STUDYING THE IMPACT OF THE ELECTROMAGNETIC FIELD WITH LOW FREQUENCY ON MINCED MEAT

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Abstract. *In the article there are research results of how the low frequency electromagnetic field affects the muscular tissue of pork and beef. The pictures, justification and comparison of the received results are given.*

Keywords: *histology, muscular tissue, electromagnetic effect, tissue structure, fibers, unclear*

The analysis of the special literature data proves that nowadays one of the perspective trends of intensification the technological process of summer sausage production is applying the electromagnetic field with low frequency (EMF LF). But using EMF LF is connected with necessity to make an optimal frequencies choice, human safety, industrial applying of EMF LF, studying the influence of EMF LF on starter cultures and meat materials [1-3].

The article goal is to study histologically the effect of low frequency treatment of the pork and beef muscular tissue.

The preparation of meat materials to be treated with EMF was as follows: the trimmed beef of high quality and trimmed pork semi fat in pieces with weight up to 300 gram were put in carts and the layer thickness was 30 cm. The meat materials were electromagnetically treated for 30 minutes with frequency 100 and 30 Hz. After the treatment the received result was compared with the help of the microstructural analysis [4,5].

Studying the spine longissimus muscular of pork we received the following results. At the histological analysis of pork without EMF LF treatment we obtained the data as follows.

The muscular fibers of the spine longissimus are at the stage after the cadaveric rigidity. The main part of the muscular fibers is stretched out and has a linear form. A fewer number of fibers is curly, slightly wavy form that corresponds to the special literature sources data [6,7]. The transverse banding pattern in the muscular fibers is well marked, in some spots it is weakened because of the zone cadaveric muscular convulsive reflex. The nuclears are well colored with well identified chromatin, of oval form and placed along all the volume of the muscular fiber sarcoplasm. The connective layers are wavy with well differentiated cell endomysium elements that grees with the data of other authors such as A.M. Patiev, S.V. Patiev, A.A. Nesterenko [1,3].

Examining the beef without EMF LF treatment we received the following results data.

The muscular fibers are in different functional morphological condition. The most of them are characterized by wide amplitude waviness and the rest of them have a straitened form. In most muscular fibers the transverse banding pattern is moderately expressed. There are some fibers with

strong waviness. The nuclears are well colored and characterized by distinct chromatin. The nuclears are in bigger mass number next to sarcolemma. The connective tissue layers are wavy, closely stuck to the bundles of muscular fibers; they are more developed in comparison with chest musculars that agrees to the description of the following authors as A.A. Nesterenko, A.I. Reshetniak [8-10].

The main part of the muscular fibers is straitened and has a linear form. The smaller number of fibers is of curly and wavy form. The transverse banding pattern in the muscular fibers is well marked, in some spots it is less expressed because of the zone cadaveric muscular convulsive reflex. In the cross-section the muscular fibers form is polygonal.

At EMF LF treatment with frequency 100 Hz and time period 30 minutes the pork muscular tissue is characterized by numerous, a little bigger in the spots of the intra-bundle space and perimysium, light spaces and associating with connective tissue structures of the muscular carcass. Between the muscular fibers there is a slightly developed muscular carcass of the connective tissue. We observed a more developed processes of destructive changes accompanied with sarcolemma breaking and muscular fibers fragmentation. A small part of the muscular fibers is characterized by a significant transverse-fissured integrity breakage and raptures. Along with the initial bundles with loose fibers position there are thickened bundles of the muscular fibers. The deformation degree of the muscular fibers is limited.

The muscular fibers are often separated due to the appearance around them a light not colored with hematoxylin and eosin space or they are close to each other [11,12]. Between the muscular fibers, mostly in the perimysium part, there are small groups of fat cells of different size. The muscular fibers are characterized with moderate curliness with expressed indications of maturity and autolysis revealed in numerous transverse-fissured integrity breakage and raptures. The nuclears are well colored and in some cases are located in the non-typical for the muscular tissue places.

Analyzing by the method of the light microscopy the cooled beef after the electromagnetic treatment with the frequency 100 Hz for 30 minutes it was detected that on the longitude sections there was vague transverse banding pattern which in some spots turned into a longitude one. On the background of the linear form of the muscular fibers domination we can find moderate wavy fibers or their fragments. Sarcolemma does not preserve its continuity on the big length of the muscular fibers and raptures and destruction of the muscular fibers are frequently found. On the transverse sections the muscular fibers form is polygonal with a limited round shape or round.

The configuration of some fibers in the initial bundle is quite loose with a visual space in the endomysium part. The edge between separate muscular fibers is not always well seen. The cells nuclear of the connective tissue and muscular fibers in most cases are oval with not distinctive chromatin and they are located under sarcolemma. The destructive changes of the muscular tissue as the result of the electromagnetic treatment are expressed very significantly.

It is established that after treatment with EMF LF beef and pork with frequency 100 Hz for 30 minutes the muscular tissue is characterized by significant structure changes expressed by partial or complete muscular fiber breakage. The pH value of both samples of the muscular tissue shift to the acid side, the water binding capacity decreases, the examined samples weight changes and the microbiological seeding of the materials reduces [13,14].

Conclusions. The EMF treatment with frequency 100 Hz leads to more significant changes of the muscular structure. We suppose that such changes are caused by the resonance of the cell inner frequency and outer impact on it. Breakage of the cell integrity structure can lead to the pH value change of the tissue and protein tissue composition.

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