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MEAT PRODUCTION, MECHANIZATION AND ROBOTIZATION, SANITATION AND MEAT QUALITY.

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The future meat production will be based upon early detection of stress meat, hot boning, stimulation of hot boned meat cuts and direct processing of prerigor trimmings.

"Agri-mation" is increasing rapidly. Microprocessors and computers together with mechanization and robotics will make the operators in the meat industry more effective. Advanced machine-3D-vision inspection systems are already seen in use.

"Third generation" robots with finger-like manipulators will take their cues from computers via data-communication networks instead of human operators. Voice-recognition equipment is taken into use where human interactions are required. An evolution will probably come in the near future as electronic components, sensing and vision technology is getting better and software cheaper. Optic fibers instead of electric wiring make the use of microprocessors more stable in tough environments.

Sanitation will be made easier by robots. Washing of carcasses will become more attractive when using sophisticated machines after automatic weighing and laser based vision-grading. Meat quality will be better when new developed fiber optics and quality registration equipment is available together with the increased know-how of the meat technologist who will be helped by computerized memories.

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ВЛИЯНИЕ КАТЕГОРИИ КРУПНОГО РОГОТОВА СКОТА НА ВЫХОД ЩИДОКРАННОГО ФЕРМЕНТНОГО СЫРЬЯ

Умберто Сардуй, Лауделина Родригес, Марта Луго, Ангела Миранда,
НИИПП, Гавана, Куба.

Для проведения опытов были использованы 60 голов, которые разделили на 3 категории / быков 1-ой и 2-ой, коров 3-ей категории / по 20 голов каждого из них. Переработка проводилась согласно существующей технологии в нашей стране. Железы были выделены соблюдая те факты, которые более интенсивно влияют на их выход, после чего замораживали и взвешивали для определения потери.

Результаты обработали статистическим методом. Показано что нет существенных различий на средние показатели выхода желез для каждой категории животных.

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RESULTS IN THE PARTIALLY SCALDED PIG SLAUGHTERING TECHNOLOGY

Foltányi, J.-Sipos, I. : -Hungarian Meat Research Institute

The Hungarian Meat Research Institute has constructed for several years development work a new machine which can partially scald, dehair, singe and polish the heads and the legs in the skinning technology for slaughtered pigs. The quality of dehairing is suitable, there are no scalding damages in the hide area intended for hide pulling. The capacity of the machine is 240 pigs/hour.

The Institute has also developed an other important equipment for this slaughtering technology, the hide pulling machine. The capacity of one machine is 70-90 hide/hour and in rotary arrangement three machines have a total capacity of 240 pigs/hour. The manual prehiding is about 30% of the total hide area. The quantity of the fat removed with the skin remains between 2-2,5 kgs, depending on the manual prehiding.

The microbiological test results show that neither the partially scalding nor the hide pulling influence significantly the microbiological conditions comparing with the scalding technology. The realtively careful slaughtering results less PSE meat at the stress sensitive animals.

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BEEF QUALITY TRAITS IN DIFFERENT MUSCLES OF GROWING-FINISHING BULLS SLAUGHTERED AT VARIOUS AGES

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former investigations directed towards beef quality traits in different cattle breeds kept in Hungary has been continued. Preliminary results were presented to the 28th European Meeting of Meat Research Workers held in Madrid 1982. In addition to Hungarian Red Spotted and Holstein Friesian chemical analysis was extended on further genotypes such as Hungarian Grey Cattle /Steppenrind/ and Hereford breeds. Bull calves and growing-finishing bulls fattened on corn silage based diets with moderate concentrate supplementation were slaughtered at 200, 350 and 500 days of age, respectively. Muscle samples were taken from M. longissimus dorsi, M. semitendinosus and M. psoas major.

2 - 5 Совершенствование технологии и оборудования для сбора пищевой крови

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Вопросам сбора пищевой крови и ее использованию уделяется большое внимание. С целью получения доброкачественного продукта разработана установка, производительностью 50 и 100 туш/час. для сбора пищевой крови крупного рогатого скота. Установка работает по принципу замкнутой, непрерывной действующей системы в автоматическом режиме управления. Она обеспечивает сбор, стабилизацию, выдержку пищевой крови до заключения ветсанэкспертизы о ее пригодности на пищевые цели, опорожнение кровесборников, мойку и санитарную обработку закрытой системы сбора крови. Установка обладает высокой степенью унификации, что позволяет выпускать ее с различной производительностью с применением унифицированных узлов.

2 - 6 ВЛИЯНИЕ ТЕХНОЛОГИЧЕСКИХ ПРОЦЕССОВ ОБРАБОТКИ ПТИЦЫ НА ГИГИЕНИЧЕСКУЮ НАДЕЖНОСТЬ МЯСА

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Известно, что степень микробиальной обсемененности определяет устойчивость и гигиеническую надежность мясопродуктов при хранении. В наших исследованиях установлено, что обильное обсеменение микроорганизмами тушек птицы связано с большим количеством их на кожном покрове птицы, технологическом оборудовании и в помете. По ходу технологического процесса первичной переработки и потрошения птицы микробиальная обсемененность составила: в воде ванны тепловой обработки - 2,9031; в машине снятия оперения - 4,2672; в воде ванны охлаждения - 4,0569 и в воде душевой установки - 3,9395 логарифма средней величины количества микроорганизмов в 1 мл. Микробиальная обсемененность тушек птицы значительно снизилась в процессе первичной переработки по сравнению с живой птицей: у кур до 2,7065, у бройлеров-до 3,0418 и у уток-до 5,2364 логарифма средней величины количества микроорганизмов на 1 см². Среди выделенных микроорганизмов из семейства *Enterobacteriaceae* наибольшее количество приходится на кишечную палочку - 85%. В результате проделанной работы показано, что соблюдение санитарно-гигиенических условий первичной переработки птицы позволяет сохранить гигиеническую надежность тушек в охлажденном виде в пределах 6 суток при 273-275 К.

MEAT QUALITY OF PIGS FED SLAUGHTERHOUSE RESIDUUM

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The meat quality of pigs fed formula feed to which fermented slaughterhouse residuum (FSR, trial group, was added at the level of 20% was compared to that of a control group (fed formula feed only) and its usability as a pig feed was evaluated. Loin meat was analyzed to determine physicochemical characteristics such as pH, color and the chemical composition of the meat 24 hr postmortem. The chemical composition and processing quality of the meat were also investigated using a cooked cured loin roll. The visual color scores of the meat based on Pork Color Standard in Japan and Hunter values were essentially the same for both the control and trial groups. This was also the case with respect to total heme pigments. The pH and chemical composition (moisture, crude protein, fat and ash) in both groups were similar, and all values in the normal range. Neither were any significant differences in loin roll color evident. The pH and residual nitrite content showed no significant differences, even though these values were somewhat lower in the trial group. The chemical composition of the meat product was not effected by the FSR used in this experiment. A sensory test was performed by 52 persons, according to a method described by Scheffé. The meat, after being grilled in a microwave oven and the loin rolls of the trial and control groups were compared on the basis of color, odor, tenderness, flavor and given total point evaluations. No significant differences could be found in the control and trial groups.

The data of the present research confirm the possibility of using slaughterhouse residuum as a source of pig feed.

THE EFFECTⁿ OF FEEDING SINGLE CELL PROTEIN (SCP) ON SOME
PHYSICAL ASPECTS IN BROILERS

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Soybean meal was replaced completely by ethanol yeast (SCP) at a rate of 10% in broiler diet at different stages of an 8-week experimental period namely, the first 4 weeks (group 2), last 4 weeks (group 4), and the entire period (group 3), while the control (group 1) did not receive the yeast. The effects of the yeast were studied on body weight, liver and heart weights as percentages of body weight, and the packed cell volume (PCV) :

- 1- Body weight increased slightly in groups (2,3,4) as compared with group (1). Whereas males were significantly higher than females ($P < 0.01$).
- 2- Relative weight of liver was higher in group (3) as compared with group (1) ($P < 0.01$), and females surpassed the males in this aspect ($P < 0.05$).
- 3- Relative weight of heart did not exhibit significant differences between the groups. But females had higher values than males ($P < 0.01$).
- Group (3) had significantly higher (PCV) value than the groups (1 and 2).

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INFLUENCE OF ANTEMORTEM DIET ON EXTRA LOW VOLTAGE ELECTRICAL STIMULATION IN LAMBS

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In order to ensure that the lambs were not suffering from stress that might affect the results of the electrical stimulation, and to determine the role of diet, in the present study of the effect of electrical stimulation (5 V) the lambs were allowed to rest (72 h), during which time they were fed a normal diet (hay) and an enriched diet (hay and molasses).

Significant differences ($P < 0.01$) were found between shear strength (Kramer shear cell) and toughness assessed by a taste panel for the stimulated and unstimulated lambs fed the diet of hay. However, no such significant differences were detected in the lambs fed the enriched diet of hay and molasses. This suggests the important role of diet on the effect of extra low voltage electrical stimulation.

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EFFECT OF EXTRA LOW VOLTAGE ELECTRICAL STIMULATION ON BEEF STERNO-CLEIDOMASTOID MUSCLE (TRIAL USING TWO STIMULATORS WITH DIFFERENT ELECTRICAL PARAMETERS)

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Two prototype direct-current, square-wave extra low voltage electrical stimulators having different electrical parameters developed by the Escuela de Ingenieros Agrónomos de Córdoba (151 V (peak), 5 Hz, 24 V effective value) and by the Instituto del Frío (80 V (peak) with a mean value of 40 V, 14.3 Hz, and 57 V effective value) were studied, along with their influence on the pH, R value, colour (HunterLab), toughness (Kramer shear cell and taste panel), and cooking loss of beef sternocleidomastoid muscle.

The results obtained indicated that electrical stimulation in the first few hours post-mortem using either stimulator resulted in a decrease in the pH and an increase in the R value. Significant differences were found between the control samples and those undergoing electrical stimulation. Electrical stimulation in the conditions tested did not appear to have any effect on the colour or cooking loss.

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Qualität von Lammfleisch verschiedener Populationen

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Von den drei Nutzungsformen der Schafhaltung Milch, Fleisch und Wolle, ist heute in der Bundesrepublik Deutschland nur die Fleischproduktion von ökonomischer Bedeutung. Das Erzeugungsziel soll ein Mastlamm mit optimalem Verfettungsgrad und bester Fleischqualität sein. Im Hinblick auf das Alter wurde in der sehr weitgefaßten Kategorie Lammfleisch eine Differenzierung in Milchlammfleisch (Alter bis 6 Monate) und Mastlammfleisch (Alter bis 12 Monate) vorgenommen. Damit dürfte zugleich die Gewähr gegeben sein, daß das Fleisch der Kategorie Milchlamm noch weitgehend frei von artspezifischen Geruchs- und Geschmackswerten ist. Ziel der Arbeit war es, festzustellen, inwieweit Zusammenhänge zwischen quantitativen und qualitativen Merkmalen der Kategorie Milch- und Mastlamm bestehen, und zu prüfen, ob und welche Merkmale eine qualitative Aussage ermöglichen. Für die Erfassung des Schlachtwertes wurden 202 Schlachttierkörper der Kategorie Milchlamm (Alter- 4,7 Monate) und 153 Mastlämmmer (Alter- 9 Monate) untersucht. Das Mastendgewicht beim Milchlamm betrug 44,9 kg und Mastlamm 47,5 kg. Die Gewebeanteile Fleisch und Knochen zeigten keine signifikanten Unterschiede zwischen den Kategorien Milch- und Mastlamm. Milchlämmer hatten aber einen um 3,3 % höheren Gesamtfettgehalt. Die Ergebnisse der sensorischen Prüfungen zeigen, daß Zartheit, Saftigkeit und Aroma im M. long dorsi und M. semimembranosus der Kategorie Mastlamm gleich oder besser bewertet wurden. Das Aroma des Lammfleisches hängt in erster Linie von der Fettqualität sowohl quantitativ als auch qualitativ ab.

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LE DEPOUILAGE DES PORCS DE FABRICATION EN ABATTOIR INDUSTRIEL :

Une INNOVATION RATIONNELLE ?

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La préparation externe des porcs est traditionnellement effectuée en France, comme en Europe Occidentale, par 4 opérations qui sont chronologiquement : l'échaudage, l'épilage, le flambage et le grattage. Ces opérations, très coûteuses en énergie, ne sont pas toujours indispensables si l'on considère la filière porc complète. En effet, pour la première fois, un abattoir industriel pratique couramment le dépouillage des porcs. Cet abattoir est spécialisé dans l'abattage des truies de réforme ou coches, pour la fabrication de charcuterie fraîche : les carcasses sont alors intégralement découpées et transformées sur place, et aucune pièce de découpe ne doit garder la cuenne. Une méthode de dépouillage des carcasses de porc de gros format a été développée. Elle met en œuvre un arracheur mécanique de peau par enroulement de haut en bas sur la chaîne d'abattage. L'utilisation de cette machine permet : - de prélever la totalité de la peau de porc, sans se limiter au "croupon" - dépouiller la tête sur la chaîne d'abattage - de traiter les carcasses dans d'excellentes conditions d'hygiène - de limiter la préparation de la dépouille au minimum - de prélever la peau avec une cadence nominale maximale de 70 truies/h. Il importe particulièrement de remarquer que cette technologie permet d'éviter complètement l'opération d'échaudage de la peau (à 62°C), ce qui induit pour conséquence : - des économies d'énergie qui diminuent le prix de revient de la viande ainsi obtenue - une peau constamment de bonne qualité, transformable en bon cuir - surtout une faible population microbienne de surface de la carcasse d'où un effet bénéfique sur la qualité de la viande. Ce procédé dévoile tout son intérêt pour l'abattoir, s'il peut valoriser au maximum ses peaux de porc de bonne qualité vers l'industrie du cuir.

THE EFFECTS OF CAPTIVE BOLT STUNNING ON BRAIN FUNCTION IN CATTLE AND SHEEP.

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The effectiveness of captive bolt stunning was evaluated in sheep and cattle. Brain function following stunning was assessed using cortical evoked potentials; loss of evoked potentials was considered to represent profound brain failure inconsistent with sensibility.

In anaesthetized sheep, a frontal stun was found to instantaneously and irreversibly abolish both visual and somatosensory evoked potentials. Shooting in the poll position produced only temporary loss of evoked activity in 5 of 8 animals, and recovery of activity occurred in 50 sec in these animals. The effectiveness of captive bolt stunning, and the relevance of bolt velocity, was also examined in anaesthetized cattle. The incidence of irreversible loss of evoked potentials was not significantly different when bolt velocity was increased from 40 to 100 m/sec. However, in those animals whose evoked potentials returned, the time to the reappearance of potentials increased from an average of less than 20 sec at 40 and 60 m/sec bolt velocities, to greater than 40 sec at 80 and 100 m/sec. At all bolt velocities examined, some animals were found which did not completely lose evoked activity following stunning.

These results suggest the following: 1. Captive bolt stunning in the frontal position in sheep is an effective method of stunning from a humanitarian standpoint; in contrast, the occipital shot should only be employed when essential (i.e. in horned animals) and then always followed by prompt sticking. 2. Captive bolt stunning in cattle can be associated with rapid recovery of brain function even when high bolt velocities are employed. For this reason, the stun to stick interval should be considered with greater care than has generally been the case, with a view to minimizing this interval in order to prevent recovery.

POULTRY SLAUGHTERING PROCEDURES

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The effect of 9 different slaughtering methods on spontaneous and evoked electrocortical activity in the brain were examined in anaesthetised chickens and ducks. The object was to establish which methods were quickest in slaughtering poultry, and by what order of magnitude. The methods were: cutting both carotid arteries, both jugular veins, one jugular vein, one jugular vein plus one carotid artery, inducing a cardiac arrest, severing the spinal cord plus vertebral arteries, severing the spinal cord plus vertebral arteries and ventilating the bird mechanically, decapitation, asphyxia. In addition, 8 different neck cutting methods were examined at commercial abattoirs in Britain, to establish which blood vessels were usually severed in each method.

Cardiac arrest and decapitation were the quickest methods of reducing activity in the brain, and severing one jugular vein only took the longest. In commercial abattoirs chickens are usually slaughtered by mechanically severing the spinal cord plus one or more of the vertebral arteries. This results in death from asphyxiation. Asphyxia caused a more prompt reduction in brain activity in chickens than in ducks, and this difference was probably due to a diving reflex in the latter. Time to brain failure following cardiac arrest, however, was the same in the two species.

With manual neck cutting methods, one carotid artery plus one jugular vein are usually severed. This results in a delayed death in comparison with cardiac arrest or severing both carotid arteries. It is concluded that inducing a cardiac arrest at stunning results in a prompt death and hence reduces the likelihood of the animal regaining consciousness following stunning.

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INFLUENCE OF ELECTRICAL STIMULATION ON STRUCTURAL-MECHANICAL PROPERTIES OF BEEF CARCASSES

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Twelve bull calves of black-variegated cattle lot, at the age of about 20 months and a living mass of 440 ± 40 kg, were electrical stimulated (ES) immediately after slaughtering and exsanguination. To this aim, rectangular one-polar (unidirectional) impulses with duration of 10 ms, frequency of 14,3 Hz and amplitude of 90 V were used, obtained from a laboratory electro-stimulator EC-4, specially developed in HIFI - Plovdiv. ES was carried out for 2 min. Two negative electrodes of stainless steel with length and diameter of 150 and 6 mm, respectively, were inserted into the muscles around the Achilles' tendon of both legs. A positive electrode (in the form of tons) was set in the nostrils. Twelve non-electrostimulated bull calves of the same lot were used as control.

After ES, the experimental and control carcasses were rapidly cooled to $-10 \pm -15^\circ\text{C}$ at the rate of airflow from 2 to 3 m/s, to temperature of 6°C (in depth) and stored at the ambient temperature of 0 to 2°C .

Investigations on structural-mechanical properties of *m. longissimus dorsi* were made by determination of the indexes of elasticity, structural and plastic strength in the 1, 6, 12, 24, 48 and 72-nd hour after ES.

It was found that ES at the given conditions lead to accelerated drop of pH and improvement of the structural-mechanical properties of the ES muscle, which at the end of the 3-rd day were close to those of the control toward the end of the 12-th day.

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ДЕФЕКТИ ПО СУРОВИТЕ КОЖИ, ДОБИТИ ПО ВРЕМЕ НА МЕСОДОБИВА И КОНСЕРВИРАНЕТО

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През последните десетилетия добивът на месо се превърна в модерна промишленост с висока механизация на труда и на производствените процеси. Манипулирането на кожите, заготовката и консервирането все още се провежда по методи и технологии, които не отговарят на промишлените методи за производство на месо. На много места консервирането се провежда чрез осоляване на ръка и продължително отлежаване. Допускат се редица грешки при консервирането, които водят до получаване на гънки, образуване на червени и сини солни петна и гнилостни процеси.

В доклада се посочват конкретни мерки, които ще осигурят бездефектно добиване на сировите кожи или ще сведат до минимум тези дефекти.

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EINFLUSS DES ZEOLITS AUF DIE FLEISCHQUALITÄT BEIM MÄSTEN VON SCHWEINEN

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Es wurden 2 wissenschaftlich-wirtschaftliche Versuche mit männlichen Futter-Schweinen "Camberow" in den Jahren 1981 und 1982 im Institut für Tierzucht, Nahrungs- und Durchgeführte. Die Schweine wurden von 10 Kg auf 105 Kg Lebensmasse gewichtet. In beiden: beim ersten Versuch der Einfluss einer Futtermischung, bei der 4% des Kaiserspecks durch Zeolit ersetzt wurde, untersucht, und beim zweiten Versuch wurde der Einfluss von 1,5 g Zeolit zu 1 Kg Lebensmasse in der Tagesration ermittelt.

Es wurden statistisch zuverlässige Unterschiede zwischen der Versuch - und der Kontrollgruppe festgestellt. Beim ersten Versuch war bei der Zeolit-Versuchsgruppe der Anteil der Fleischmasse grösser und der Anteil des Speks und der Fette geringer bezogen auf die Gesamtmasse der geschlachteten Tiere. Es gibt keine bemerkbare Unterschiede bei den anderen Kennwerten.

In der chemischen Zusammensetzung des Fleisches und der Fette zeigen die beiden Gruppen keine nennenswerte Unterschiede. Aber die Zeolitgruppe im Vergleich zu der Kontrollgruppe besitzt einen geringeren Fettgehalt des Fleisches (16,41%) gegenüber (18,61%) und auch des Longissimus dorsi (1,53% gegenüber 1,84%). Andere Qualitätsunterschiede wurden im Fleisch nicht festgestellt.

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AUTOMATISCHES SYSTEM FÜR NASSTOALET DER SCHLACHTKÖRPER VON RINDER

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Das entwickelte System für Nasstoalet der Schlachtkörper von Rinder schlägt eine Anlage vor, welche von dem Takt des Konveyors gesteuert wird. Die Anlage realisiert ein technologisches Regime, welches das Ziel hat:

- a) Auswaschung des Schlachtkörpers von den vorgängigen Manipulationen.
- b) Senkung der oberflächlichen Temperatur des Schlachtkörpers infolge der Verdampfungskühlung.

Die erhaltene Ergebnisse zeigen eine Verminderung des Verbrauches der Energie bei der Kühlbearbeitung des Fleisches und auch eine Verminderung der Gewichtverlust bei der nach kommenden Kühlung ein Ergebniss infolge der entstandene dünne Kruste von ausgetrocknetem Muskulgewebe.

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Производство гусинного мяса в нашей стране ежегодно увеличивается около 30 % и добивается полностью из откормленных для жирной печени гусей. Около 40 % этого мяса остается в стране, но не находит хорошего приема в натуральном виде из-за высокого содержания подкожного жира. Это приводит к поиску возможностей для его перерабатывания в мясные продукты. Данные о составе гусинного мяса у нас - скучные и неполные, они относятся к мясу неоткормленных гусей, а исследование его технологических свойств не совершено. Это заставило провести исследования о изучении технологических свойств грудной и бедреной мускулатуры откормленных гусей. Установлено, что у грудной мускулатуры более высокое содержание влаги, общего и удобоедимого белка и более низкое содержание жира по сравнению с бедреной мускулатурой. Кроме того, у бедренной мускулатуры более высокая влагоноглащающая и солеглащающая способность, но более слабо выражена водозадерживающая способность по сравнению с грудной мускулатурой.