

Ultrastrukturelle Veränderungen des Fleisches von ohne Ausruhezeit geschlachteten Kälbern.

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Die Verfasser untersuchten die ultrastrukturellen Veränderungen der Muskelfasern im Fleisch von Kälbern, die mittels speziellem LKW-Transport über eine Entfernung von 25 km transportiert und nach 24-stündiger Ausruhezeit vor der Schlachtung (Kontrollgruppe) und ohne Ausruhezeit (Experimentalgruppe) geschlachtete wurden. Es werden die mit dem Elektronenmikroskop durchgeführten Beobachtungen der Myofibrillen, des Glykogens und der Mitochondrien von Proben, die 2, 24, 48, 72 und 144 Stunden nach dem Schlachten der Tiere entnommen wurden, erörtert und demonstriert. Wesentliche Unterschiede wurden nicht festgestellt. Die bei den durchgeführten Untersuchungen erzielten Ergebnisse bieten die Möglichkeit für die Fleischkombinate, Kälber nach einem Transport über kurze Entfernungen ohne vorherige Ausruhezeit im Schlachthof zu schlachten.

Ultrastructural changes in the meat of calves slaughtered without pre-slaughter rest

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A study was made of the ultrastructural changes occurring in the muscle fibres of calves transported to the meat packing plant by special truck transport at a distance of 25 km and slaughtered after a 24-hour pre-slaughter rest (for the control group) or without rest (for the experimental group). Electron microscope observations of myofibriles, glycogen, and mitochondria of samples taken 2, 24, 48, 72, and 144 hours post mortem, are demonstrated and discussed. No essential differences were found. The results obtained from the studies conducted, open the possibility to meat packing plants to slaughter calves without a pre-slaughter rest, when they were transported over short distances.

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Modifications ultrastructurales de la viande de veaux, abattus sans repos

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On a étudié les modifications ultrastructurales dans les fibres musculaires de la viande de veaux, transportés jusqu'au combinat de viande par transport spécial à une distance de 25 km et abattus après un repos de 24 h. (groupe témoin) et sans repos (groupe expérimental). Les examens électro-microscopiques des myofibrilles, du glycogène et des mitochondries d'échantillons prélevés 2, 24, 48, 72 et 144 h. après l'abattage des animaux sont discutés. On n'a pas constaté de différences essentielles. Les résultats, obtenus des recherches effectuées, offrent aux combinats à viande la possibilité d'abattre des veaux sans repos lorsque ces-derniers sont transportés à de courtes distances.

Ультраструктурные изменения мяса телят, забитых без доубойного отдыха

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Исследованы ультраструктурные изменения, наступающие в мышечных волокнах мяса телят, транспортированных до мясокомбината специальным автотранспортом на расстоянии в 25 км и забитых после 24 часов доубойного отдыха (для контрольной группы) и без отдыха (для опытной группы). Показаны и рассмотрены электронно-микроскопические наблюдения миофибрилл, гликогена и митохондрий проб, отобранных через 2, 24, 48, 72 и 144 часа после убоя животных. Существенных различий не обнаружено. Результаты, полученные от проведенных исследований, дают возможность на мясокомбинатах забивать телят без доубойного отдыха, когда они транспортированы на короткие расстояния.

Ultrastructural changes in the meat of calves slaughtered without pre-slaughter rest

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The conditions and length of the transport and pre-slaughter treatment of the animals, have a definite effect on the liveweight and slaughtered weight, on the process of glucolyses and the preservation of the meat quality.

Clarac (4) and Wismer-Pedersen (7) establish that the transport along with the muscular strain and nervousness of the animals in the boxes prior to stunning cause a rapid fall in pH values on the 45th minute after slaughter.

Levantin et al (1) establish that the lengthening of the pre-slaughter rest of calves, transported to a distance of 35 km by trucks ZIS-150 leads to a liveweight loss, quantity and quality of the obtained meat, in comparison with immediately slaughtered after arrival animals.

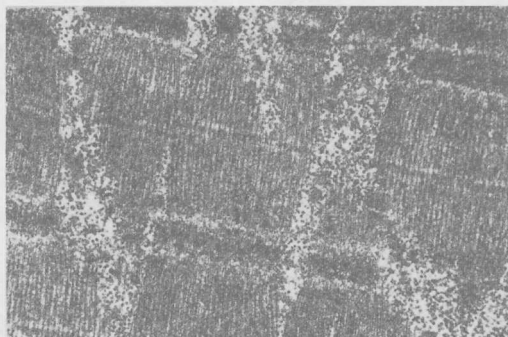
The problem for the influence of transport and the pre-slaughter treatment of the animals on the quality of the obtained meat, and the possibilities for its storing is studied by many authors (2,3,5,6,8). They follow some indices, valid as indexes for meat quality, especially the pH value and glycogen content.

With these studies we endeavoured to study the ultrastructural changes appearing in meat from calves transported to a distance of 25 km and slaughtered after a pre-slaughter rest of 24 hours and without pre-slaughter rest.

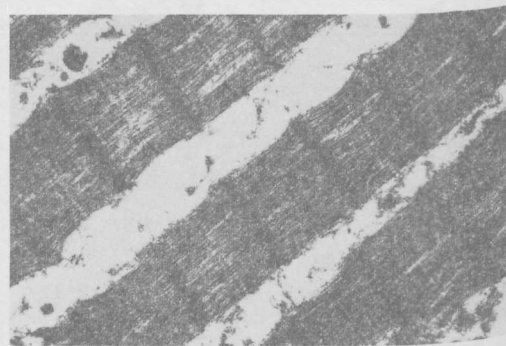
Material and methods. The studies were carried out with 6 bulls, transported to the slaughterhouse by trucks and 25 km distance. Three were slaughtered following a pre-slaughter rest of 24 hours, and three without any rest. The materials for electronmicroscopic studies were taken on the 2, 24th, 48th, 72, and 144th hour following the slaughtering of the animals. Samples of mm. long. dorsi measuring 1 x 0,5 x 0,5 mm, fixed in 5% glutaraldehyde for 2 hours, postfixed in 1% Osmium tetroxyde in miloning buffer with pH value of 7,2-7,4 after dehydration and double passing through propylenoxyde, were included in Durcupan. Ultrathin cuts prepared on Ultramicrotom Tesla EB 490 A, contrasted with uranylacetate and leadcitrate were seen under an electronmicroscop Tesla - BS - 613.

Results and Discussion. Ultrastructural changes in the meat from calves slaughtered, after 24 hours of pre-slaughter rest. Two hours following the slaughter of the animals, in the muscle fibres is observed the following electronmicroscopic picture: myofibriles are straight and the I-discs are very clear, A-discs and H-zones also. Z-lines are seen as dark dense narrow stripes placed in the middle of the I-discs. M-lines are well pronounced in the middle of the H-zones. In the sarcoplasm and the myofibriles, predominantly in the I-discs are discovered glucogene granules. In the mitochondria are observed oedemic and destructive changes.

Under refrigeration storage of the meat during 24 hours, in the muscle fibres have taken place the following ultrastructural changes: the myofibriles are contracted and on certain places curved. The light stripes placed sidewise to the Z-lines are totally lacking and the I-discs are not found either. On their places are observed dark stripes, distinguished by their electron density from the Z-lines and limiting the separate sarcomers, which are strongly shortened. The glucogene granules have disappeared and the sarcoplasm between the myofibriles is lighter. In the mitochondria are observed strongly expressed oedemic and destructive changes. Electrongram 2.



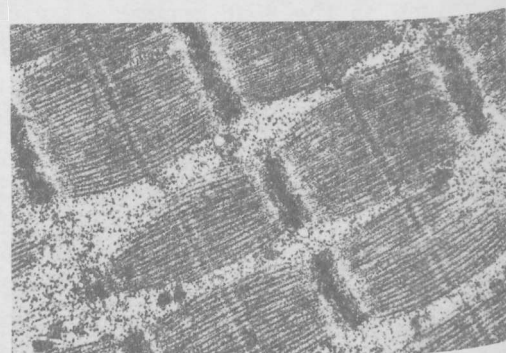
Electronogram 1. Magn. 19000x



Electronogram 2. Magn. 14000x



Electronogram 3. Magn. 19000x

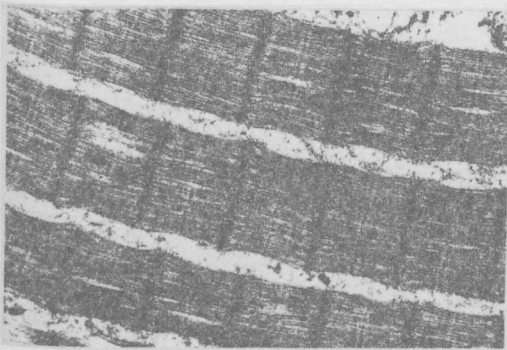


Electronogram 4. Magn. 19000x

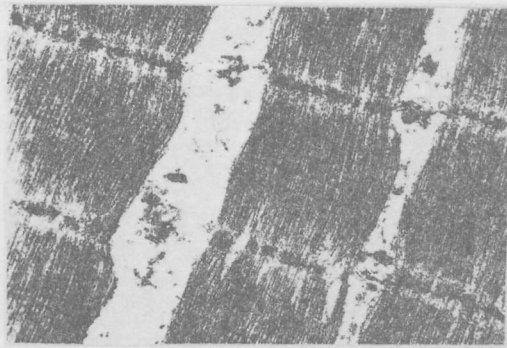
The ultrastructural changes appearing in the muscle fibres following 48 hours of refrigeration storage of the meat, are characterized by strong myofibrile contraction, shortening of the sarcomers, disappearance of the light stripes found sidwise of the Z-lines and strongly expressed oedemic and destructive changes in the mitochondria. The electromicroscopic picture of the muscle fibres following a 6 days refrigeration storage of the meat is characterized by a relaxation of the myofibriles and restoration of the light stripes found sidwise of the Z-lines. In the mitochondria the oedemic and destructive changes are more strongly underlined in comparison to those described. El. gram 3.

Ultrastructural changes in the meat of calves slaughtered without pre-slaughter rest. Two hours following the slaughter of the animals in the muscle fibres is established the following electromicroscopic picture: the myofibriles are straight and the I-discs on them are clearly marked, A-discs, H-zones, Z-lines, and M-lines also. In the sarcoplasm and myofibriles are observed glucogen granules. In the mitochondria are found oedemic and destructive changes. Electronogram 4.

On the 24th hour after the slaughter of the animals, in the muscle fibres appeared the following changes: the sarcomers are strongly shortened while the myofibriles on given spots are curved. The I-discs have disappeared and on their place are noticed the previously described dark stripes, distinguished by their electron density from the Z-lines. In the sarcoplasm are not encountered glycogenic granules and it is lightened to a great extent. In the mitochondria are observed oedemic and destructive changes. Electronogram 5. In the samples taken 48 hours following the slaughter of the animals, it is clearly seen that the myofibriles are in condition of strong contraction while the sarcomers are with small dimensions. In the mitochondria the picture of oedemic and destructive changes continues.



Electronogram 5. Magn. 10000x



Electronogram 6 .Magn. 19000x

On the sixth day following the slaughter of the animals is observed a relaxation of the myofibriles and restoration of the light stripes placed sidewise to the Z-lines. The oedemic and destructive changes in the mitochondria are comparatively more strongly expressed. Electronogram 6.

Analysing the observed ultrastructural changes in the muscle fibres of the meat from calves slaughtered following a 24 hours pre-slaughter rest and without any rest, it is clear that no significant changes exist.

Conclusion. The obtained data from the electronmicroscopic studies of meat samples from calves transported to the slaughterhouse from short distances (25 km) and slaughtered following a 24 hours pre-slaughter rest and without any rest testify that the processes taking place in the muscle fibres after slaughter are almost with similar exhibits, while the ultrastructural changes are basically the same.

Literature

1. Levantin L.D., U.P. Fomichev, E.C. Afanasieva, XIII Eur. Meeting Meat Res. Workers, Moscow, 1977
2. Alterange W., SVZ, 62, 1962, 17:253
3. Bartels H., Tehn. Mesa, 1/2, 1972, 34-38
4. Clarc J.B., Proc. Inst. Fd. Sci. Technol. (UK), 1973, 6, 3, 136-144
5. Coretti, K., Die Fleischwirtschaft, 1961, 13, 12, 1012
6. Hedrick H.B., J. Anim. Science, 24, 1965, 1, 255
7. Wismer-Pedersen, J. Food Science, 1959, 24, 711
8. Van Gills und Van Logtestijn, Utrecht, Nederland, Arch. f. Lebensmittelhygiene, 1967, 3