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CONTRIBUTION TO THE STUDY OF INFLUENCE OF AUTHOLITIC PROCESSES UPON THE QUALITY OF FROZEN MEAT

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There was in Yugoslavia a sudden increase after the War in the number of modern meat packing plants, equipped With cold stores of corresponding capacity. The processing of a Breat deal of products is carrying on in air conditioned rooms. Beside this, in our country is built up a considerable number of refrigerating plants, in which besides other foof products, the meat is also stored.

When putting these refrigeration plants into operation, various problems arose. First of all, it was already observed at the beginning that the experiences and technological processes brought in from abroad, could not be always applied to Yugoslav conditions. Problems appeared on cooling and freezing of meat destined for consumption, as well as with meat devoted for processing of a variety of meat products.

Special attention was called by the Xugoslav meat industry to the methods of freezing and defrosting of meat. New conditions in large modern meat packing plants enabled sufficiently an accurate control of the shrinkage of meat and meat quality. We have already learned two years ago that the existing mode of freezing which is largely applied all over the world is not only unrational with regard to the rentability, but often could be almost catastrophical for the meat quality. Of course the same methods have been accepted by Yugoslav meat industry and are still in the usage.

On the other hand, in the recent years there appeared numerous publications treating different methods of freezing and defrosting of meat and their effects /1, 2, 3, 4, 5, 6, 7, 8, 9, 10 and 14/. Among these publications, the papers published by Bendall, Marsh, and Callow treating the problems of influence of autholitic processes on the quality of frozen meat, are of a special interest for the practice.

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Figuro 1

Losses of drip by defrosting of meat frozen at -26°C /after slow and quick defrosting/



Legend:

meat frozen previously cooled x - - x - - x meat frozen without previous cooling a - immediately after defrosting b - 3 hours after defrosting

o - 24 hours after defrosting

Taking into consideration the above mentioned in the Yugoslav Institute of Meat Technology and in some meat packing plants were made numerous investigations about more important factors, which influence the properties of frozen and defrosted meat and its keeping quality. It could be observed indeed that the time interval between killing of animal, i.e. the stage of autholitic processes and freezing of meat is of a great importance for the quality and keeping quality of meat. The method of defrosting must be chosen in dependence to the stage of autholitic processes.



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Losses of drip of slowly and quickly defrosted meat, frozen at -26°C - by pressing method



c - 3 hours after defrosting

d - 24 hours after defrosting

The figures 1, 2, 3 and 4 show the influence of freezing at -26° C /internal temperature of meat - 18° C/ to the so called body warm meat, i.e. to the meat immediately after killing of the animal and also to the previously cooled meat.

These investigations were made always with the same , cattle breed, sex, age and fattening. Several series of experigents were performed.

The figures obviously show that regardless to the mode of defrosting /slow or quick/ - the freezing of body warm Meat, i.e. prior to appearance of rigor mortis, gave better results. In such a way treated meat losses more less drip

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Figure 3

Quickly defrosted meat, frozen at - 25°C



Legend:

i: meat frozen previously cooled x - - x - - x meat frozen without previous cooling a - before freezing b - immediately after defrosting c - 3 hours after defrosting d - 24 hours after defrosting

during defrosting / fig. 1/ and keeps better the meat juice when mechanically / fig. 2 / or thermally / fig. 3 / treated.

The investigations performed in practice gave analo-Sical results. Consequently, it may be concluded, that freezing or meat immediately after the killing of animal, i.e. prior the beginning of rigor mortis (when both pH and the quantity of ATP are high) gives the meat of better quality after being defrosted.

When comparing the results obtained by quick and slow defrosting it may be stated that the beef frozen prior to rigor mortis, will surely give better results by the use of



Figure 4





"DRODOU	+ in the second second			meat frozen previously cooled
	x -	- x	X	meat frozen without previous cooling
	8	-	before	freezing
	Ъ	+	immedia	ately after defrosting
	c	-	3 hours after defrosting	
	đ	-	24 hour	rs after defrosting

slow mode of defrosting. On the contrary, the defrosting of meat which is frozen after being previously cooled, what is tresent practice, can be done either by slow or quick mode giving the same results. It is very well pointed out in figures 1 and 3.

Considering the above mentioned experiments we are convinced to give the advantage to the freezing of meat not previously cooled and slowly defrosted.

It will be also of some interest to discuss the data obtained in experiments which were carried on in order to find out which freezing temperatures are optimal to avoid the

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creater deterioration of colloidal properties of meat. The results of these experiments are shown on figures 5 and 6. The experiments have been performed paralelly on meat frozen

Figure 5

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Losses of drip of meat frozen up to various temperatures and slowly defrosted



immediately after the killing of animal /prior to rigor mortis/ and also on meat cooled for 24 hours prior to freezing. In all cases, there was shown that the freezing of meat not be cooled gave again better results. We may realize from the figure that the lower the temperature of freezing was - beginning from -5°C up to -33°C - the lesser loss of drip is either by

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Swelling in distilled water of slowly defrosted meat, frozen up to various temperatures



pressing method / fig: 5 A/, heating / fig. 5 B / or defrosting / fig. 5 C / was examined. Examining the ability of swelling of frozen meat, which was frozen at various tempebatures, it was realized that -5°C and -10°C gave some better results, but there are almost no differences in swelling of meat frozen at -15°, -20°, -25°, -30° and -33°C.

The above mentioned results have shown that - regarding beef - it would be necessary to give up the method of precooling of meat prior to be frozen in the freezing tunnel. On the contrary, the freezing of meat should take place immediately after the animal is killed, but at any rate prior to rigor mortis. This way is much more economical, because such mode does not require cooling rooms. It would only be necessary to arrange the frequency of killing, i.e. that within 3 or at most 4 hours a sufficient number of animals is killed which corresponds to the capacity of the tunnel. This mode of freezing can be applied in the abattoirs which are supplied with tunnels and cold stores for frozen meat. But this mode of freezing could not be applied to refrigeration plants which have to be supplied with meat from long distances.

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Regarding the conclusions of some other, and especially English authors, it is necessary to point out that there is no risk that by eventual accurence of rigor mortis the shrinkage of meat could be increased. It must be pointed out that the rigor mortis in such a meat is usually not very much expressed, furthermore is almost not remarkable.

The obtained results raise also the doubt that a temperature below -25°C does not diminish the quality of meat and its colloidal reversibility. But, we do hope, that further studies will allow to give our final views.

Conclusion

1. Freezing of beef immediately after the killing of animals - thus without previous cooling - has a favorable influence to the maintenance of its quality and structure. At any rate the meat has to be frozen prior the rigor mortis occurs.

2. Defrosting of meat, which was frozen before the beginning of the rigor mortis has to be carried out slowly and shows the advantages in respect to the quick mode of defrosting.

3. Defrosting of meat after the beginning of rigor mortis may be carried out slowly or quickly with the same success.

4. The lower the freezing temperatures are, the lesser deteriorations of colloidal properties of meat - of course at the same maintaining conditions.

Literature

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