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SEVENTH MEETING OF EUROPEAN MEAT RESEARCH WORKERS
WARSZAWA, SEPTEMBER 19th to 23rd, 1961

CHANGES OF THE SOLUBILITY OF SARCOPLASMA PROTEINS IN RELATION TO CONDITIONS AND TIME OF PORK STORAGE.

by

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Changes of the solubility of sarcoplasma proteins in relation to conditions and the time of pork storage.

Some 30% of the muscle cells proteins are sarcoplasma proteins. Sarcoplasma is an important core of metabolism of the muscle cell /it contanis about 50% of enzymes[1]/ and on changes of its components depend at a high degree the processes which are going on in the tissue in the post-slaughter period. Less attention was paid to the sarcoplasma components and to the changes which take place therein than for instance to myofibrill proteins what may be explained by the methodical difficulties connented with its fractioning.

In the present paper investihations have been made on the variability of the solubility of some electrophoretically secreted fractions of the sarcoplasma proteins in relation to conditions and time of pork-meat storage.

M e t h o d s.

a/Experiments were carried out on logissimus dorsi muscle of swines. The samples were ground and then homogenized by the aid of a phosphate buffer /1:2/ of ion strength 0.15 and pH 7.4 The homogenate was centrifuged and the obtained extract used for an electrophoretic chromatography.

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b/ In the extract the total amount of protein was determined by a colorimetric biuretic method according Gornall et al./2/

c/The protein electrophorese was performed on the Whatman paper Nr.1 The proposed by us glicine-phosphate buffer of ionic strength 0.15 and pH 8.6 was adopted. 0.01 ml of meat extract was added.Time of electrophorese 14 hours at 4.5 V cm^{-1} tension.The paper stripes were dyed with amido-black 10 B.Electrophoregrams were elaborated on a sel-registering densometer.The area of each fraction was measured on the obtained electrophoretic curves /fig.1/.

The protein content of the given fraction/c/in the extract was computed from the formula

$$C = \frac{a \cdot p}{s}$$

where: a= area of the given fraction on the electrophoretic curve

p=the total protein content in the extract

s=the total area of all fractions.

4 parallel determinations of each fraction were made.

Results.

According to our identification,also taking into account investigations cited in the resp.literature/3,4/ the presence of myoalbumin protein in fraction I,globuline x in fraction II and myogene A and B in fractions III and IV were found.Fraction V was composed of proteins not placed on the paper of globular characte-

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ristic probably of high molecular structure.

1. In the first series of experiments changes of solubility of sarcoplasma proteins during 15 days storage of pork-meat at a temperature +2°-+4°C/fig.2/ have been studied.

   Of all components of the protein extract, fractions I, III and IV show a relatively good solubility during the total period of storage, whereas the solubility of proteins in fraction II constantly decreases. A great protein-content in fraction V was found only in extracts obtained from the meat not later than 24-36 hours after slaughter.

   Simultaneously slow but constant decrease of protein content in the extract during the whole storage-period was observed.

2. In the second part of the investigations changes of the solubility of sarcoplasma proteins during 82 days storage of meat in a frozen state/-18°C/ were studied. (fig 3).

   /Immediately following slaughter the meat was placed at a temperature of -18°C where it was stored after freezing. Grinding and homogenization of samples was done without preceding defreezing/.

During the storage of frozen meat an increase of the solubility of proteins in fractions I and II was observed, whereas the solubility in fraction IV did not change. A good solubility of proteins in fraction II was found. Only in the extract of fresh/warm/meat

a great protein content in fraction V was evident, in the frozen meat their solubility is insignificant.

In general the solubility of proteins from meat after freezing is smaller than from meat immediately after slaughter but with the time of its storage the solubility increases and reaches the maximum after 2 months.

3. In the third series of investigations changes of the solubility of sarcoplasma proteins during a 72 days storage /+18°C/ of pork gamma-irradiated /dose 1.5 10^6 r/have been studied.

/immediately following slaughter samples of the meat were hermetically closed in glass containers and sumitted to irradiation with gamma rays in a cobaltic bomb/.

Results of investigations regarding this series are shown in fig.4. It was found that in the course of the storage of irradiated meat the quantity of proteins transferred to the extract decreases.

Of the 5 secreted fractions the proteins of fraction I and IV loose the least of their solubility, but with the time of storage a more less solubility of proteins in fraction III is observed.

The content of proteins of fraction II in the extract falls by the end of the observation to almost zero.

The protein shanges in fraction V are the like as in experiments of the first and second series.

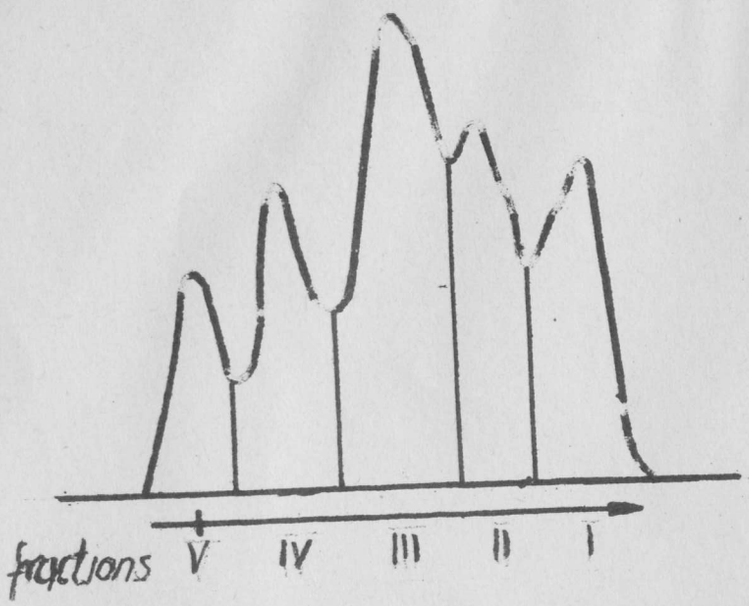

figure 1

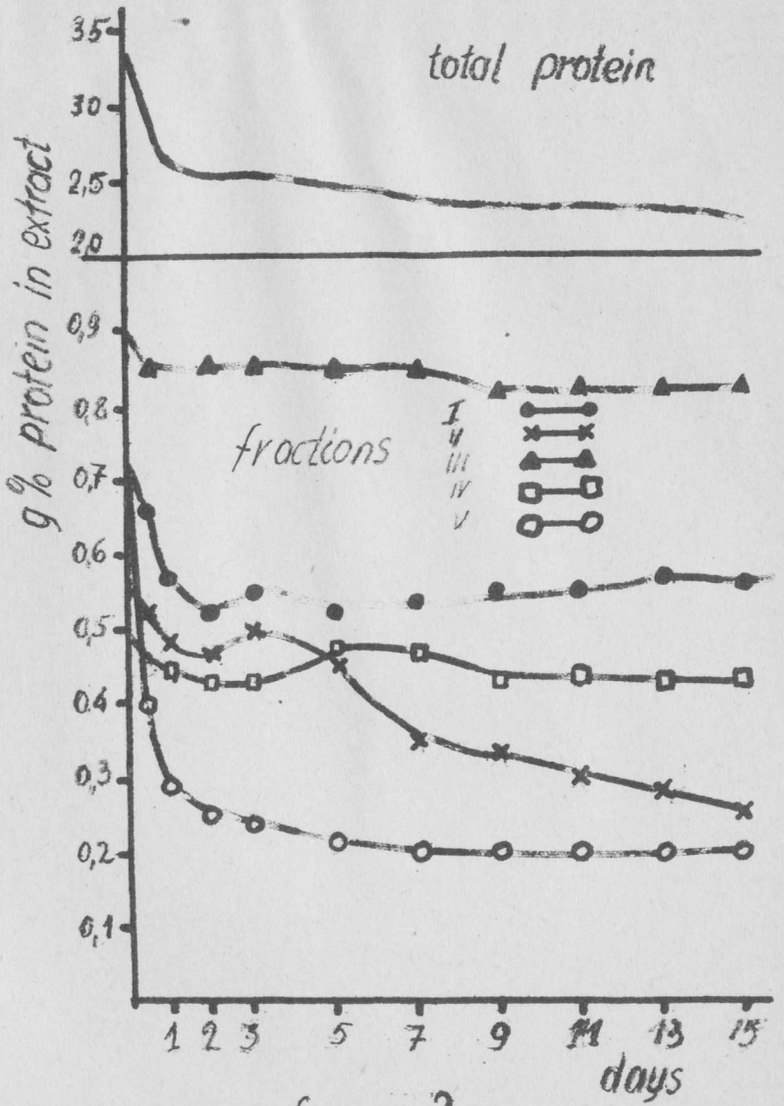

figure 2

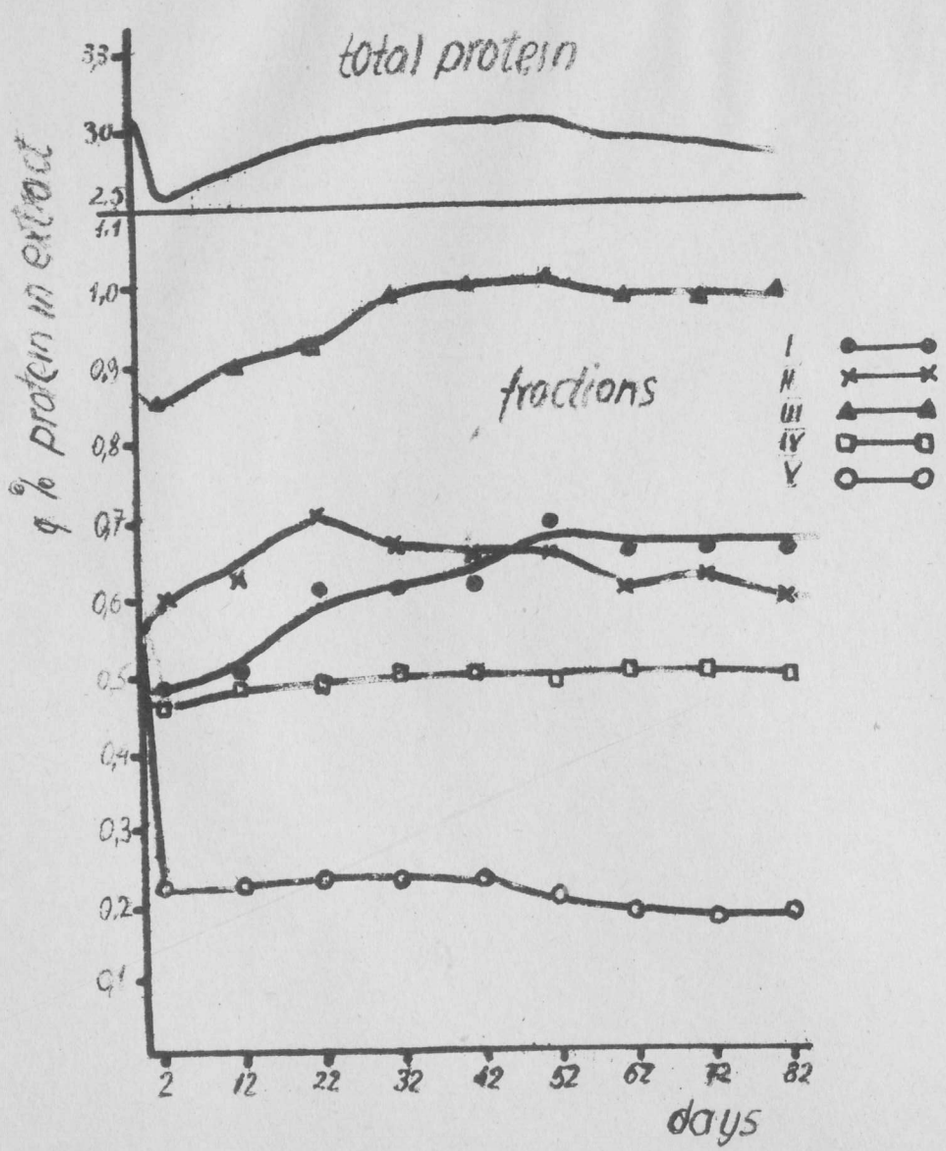

figure 3

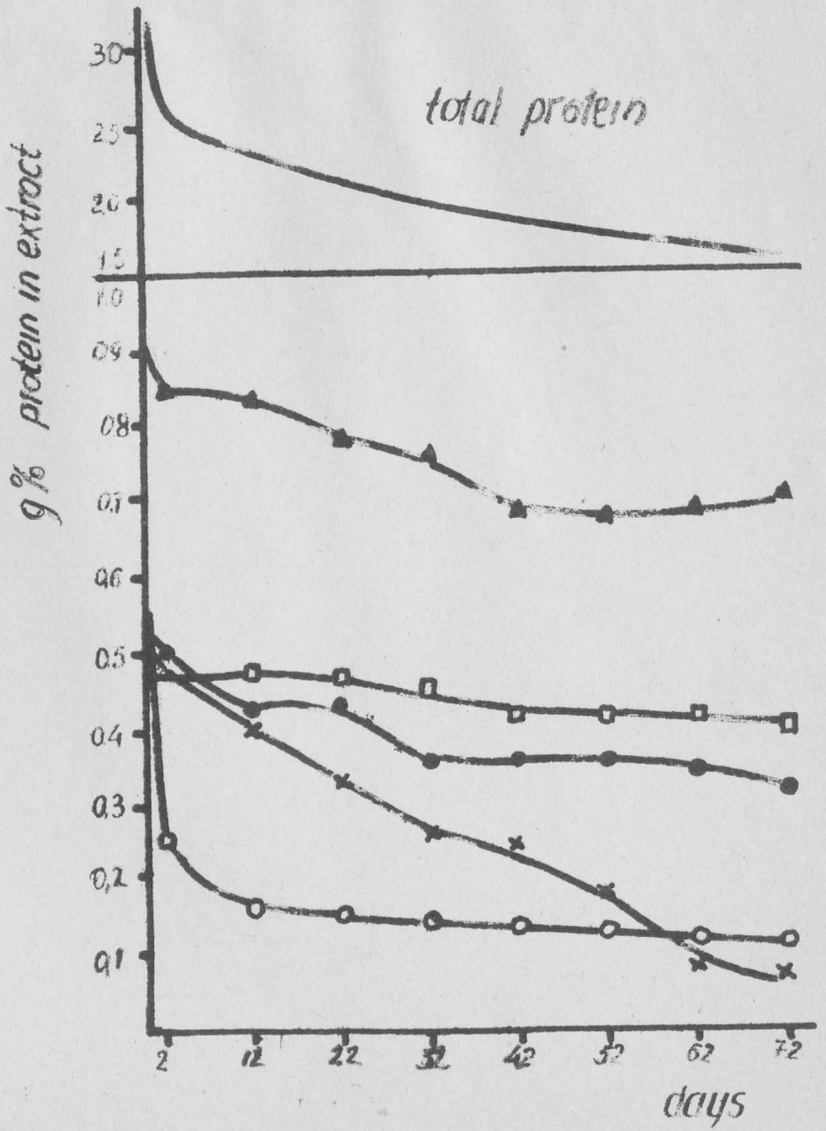

figure 4

Discussion.

In all of the three experimental series it was found that the general solubility of proteins in meat after 48 hours of slaughter considerably decreases. The reason for this phenomenon is the decrease of the solubility of proteins in fraction V soon after the slaughter.

The partial decrease of the solubility of proteins of the remaining fractions observed within 36-48 hours after slaughter /rigor mortis/ indicates the possibility to hold these proteins in situ by the structural elements of the cell. Such supposition is being affirmed by the partial increase of the protein solubility in fractions I and II after symptoms of rigor mortis have disappeared and also by the increase of the protein solubility in fractions I, II and III in muscles damaged by the mechanical influence of ice during freezing.

The carried out investigations have shown that the best solubility charaterizes myogenes i.e. proteins in fraction III and IV. Their solubility does not almost depend on conditions and time of meat storage. This is especially important because these fractions contain many enzymes.

Some properties of the globuline component in fraction II i.e. globuline x were also shown in our investigations. The solubility of this protein depends at a certain degree on the meat storage conditions.

Investigations have also shown that globulines /in fraction II and IV/ easier loose their solubility during storage than do albumines /I,III and IV fraction/.

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