

The Influence of Storage Time of the Frozen Duck Meat on its Biological Value

PANOV V.P.

Voronezh Technological Institute, Voronezh, USSR

The biological protein value of food products is determined both by the amino acid balance and by the protein digestibility by proteinases of gastrointestinal tract. As a rule during cold storage (depending on storage conditions and time) protein content is decreased and food value of meat is changed as a result of biochemical changes due to the fermentative processes which have not sufficiently been studied yet (1,2,4). In this connection the attacking of meat proteins by proteolytic enzymes should be expected to change during cold storage. The purpose of our work was to determine storage life of frozen duck meat of various fatness according to the protein attacking degree in vitro. Frozen duck carcasses of the first and second fatness categories packed in Saran film under vacuum and stored for 12 months at 255°K have been studied. Meat protein attacking by proteolytic enzymes of the pepsin-trypsin-chymotrypsin system in vitro was determined by the method (3). The attacking degree and rate of meat proteins were evaluated by the amount of hydrolysis products obtained as a result of fermentative digestibility. They were expressed in mkg of tyrosine.

Fig. 1 gives the experimental results of digestibility rate of duck meat proteins (category 1) during storage. According to Fig. 1 a considerable amount of proteolysis products is produced during the first hour of pepsin activity, then their increase is insignificant. Fermentative accessibility decrease of proteins may be a result of the conformation changes in the protein molecule structure due to the chemical interreaction with lipids, carbohydrates, carbonyl compounds, peroxides with the formation of compounds which are not split by pepsin. The addition of trypsin and chymotrypsin somewhat accelerates the meat protein hydrolysis. The protein proteolysis degree of frozen meat (category 1) has been revealed to be 7.80 mkg of tyrosine during the first month of storage and 7.06, 5.37, 4.55 mkg during 2,4,12 months respectively. According to the present biochemical concepts proteolysis in stored meat obviously occurs in the following way: end low molecular products of hydrolysis are gradually split from the protein molecule, high molecular residue being preserved on the first stages of the process which is capable to be further digested (2,4,5). Meat protein attacking after one-month storage is weaker (curve 1) than after 2 and 4 months of storage (curves 2,3), nothing being said about fresh meat (curve 4). This is indicative of protein aggregation probability with gradual loss of solubility in electrolytes. The links being formed affect protein stability to digestive enzyme activity. During storage protein aggregation probably also occurs along with hydrolytic processes leading to the decrease of protein amount. This aggregation causes the protein digestibility decrease during storage.

According to Fig. 2 which gives the results of protein digestion of duck meat (category 2) the character of protein attacking in vitro is the same as for duck meat proteins (category 1). Proteolysis degree and rate are, however, higher in the meat of the first category during further storage. The hydrolysis degree of meat proteins (category 2) have been determined to be 7.75 mkg of tyrosine during the first month of storage and 6.97, 5.27, 4.45 mkg during 2,4,12 months respectively.

Meat protein digestibility after 12 months of storage (curve 4) is marked more feebly than that after 2 and 4 months of storage (curve 2,3) and than that of fresh meat (curve 1). This proves that meat protein attacking is reduced with the increase of frozen meat storage period depending upon the fatness category. Meat packaging into Saran film under vacuum makes it possible to avoid weight losses, to decrease the rate of autolytic processes during cold treatment and storage.

Thus studying dynamics of duck meat protein attacking has shown that depending upon the fatness category of carcasses protein digestibility is reduced with the increasing of cold storage period. Being directly connected with protein assimilability meat protein digestibility is an important index of their biological value. According to the meat quality and the protein attacking degree in vitro storage life of duck meat (category 1) is 4 months and 3 months for category 2.

LITERATURE

1. Покровский А.А. Вопросы питания, 1975, № 3, с.25.
2. Головкин И.А. Холодильная технология пищевых продуктов. М., 1984, с.239.
3. Покровский А.А., Ертанов И.Д. Вопросы питания, 1965, № 3.
4. Соловьев В.И. Созревание мяса. М., 1966, с.337.
5. Черников М.П. Протеолиз и биологическая ценность белков. М., 1975, с.231.

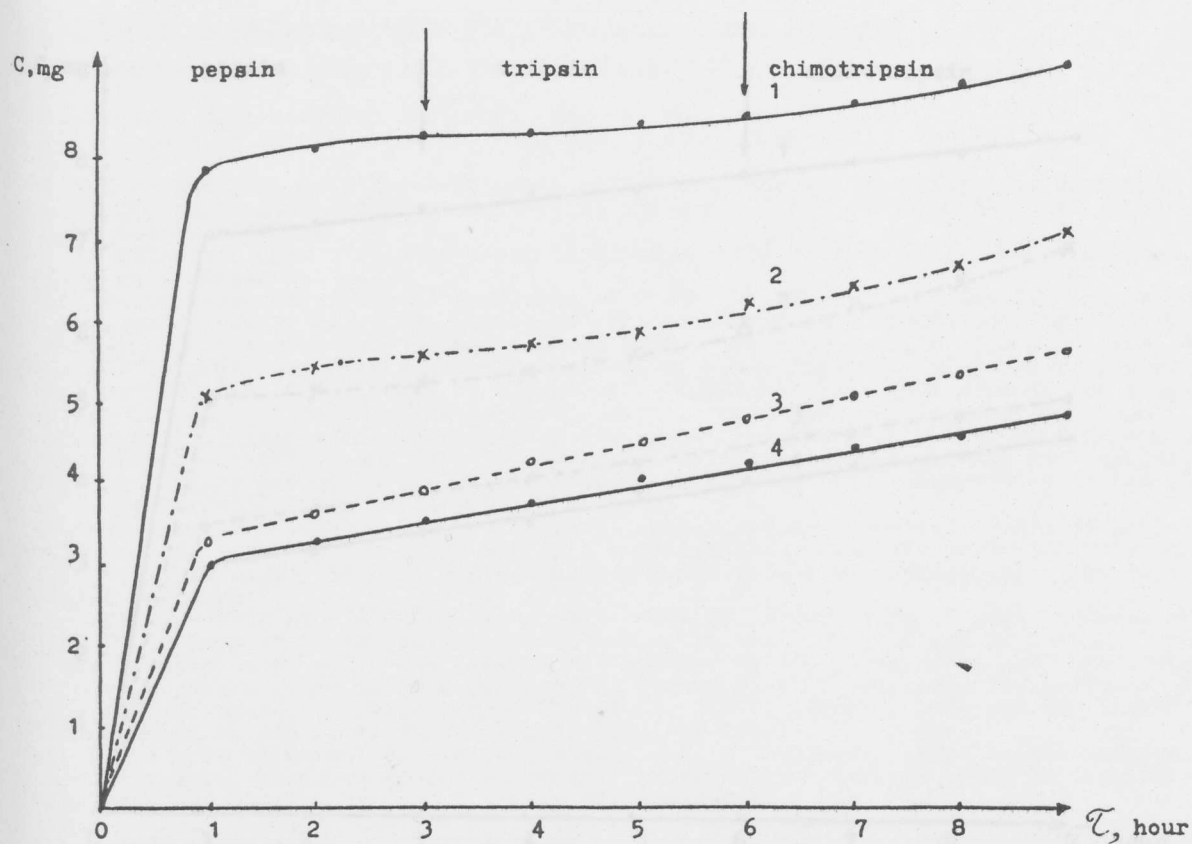


Fig.1. The attackability of proteins of the first category duck meat during storage.
(The ferment's change of time is presented by two vertical arrows)

τ , hour - the time of hydrolysis
C,mg - the amount of tyrosine

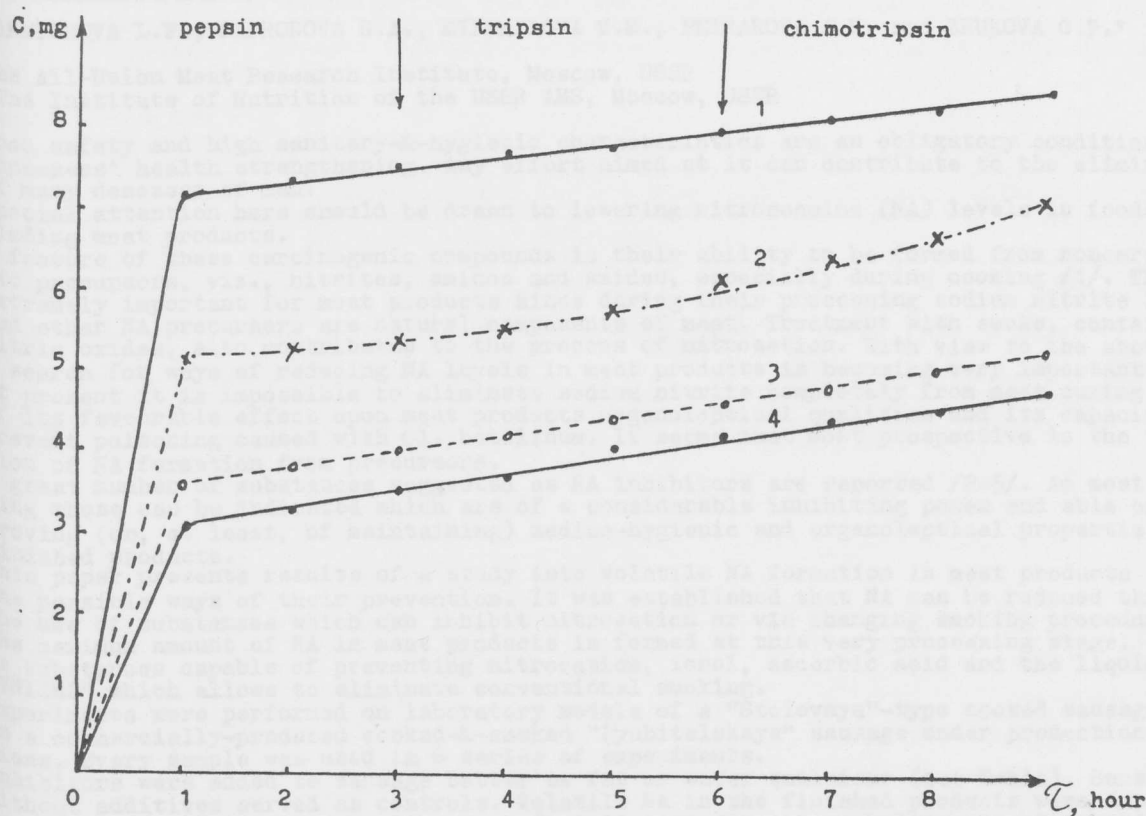


Fig.2. The attackability of proteins of the second category duck meat during storage.

(The ferment's change of time is presented by two vertical arrows)

τ , hour - the time of hydrolysis
C, mg - the amount of tyrosine