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# RELATIONS BETWEEN STRUCTURE AND NUTRITIONAL VALUE OF SOME MEAT PROTEINS: VARIATION IN THE MOLECULAR SIZE DISTRIBUTION OF WATER SOLUBLE MATERIAL UPON STORAGE .

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The chemical and physico-chemical changes occurring in meat proteins during storage are obviously of great interest and are being studied by various approaches, of which fractionation patterns on ion exchangers and electrophoresis represent notable instances. Both methods fractionate proteins essentially on the basis of electric charge. Autolytic processes catalyzed by cellular endopeptidases presumably play an important part in the modification of the protein material of meat stored under sterile conditions. It can be expected that such processes may lead to the formation of partial break-down products of molecolar weight lower than that of the native protein, yet large enough to be precipitated by reagents currently used to distinguish between protein and non-protein nitrogen. The latter type of determination has been extensively used to follow proteolysis in meat. The molecular size of partially hydrolyzed protein material can be important in determining water and salt retention in raw meat as well as the digestibility and taste of cooked meat, we thought it interesting to investigate the changes in molecular size of meat proteins as a function of storage. The molecular sieves now available make such studies particularly tempting since they provide the means for a relatively simple and cheap analysis of a large number of samples and

can be applied also to the group of meat proteins which, being soluble only in concentrated salt solutions, are not always suitable for ion exchange chromatography and electrophoresis.

In the present paper a preliminary report is made of a study of the distribution according to molecular size of soluble material from the psoas major muscle of beef examined immediately after death and after 7, 14, 21 and 28 days of storage at +2°C (after slow freezing) and at +2° C after slow freezing and thawing. The water soluble material obtained from the muscles by bland homogenization was fractionated on columns (2 x 40 cm) of Bio-gel P-2 (operating range 200 - 2,600 m.w.), P-6 (operating range 1,000 - 5,000 m.w.), P-10 (operating range 5,000 - 17,000 m.w.), P-30 (operating range 20,000 - 50,000 m.w.) and P-60 (operating range 30,000 - 70,000 m.w.). The absorbancy of the effluent was measured at 260 and 280 mμ and the concentration of peptide bonds in the effluent was assayed by the biuret method.

Reproducibility is excellent in repeated analysis of the same sample, while some scattering of results is observed in different samples.

Upon storage there is a general trend towards an increase of the relative amount of material present in the fractions containing compounds of lower molecular weight. The trend is less marked in the meat stored at - 20°C. The most evident storage-dependent changes in the elution pattern are observed with columns of Bio-gel P-6. With this molecular sieve three distinct families of fractions are obtained, one corresponding to the exclusion volume (molecular weight = 5,000) one in the center of operating range and one emerging with the fully retarded volume (molecular weigh of 1,000 or less).

While patterns obtained with Bio-gel P-10, P-30 and P-60 do not present large variations after storage.

On the whole the results seem to indicate that during storage material of 2,500 and 1,000 mol. weight is formed, probably as a result of partial hydrolytic processes. The exact nature of this material, the possible involvement of lysosomal peptidases in their production and the relation existing between the formation of these peptides and some macroscopic properties of meat are under study.

TABLE 1

FRACTIONATION OF WATER SOLUBLE MATERIAL ON Bio-Gel P-6

OPERATING RANGE = 1,000 - 5,000 m.w.

(effluent analyzed at 280 mμ)