LYSINOALANINE FORMATION IN WOOL AFTER TREATMENTS WITH SOME PHOSPHATE SALTS

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I. ABSTRACT

Treatment of wool with solutions of sodium tripolyphosphate, potassium tetrapropyrophosphate, and sodium phosphate results in the formation of lysinoalanine, the amount of which increases from the first to the last reagent. As this may be due to the different pH, solutions of the three salts of the same pH were also tried. This series of experiments suggests that although the hydroxyl ions contribute to the formation of lysinoalanine, the governing factor is the kind of the anions concerned, as the sodium phosphate acts in a more rigorous way than the two other salts, in spite of the smaller concentration and the faster reduction of the pH of the solution during treatment.

II. INTRODUCTION

Lysinoalanine $\epsilon$-(DL-2-amino-2-carboxyethyl)-L-lysine, abbreviated in the following as LAL, has been isolated for the first time in 1964 after alkaline treatment of S-dinitrophenyl-ribonuclease by Patchornic and Sokolovsky (1964), who suggested that its formation was due to the reaction of the $\epsilon$-aminogroup of lysine with dehydroalanine.

At the same time it was found (Bohak, 1964) that LAL was formed from other proteins, also after alkaline treatments, and its structure was established by independent synthesis from $\alpha$-carbobenzyloxy-L-lysine and N-phenylacetyldehydroalanine.

In the same year Ziegler (1964,1965) reported the formation
of LAL in wool after treatments with a number of alkaline reagents and suggested that dehydroalanine is formed from either cystine or serine.

The possibility of dehydroalanine formation from cystine and serine has been investigated by several workers (Mellet and Swanpoel, 1965; Sotiriou-Provata and Vassiliadis, 1966; Robson and Zaidi, 1967; Mellet, 1968; Williams and Mellet, 1969; Ebert, 1974) and it seems that both hypotheses are probable, because dehydroalanine can be formed from both aminoacids by a β-elimination reaction.

In the present work the formation of LAL in wool is studied after treatments with sodium tripolyphosphate, potassium tetrapyrophosphate or sodium phosphate, as well as with sodium carbonate, which has been studied extensively, for comparison reasons.

III. EXPERIMENTAL

Wool. Australian merino 64's has been used throughout this work.

Reagents. All reagents used were of analytical grade.

Determination of LAL. Miro and Garcia-Dominguez's (1967) method was used, but LAL was estimated directly on the strips by scanning at 520nm with a Densicord-Photovolt Model 542 scanner.

IV. RESULTS AND DISCUSSION

A. Sodium carbonate. This reagent, which has been studied extensively in the past, was included in our experiments as a basis of comparison with the other reagents. From the results of this series, shown in Tables I and 2, it is clear that the amount of LAL formed increases with temperature and concentration of the solution. The latter may indicate that the reaction is pH dependent, as the pH of the solution increases with the concentration.

It is also evident that the LAL formed represents the maximum that could be expected, as calculated from the lysine content of wool given in the literature.

Reduction of the concentration of the solution, in order to achieve a pH of 9.4, reduces the amount of LAL formed to a considerable extent. And although this may be due to the lower pH, it seems more probable, when the next series of experiments is also taken into account, that this is the result of the absorption of carbonates by wool, which reduces the already low concentration of the reagent.

B. Phosphate salts. In this series of experiments wool was treated