COMPLEX OF TECHNOLOGIES FOR ANTIMICROBIC PROTECTION OF MEAT PRODUCTS SURFACE

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Background

Health of a human being is largely dependent on the quality of foods being consumed. Wholesome and high quality meat products containing required and balanced level of food ingredients are beneficial for normal vital functions of people, prevention of different diseases, negative effects of unfavorable factors of the environment, different stresses among them.

At the same time meat products can contain a large number of substances potentially hazardous for the health of people. Noxious substances enter them both from water, air, soil, and as a result of processing of the raw materials including the stages of storage, transportation, packaging and marking of final meat products. The consequences of unfavorable ecological and industrial effects on meat products can be eliminated only with the provision of reliable protection at all the stages of production, transportation, storage and distribution of foods.

Objectives

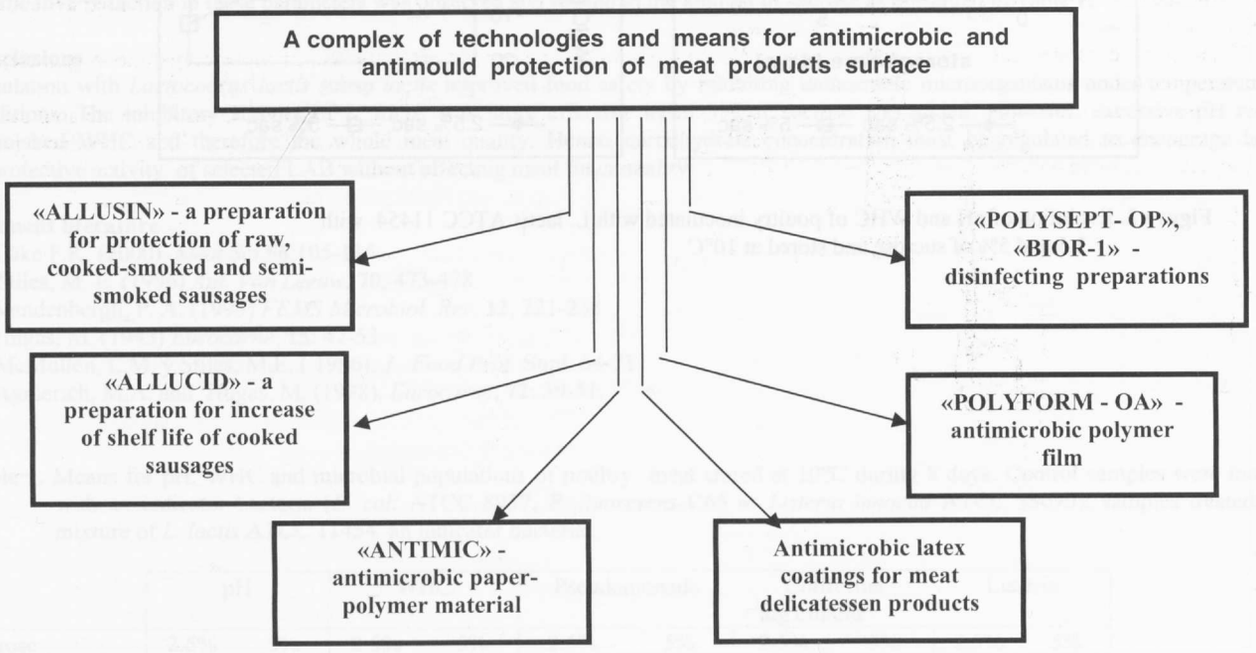
A complex of technologies and antimicrobic means designed for long-term and reliable protection of surface of meat products from toxin-forming microorganisms is considered in the paper. The presented technologies and means of antimicrobic protection of meat products have been developed in recent years at Polymer laboratory of the Moscow State University of Applied Biotechnology (MGUPB).

A scientific concept of antimicrobic and antimould protection of the surface of meat products has been developed. Its practical use suggests the accomplishment of the following complex actions:

- direct treatment of meat products surface with antimicrobic and antimould compositions containing minimum amount of preserving additives;
- introduction of antimicrobic additives into the composition of high-molecular compounds, particularly into polymer films, latex compositions for the improvement of their operational characteristics, decreasing of toxicity of preserving additives and control of velocity of their migration onto the surface of the product;
- immobilization of antimicrobic preparations on the surface of protective casings and films by different methods (for example, by soaking of casings in solutions of protective preparations before forming of sausages, applying of antimicrobic solutions on the surface of the formed sausages, etc.);
- carrying out special sanitary-hygiene procedures aimed at the reduction of microbial contamination at production and warehouses areas, cold stores in wholesale and retail trade.

Based on the investigations of the authors and literature data about antimicrobic, antimould activities and activities against yeast of traditional and new preserving additives the promising compounds have been chosen and on their base the formulations of antimicrobic preparations have been developed for use for protection of the surface of specific foods, particularly of sausages (scheme). For example a technology for modification of sausages casings "Allusin" provides for a reliable antimould protection of the surface of raw, cooked-smoked, semi-smoked sausages and other delicatessen meat products during production, storage, transportation and distribution (Patent of RF №2151514).

Scheme



The exclusive technology of treatment of natural animal and artificial fibrous casings with antimicrobic preparation "Allucid" makes it possible to increase the shelf life of cooked sausages manufactured according to Russian traditional technologies from 2 to 8 days. The investigations of strength characteristics of fibrous casings "Belcosin" and "Fabios" carried out at the Polymer Laboratory of MGUPB have shown that the use of this protective preparation doesn't have a negative effect on the quality of the casing itself (Patent of RF №2151513).

In the development of the formulations of protective compounds besides studying their antimicrobic properties the fraction of preservatives which migrate into the product and influence some of its ingredients was taken into account.

For the quantitative evaluation of migration of antimicrobic additives into products a special method of determination of the contents of preservatives using a gas-liquid chromatography as developed at the Polymer laboratory of MGUPB was used. The application of this method has shown that for the optimum formulations of antimicrobic preparations the amount of preservatives in the surface layer of the product is lower than the concentrations recommended by the Institute of Nutrition of RAMN.

The authors have carried out the analysis of fat layer under the casing of sausages. Taking into account the complex chemical composition of meat products and of their fats the investigations were carried out using such sensitive methods, as highly efficient gas-liquid chromatography and chromato-massspectrometry. The results of the experiments have shown that the antimould treatment of surface of sausages with the preparation "Allusin" helps in preservation of the fraction of unsaturated fatty acids in the layer under the casing of raw sausages which are very important for prophylaxis of various diseases of people, for example ischemia, atherosclerosis, psoriasis, thrombosis, etc.

To decrease migration of preserving additives into the product the methods of their immobilization into highly molecular compounds have been developed. Based on the example of latex and polymer films it was established that such approach is effective because it allows to fix the preservative securely on the border: protective film – product.

Special heat shrinkable packaging materials have been developed at Polymer laboratory of MGUPB possessing high protective properties together with resistance to biological corrosion, and ecological and hygiene safety. New multi-layer packaging materials of series "Polyform", mark OA, feature a high antimicrobic, antimould activities and activities against yeast. They are designed for packaging, (including the vacuum one) of ready meat and fish delicatessen products, sausage products, hard and soft cheeses for their long storage and also for maturing of hard cheeses (Patents of RF №2136562 and №2136563).

Latex coatings with antimicrobic properties as formed directly on the surface of ready sausage and meat delicatessen products, hard rennet cheeses ensure their reliable protection from xenobiotics, contamination with undesirable microflora and mechanical damage during production, storage, transportation and distribution. Owing to the introduction of antimicrobic additives into latex compositions, their operational properties are improved, for example, viscosity is increased, the processes of film formation are accelerated.

The use of new formulations of preservatives as modifying additives in the latex composition allowed to use it as antimicrobic coating in production of a new combined heat-shrinkable paper-polymer packaging material "Antimik". This material is designed for packaging of dry products (tea, coffee, concentrated foods, flour, bakery and confectionery items, etc.), as well as medicinal, pharmaceutical products (dry products forms, including dry medicinal herbs) hygiene products, seeds (Patent RF №2163558).

The developed antimicrobic packaging materials and antimould compositions for protection of surface of different foods, including meat and dairy products are promising for the increase of shelf life of products, as produced with their use.

The effective protection of surface of the products is reached only in combination of the indicated technological means, packaging materials with antimicrobic properties with the implementation of a series of necessary sanitizing procedures on disinfecting of production and warehouse areas, drying equipment, cold rooms, points of sale. With this aim special disinfecting preparations of long action "Polysept-OP" and "BIOR-1" and the technology of their use at food enterprises are developed in Polymer laboratory of MGUPB). These preparations are recommended for disinfection of different building structures, the surface of equipment, inventory, they can also be used as an antimicrobic additive in lacquers, paints and whitening.

These antiseptics form a biocide film of prolonged action on the treated surface. The use of disinfectants "Polysept-OP" and "BIOR-1"eliminates the possibility of any damages of materials, change of color, appearance of odor, corrosion, allergic reactions of the personnel.

There is a necessary technical documentation and corresponding hygiene certificates for use of these preparations in different industries of national economy.

The developed technologies of antimicrobic and antimould protection of the surface of meat and other foods find wide application at the processing enterprises of agri-industrial complex, in food trade both in Russia and in the countries of CIS. The technology of protective processes is extremely simple and practically doesn't increase the production cost of products.