upon denaturation, but they are not conclusive enough to decide whether or not some hydrolysable peptide bonds are pre-formed in the molecules of the genuine globular proteins.

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[1] Linderstrøm-Lang, K., *Collegium*, **10**, 561 (1937).

## New Derivatives of the Silyl Radical

THE compound monochlorosilane, $SiH_3Cl$, prepared in 1919 by Stock, was shown by him to yield volatile monomeric derivatives in its reactions with water and ammonia. With water it forms the compound $(SiH_3)_2O$, which is a gas, b.p. $-15{\cdot}2°$; and with ammonia the product is an amine-like body of the formula $N(SiH_3)_3$, b.p. $+52°$. This field appeared to us to be one which was capable of great extension, and we have already made a number of interesting