

This condition can be partially prevented by (1) adjusting the calcium-phosphorus ratio of the diet to a more suitable value, and (2) by adding from 6 to 10 per cent. of rice bran to the diet. When both of these changes are made simultaneously, it is possible to prevent the condition entirely. In the presence of 6 to 10 per cent. of rice bran, a dietary calcium-phosphorus ratio of 2.5:1 was found to be effective in preventing perosis.

It seems probable that in the past this condition has often been confused with rickets. That the condition is not a truly rachitic one is indicated by the following observations: (1) The ash content of the leg bones may be, and nearly always is, normal, and (2) the calcium and inorganic phosphorus content of the blood serum falls within the normal range.

In view of the experimental findings it seems necessary to postulate that, in addition to vitamin D, another accessory food factor, or vitamin, is necessary for the proper development of the leg bones (and possibly of the other bones) of the growing chicken. It is suggested that water-alcohol extracts of rice bran may be of value in treating refractory cases of rickets in human babies, when there is little or no response to treatment with viosterol, or cod-liver oil, alone.

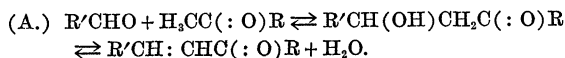
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THE FORMATION OF GLYCINE FROM SERINE¹

In a recent paper, Daft and Coghill² have recorded the isolation of glycine in 28 per cent. yield from the vigorous alkaline hydrolysis of another naturally occurring amino acid, serine. While the reaction may appear anomalous, it is readily explained on the basis of a theory which the writer is finding useful for the explanation of the sensitivity toward alkalies of cysteine and its derivatives.

The reaction:

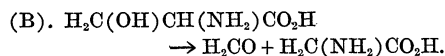


is very well known, as is the fact that all its stages are reversible, the various changes being powerfully catalysed by alkalies.

Glycine, $H_2NCH_2C(:O)OH$, is a substance which contains, at least formally, the same groups as the methyl ketone of equation A. It is generally recog-

nized that the carboxyl group is much less, though not indefinitely less, active in the respects here discussed, than the keto group. Nevertheless, reactions analogous to those indicated in equation A take place with glycine when it is substituted for the ketone represented in that equation. As a good example, the customary synthesis of β -phenyl serine³ from benzaldehyde and glycine may be mentioned.

In the writer's opinion, the formation of glycine from serine as described by Daft and Coghill is only a reversal of this reaction:



It is perhaps worth while, in this connection, to call attention to the fact that methylenemalononic ester, $H_2C:C(CO_2C_2H_5)_2$, needs no stronger alkali than ammonia to give⁴ a formaldehyde derivative (hexamethylenetetramine) and malonamide. This reaction, in which hydroxymethylmalonic ester is undoubtedly an intermediate, is quite analogous to that described for serine, but occurs under much gentler conditions, due presumably to the greater activating effect of two carboxyl groups, and to the fact that the latter are in this case esterified.

It may be added that when cysteine is hydrolyzed with alkali, no formation of glycine has as yet been observed. The reaction takes instead the other course suggested by equation A, and hydrogen sulfide is split out⁵ in the first of a series of reactions. A strictly analogous reaction, with loss of water, apparently accounts for the major portion of serine when the latter is similarly treated.

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³ E. Erlenmeyer, Jr., *Ann. Chem.*, 337: 245, 1904.

⁴ A. Kötz, *J. prakt. Chem.*, (2) 75: 506, 1907.

⁵ H. T. Clarke and J. M. Inouye, *Jour. Biol. Chem.*, 89: 399, 1930.

¹ From the Bureau of Dairy Industry, United States Department of Agriculture.

² *Jour. Biol. Chem.*, 90: 341, 1931.