HISTOLOGICAL METHODS AND MEAT PRODUCTS QUALITY EVALUATION

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An increasing variety of meat products at the Russian consumer market, being produced both in plants of this country and coming from abro needs a full-value control of their quality. All these products are tested for safety during necessary certification procedures according parameters, provided by "Medical and biological requirements to the quality of raw materials and products". However, it may often be case when a processor produces a product of poor quality, or adulterated product. This occurs if the processor uses low quality meat r materials, or by-products and plant components instead of meat. Non-conformity of the real composition of the product to the claimed determined by standards for this kind of products is also possible. Such violations may not be determined in the investigations carried during certification of the products.

The methods allowing to find such inconsistencies used in scientific investigations are widely described in literature (Godon B., Valery-Mass D., 1991 et al). They include methods of electrophoresis, immunediffusions and chromatographic analysis. But they very often need expens precision equipment and so far have not been adapted to such complicated multicomponent systems, as meat products, especially the combin ones. The methods of immune-enzyme analysis give very good results. This method is particularly suitable for the determination of the spec of the meat and the determination of the presence and amount of plant additives of proteins, such as the soya ones. Nevertheless, the abov mentioned methods, though having benefits, don't allow to reveal the substitution of meat by the other animal ingredients - udder, lungs, li and other by-products; or the whole complex of different chemical compounds should be used.

One of the most objective methods of quality determination of meat raw materials and the products with simultaneous determination of the real content is a histological microstructural analysis. Histological method makes it possible to judge both about the structure of the produc a whole, and about changes, that take place in individual parts and components of the investigated objects, differentiate the peculiarities different tissue and cell structures. However, the work with food products has specific features as compared to native biological materials. T is associated with the fact that biological strucutres undergo significant changes in the course of mechanical, thermal and other kinds technological effects (Horn D., 1987, Khvylya S.I., etd, 1994).

During recent years the laboratory of microstructure and chemistry of meat of the Meat Research Institute of Russian Academy of Agricultu Sciences has accumulated a large practical experience of microstructural identification of the composition of different meat products and of influence of technological processes on the strucutre of the components present in them. Not requiring a complicated equipment this method histological analysis allows to get rather quickly comprehensive responses about the quality and real composition of the most meat products.

The preparation of the material for the microstructural analysis contains several methodical steps which depending on the type of the produc studied, degree of comminution of the components and their arrangement have some peculiarities. Besides, the selection of the method preparation of the product for the investigations is determined by the requirements of fastness, depth of the analysis and its directionality necessity of obtaining of only qualitative or quantitative characteristics. The fixation of the material studied can be carried out in accelerate mode at elevated temperatures, (sometimes with volumetric or structural deformations), or according to the accepted in histology classic ways. Some types of products can be cut in cryomicrotome just after the fixation, but only in case they don't require special impregnation strengthening the blocks. Other need the additional enclosure in a sealing gelatin, celloidin, parrafin, etc. Besides, depending upon the purpose of the investigations different ways of differentiating staining of the obtained sections can be selected.

A practical histologist, connected with arbitration and certification procedures of the meat raw materials, semi-prepared and prepared food very often faces the following problems:

The substitutions of the ground meat by the meat mechanically collected from the bones were often revealed. Or the meat of slaughter anim was fully or partially substituted by the poultry meat. Such substitutions are revealed by the presence of multiple bone particles (Fig. 1A) a by the localization of nuclei in muscular fibers as related to sarcolemma. In sausage products the content of connective tissue was oft increased, or some components were used that are not provided by the Russian requirements for such products.

These may be by-products and plant components - starch (Fig. 1B), flour and protein isolates. In such products the content of the muscul component can be decreased by volume to 3-5%.

Similar unallowed substitutions including by-products can also be encountered in canned meats (Fig. 1C). The analysis of ham products oft reveals the essential by volume substitutions of meat by plant additives - flour, starch, protein isolates, etc, decreasing the quality of the produ as compared to the claimed one.

Sometimes a necessity of the determination of the causes of sausages spoilage arises. Then by the site of microflora development a microstructural changes in the sausage batter the histologist can determine, whether the spoilage was associated with use of contaminated ra materials or due to violations of storage conditions (Fig. 1D).

In addition to quality evaluation of the state of meat raw materials or the composition and characteristics of meat products, using the method histological analysis, one can determine its exact quantitative composition by the most of the components. The presentation of such information can be realized in the simplest form as a verbal characteristic, as this provided by Food legislation of Germany (§ 35 LMBG). Or it is given in strict mathematical form as volume percent. With the present state of the development of systems of computer image analysis such assessme is not too difficult.

Histological method of evaluation of raw materials quality and the composition of meat products is used in many countries, but, unfortunate during research work. From our point of view this method should have a wider law basis, such as provided by Food Law of Germany (§ 3 LMBG, Kuschfeldt D., 1986). At the present time, in Russia the method of histological analysis is legalized in the provisions of GOST 1949 93. At the present time the work is in progress on the development of the State standard of the histological method of the identification of t real composition of meat products, that is urgently needed because of the expansion of the flow of products to the consumer market, hav unconventional composition or those, which have a composition which is not based on technological regulations. At the same time t technical abilities of a histologist which have grown during the latest time make it possible to carry out such investigations quickly and with high degree of accuracy.

References
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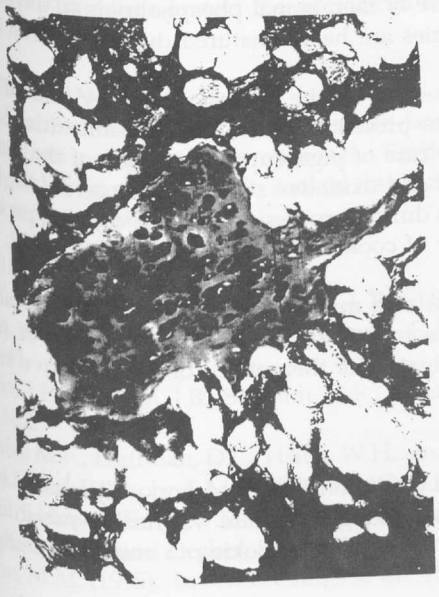
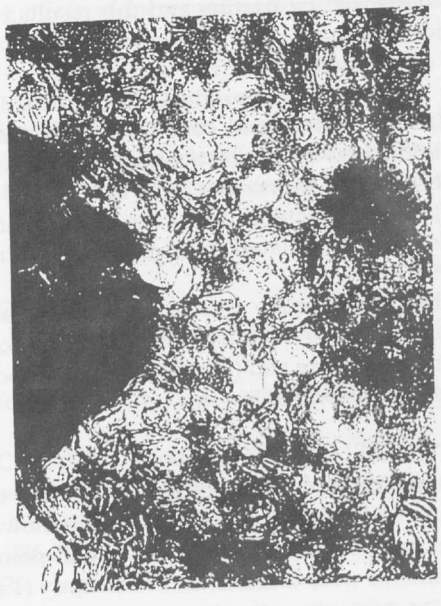
Fig.1. Microstructure of some components of meat products.

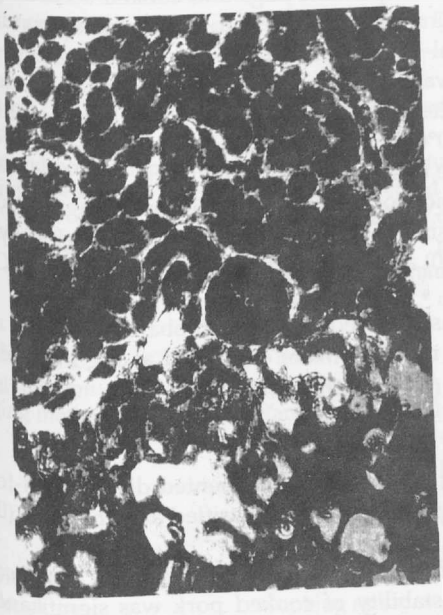
A - cartilage in sausage



B - starch in ham



C - kidney in canned meat



D - microflora in sausage