THE BIOCHEMICAL INVESTIGATIONS REGARDING THE FOOD SAFETY WHICH HAPPEN IN THE MEAT DURING PROCESSING TECHNOLOGY

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Abstract: The study followed the most important modifications which take place especially in the protein, the lipid and glucide system but also those of other compounds from the structure of the meat in order to realize an evaluation of the innocuity and nutritional state of the meat in each stage of the processing technology. The desired modifications, morphostructural and biochemicals, which are produced in the food raw materials during the technological stages of processing, are the result of the conjugate action of the tissue and bacterium equipment, conducted with competence by the technologist, using performing equipments.

The researches were undertaken in the following directions: the biochemical proteolysis processes identification during the rigidity and maturity installation, as well as during the processing stages; the changes evolution in the sugars system in the muscular rigidity period respectively in the maturity period; the colour meat transformations.

INTRODUCTION

The foods destinies of the human consumption must finding in a triple hypostasis: should feed, should like and should be without noxious factors for the health.

The metaphoric notion “food health”’ is indissoluble connected of the human health, being one of the most important influence factors of ours days. No casual, at the International Conference of Nutrition organized by FAO/OMS at Rome, in December 1992, where 159 states were participated, inclusively Romania, was synthesised the final declaration and the world logistic action plan concerning “Food security”. The declaration signed also by the Romanian government forecast the politics elaboration in this meaning at the each state standard.

The food safety systems establishing represent a national priority because this is the fundamental stone which stay at the base of the public health building. There is evidence in this sense the state organisms which are instituted, respectively the crowd of the law documents elaborated at the last.

For Romania, the passage from the food raw material export to the finished products export is conditioned by the insurance and the guarantee of the quality safety production, inclusively from the salubrity point of view.

The UE countries were adopted the quality system, and the market “actors” assign the important resources for the creation and for the implementation of such systems. The obtaining of the quality certification and the implementation of the modern systems of quality management represent for the food companies the “passport” for the entrance on the European Union market.

The progresses in the quality field of industrial processing of foods can’t be possible without the knowledge development in dynamics domains such as food microbiology and
food biochemistry. The biotechnologies applied in food industry are based on the results of enzymology researches, of fermentative and adulteration processes of microbiology researches, of starter cultures utilisation, all being destined at the obtaining of the superior quality foods. Proteins are very quickly disorganized by the action of the intracellular proteolytic enzymes and the autocatalytic complex [2,10] and then by bacterial and mycolithic enzymes.

The proteolytic process can be described by the decrease of the total nitrogen content and the accumulation of free ammonia and amino-nitrogen [6]. These biochemical modifications are time dependent. They can be also influenced by many environmental parameters. Temperature is one of the most important one. The higher the temperature is, the higher the activity of the enzymes, and the quicker the proteolysis.

The sensorial and nutritive value of the meat is enriched after some transformations in its molecular systems during the muscle rigor and ageing. The specific transformations are depending on the animal health and are evolutionary processes depending on the time after slaughtering [6].

The most important carbohydrate of the meat muscle is glycogen (animal starch). Its amount in the muscle tissue is less than 1% (0.3-1.3) and diminishes in the carcass post mortem [8,9]. The glycogen results from glucose, being the storage form of the carbohydrates for the muscle activity in animal tissue. It is decomposed post mortem in lactic acid which lowers the pH [4].

The colour of the meat on its chemical structure, on its myoglobin’s contained and on myoglobin’s chemical state. The structure of the muscle together with its pH influence the absorption and the incidental light diffusions that is a more intense colour. [2]

MATERIAL AND METHODS

To evaluate the dynamics of the protein-system of the meat, there was used the biochemical analyses of the total nitrogen content of the meat using the Kjeldahl method, perform every 24 hours during an experimental period of 168 hours. These analyses were made to identify the transformations of the protein-system during the muscle rigor and the maturation at refrigeration temperatures.

There were made also investigation on samples from muscles of pork, adult beef, young beef and chicken thigh. The samples were also cropped 1 hour after slaughtering or immediately after slaughtering the chicken. After cropping a range of samples were stored at 18 - 20°C and another one at 0 - 4°C.

In order to determine the pigment concentration in meat, the spectrophotometric analysis of watery meat sample was used according to the method of Braunard. [1] It has been used meat of two species: porcines and bovines. Within the same species it has been taken samples of different muscles: trapez cervical, obliquus extern, longissimus dorsi. [5]

Specific quantitative methods: spectophotometric for the glycogen, iodometric for the lactic acid were used to analyze the level of these molecules during the biochemical transformations of the meat after slaughtering.

For the determination of the lactic acid content, there was used pork meat samples cropped immediately after slaughtering. The analyzes were performed 2, 24, 48, 72 and 96 hours post mortem.
RESULTS AND DISCUSSIONS

The results of the performed determinations showed that the value of the protein content, reflected by the value of the total nitrogen, decreased during the preservation time. There were differences in the protein content from to the other specie.

The ham had a protein content, quantified as total nitrogen, lower (2.88g %) than the adult beef round (3.08g %) and the young beef round (2.93g %). The chicken thigh had the lowest value (2.71g %).

![Graph showing protein content over time](image)

**Fig. 1 – The evaluation of the protein content during the muscle rigor and aging of the pork, calf, beef and chicken**

The younger animals had lower protein content than the adult ones, maybe because the first had lower dried substances content and higher water content: adult beef round (3.08g N total %) and young beef round (2.93g N total %). (Fig.1)

The beef meat, in comparison with the pork meat, had a higher accumulation of ammonia (10.3 mg% and 9.3 mg %) and a lower ammine content (93, 4 mg% and 126, 3 mg %).[7]

The storage temperature of the meat during the muscle rigor and ageing influenced the proteolyses. (Fig. 2)

The process was accelerated by high temperatures, 18-20°C. (Fig.3) The sub-products, because of their processing modus, had lower protein content than the meat they were made from and higher ammine and ammonia accumulations after 24 hours of ageing.

The evolution of the molecular system involved in the color of the meat during the muscle rigor and ageing was analyzed comparative in different kinds of muscles from pork and beef meat and from animals of different ages and species.
The proteins content, g/100g

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<th>Time postslaughter, hours</th>
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On the basis of the equations established by mathematic modeling there could be made predictions on the content of different components of the pigment system at different times of storing the muscles.

The evolution of the myoglobin pigment after slaughtering had a variation correlated with the modification of the meat pH value.
Every specie had a special amount of different heminic pigments. The beef meat had a higher total pigment amount (0.84mg/g) than the pork one (0.28mg/g). At young animals the color was light (0.64mg/g), because the muscle fibbers is richer in miofibers. [3]

The metabolic type of muscle influenced also the myoglobin content: the cervical muscles (trapeze cervical) and the abdominal muscles (obliquus extern) are darker than the sublumbars muscles (longissimus dorsi). (Fig.4)

The transformations of the glucide molecular system components in pork and beef meat during the muscle rigor and ageing were analyzed by the correlation between the decrease of the glycogen amount and the increase of the lactic acid amount. In the first 24 hours the glycogen content decrease massive, over 87% of the initial value. After 2 hours, the glycogen content was higher in the gluteic muscle (12.10 mg/g), longissimus dorsi (12,39 mg/g) and psoas ones (11,4 mg/g), which have a glycolytic metabolism, than the supraspinatus muscle (10,80 mg/g). After 72 hours the decrease is lower because the glycolitic enzymes were inactivated by the increased acidity of the meat.

CONCLUSIONS

- Every stage of the technological process is characterized by some transformation which take place in the structure and composition of the meat, all these being evaluated by Physical, chemical and microbiological parameters.
- The continuous monitoring of all parameters, which show the quality of the meat and meat products, is very laborious, but the accomplishment of this request leads to the safety of these products and the impact they have on consumers' health.
- The total quantity of the proteins falls more rapidly when the meat is deposited at a temperature of 18-20°C, in compare to refrigerated storage at 0.4°C.
- Regarding the analyzed species, the conclusion was that each is characterized by a special protein content presented as total nitrogen.
The younger animals had lower protein content than the adult ones, maybe because the first had lower dried substances content and higher water content.

The storage temperature of the meat during the muscle rigor and ageing influenced the proteolyses. The process was accelerated by high temperatures.

Every specie had a special amount of different heminic pigments.

The pigment content increased with the age animal age, so that the meat had a darker color. In every kind of meat the pigment quantity was direct related with the sarcoplasma content of the muscle fiber cell.

Each species had special glycogen content. The pork muscles had a higher content than the beef ones animal age, so that the meat

BIBLIOGRAPHY