ON SULPHUR CONTAINING AMINO-ACIDS. VI.
ON THE PRESENCE OF CYSTEINE GROUP
IN PROTEIN MOLECULES.

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The purpose of this investigation was to make some quantitative studies concerning the presence of cysteine group in the protein molecule, a subject on which, as far as we know, no work has hitherto been done.

The summary and conclusion of the investigation were as follows:

(1). The authors have failed to confirm the findings of Mörner that *cysteine is produced* secondarily from cystine during prolonged hydrolysis of proteins with hydrochloric acid.

(2). The authors have demonstrated that the procedure of Mörner for the identification of cysteine in a protein-hydrolysate is erroneous, and have verified the fact that cysteine is not produced from cystine, but that on the contrary cysteine, in the course of hydrolysis, gives rise to cystine, and that both cysteine and cystine are the primary products of the complete hydrolysis.

(3). In accordance with the results of investigation of Heffter and Arnold, the authors have found that some proteins give the nitroprusside reaction while others do not, and came to the conclusion that there are sulphur-linkages, such as R-SH, R-S-R and R-S-S-R, in protein molecules. The protein containing R-SH group gives the reaction directly, the one containing R-S-R group indirectly or after a certain degree of hydrolysis, and the other containing R-S-S-R alone does not.

(4). Cysteine and cystine were determined, by means of the iodine-method, in the several stages of hydrolysis of proteins. Egg albumine and wool gave only a minute quantity of cysteine in comparison with that of cystine but muscle-proteins freshly prepared gave much cysteine, for instance, the muscle protein of Pagrus, when hydrolysed with hydrochloric acid in the current of carbon dioxide gas, gave nearly an equal amount of cysteine and cystine. When it is borne in mind that cysteine is easily oxidizable to cystine, during the preparation of proteins, and especially in the instant of the cleavage of proteins, the cysteine content of living muscle proteins should be predominate to their cystine content.

(5). The effect of acid hydrolysis upon cysteine was studied with pure cysteine and with a mixture of cysteine and gelatine which contained no

cysteine. The hydrolysis was performed in the usual way or in the air. The quantity of preformed cysteine and cystine produced were determined quantitatively. The oxidation was slow and the cysteine reaction disappeared after about 100 hours of hydrolysis but when muscle proteins containing the cysteine group was treated in the same way the oxidation was more rapid, and after 20 hours the cysteine reaction was negative. From this experimental result we see that isolated cysteine is more stable than cysteine in the nascent state, which is reactive and autoxidizable.

(6). When cysteine was boiled with hydrochloric acid as mentioned above it became cystine quantitatively.

ON THE HORDEIN OF THE NAKED BARLEY.

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Three Kinds of Alcohol soluble proteins were separated by the authors from new and old naked barley (*Hordeum Coeleste* L.) according to Osborne's method.

(1) The old barley flour was extracted with 70% cold alcohol. The resulted solution was condensed to a small volume and cooled, when a jelly like substance was deposited.

Dissolving it in a little quantity of dilute alcohol, pouring into the cold water (0—5°), the protein was again deposited.

After this treatment was repeated three times it was redissolved in a small quantity of dilute alcohol when this solution was the absolute alcohol, a firm coagulum (A) was formed in the milky solution. By condensing the mother solution separated from (A) to a small volume and pouring into the cold water, it produced the second yield (B).

(2) From the new barley flour we obtained by the same method also two proteins (C) and (D).

But (B) and (D) were proved afterwards to be identical.

We studied these three proteins on their physicochemical and chemical properties and found the marked differences among them in the following points.

(1) The color reaction.