

PROBLEMS AND PROSPECTS FOR USE OF STARTER CULTURES IN PRODUCTION OF TRADITIONALLY NON-FERMENTABLE PRODUCTS

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Background. Starter cultures of bacteria are widely used in the production of raw, raw-dry and sometimes cooked sausages in order to prevent the development of undesirable microflora, improve the quality and increase the storage life of meat products (6, 8). There are reports about positive influence of starter bacteria cultures on storage life, numbers and species of microflora of the ground meat (7). Bacterial preparations (ПБ-СК; АЦИД-СК) (1) for sausage fermentation are developed in this country; their new types are proposed for the treatment of low-grade raw materials, that are subsequently would be used for the production of semi-smoked and raw sausages (2,3). However, the problems of use of bacterial starter cultures in the processing technologies of cooked sausages, ground semi-prepared meat products (especially, during processing of meat with high pH, so called DFD meat) which are the foods with limited storage life, so far have not found due consideration. It should be noted that in addition to the criteria for starter bacterial cultures used in the fermentation of traditionally fermented foods (first of all, antagonistic activity, resistance to low temperatures and effects of NaNO_2), the microorganisms which are used in the production of cooked sausages and chilled ground meat semi-prepared products should have moderate or weak ability of aroma or acid formation. Otherwise, the flavour and aroma of the products will differ from traditional ones and will not be accepted by the consumers.

An important consideration is the resistance to antibiotics that are widely used in animal husbandry and veterinary, and the residues of which are often found in animal products (9,10). The contamination of meat products with antibiotics residues in our country is rather great - 10-11% (according to data of Gossanepidnadzor) (4). As a result, a series of medical and biological problems arose and first of all, the spread of antibiotic-resistant strains of pathogenic microorganisms, including bacteria of genus *Salmonella*. Use of lactic-acid bacteria with desired properties as starter cultures in the manufacture of traditionally non-fermentable meat products will make it possible to solve the problem to some extent.

Objective: To determine the possibility and practicability of using bacterial starter cultures in the production of cooked sausages and ground meat semi-prepared products the strains of lactic acid bacteria were isolated and their biological properties were studied.

Materials and methods: In the course of the experiment 17 cultures of lactic acid bacteria were isolated from meat raw materials (initial pH of meat - 6.3 - 6.5). By their morphological, cultural and biochemical properties the selected strains of lactic acid bacteria were identified and attributed to *S.lactis* (st. 1,3,6), *S.diaceitilactis* (st. 4,5,8), *S.cremoris* (st.16), *S.thermophilus* (st. 7, 17), *Lb. plantarum* (st. 9,11,13,14), *Lb.lactis* (st. 2,10) and *Lb.acidophilus* (st. 12,15). In selecting the promising strains for the production of cooked sausages and chilled ground semi-prepared meat products the antagonistic activity was determined by the method of diffusion on agar according to the degree of inhibition of growth of test-cultures of bacteria *S.aureus* (st. 209), *Ps. aeruginosa* (st. 47), *E.coli* (st. 840) resistance to sodium chloride - by the presence or absence of growth on the agar with hydrolyzed milk and chalk, containing from 1 to 9% NaCl ; the degree of acid formation - by the accumulation of the acid in the milk clot ($^{\circ}\text{T}$), aroma formation - by the zones of clarification on a medium with potassium citrate.

Results and discussion: As a result of the investigations it was found that *S.lactis* (st. 3), *S. diaceitilactis* (st. 4), *Lb.plantarum* (st. 11) most fully corresponded to the claimed requirements. All the selected strains possessed the resistance to low temperatures, sodium chloride, moderate energy of acid and aroma formation, pronounced inhibiting properties with regards to test-cultures (Fig. 1,2). Joint culturing of the selected cultures of microorganisms showed that the strains were good symbionts and demonstrated most fully the previously found properties, characteristic of each culture.

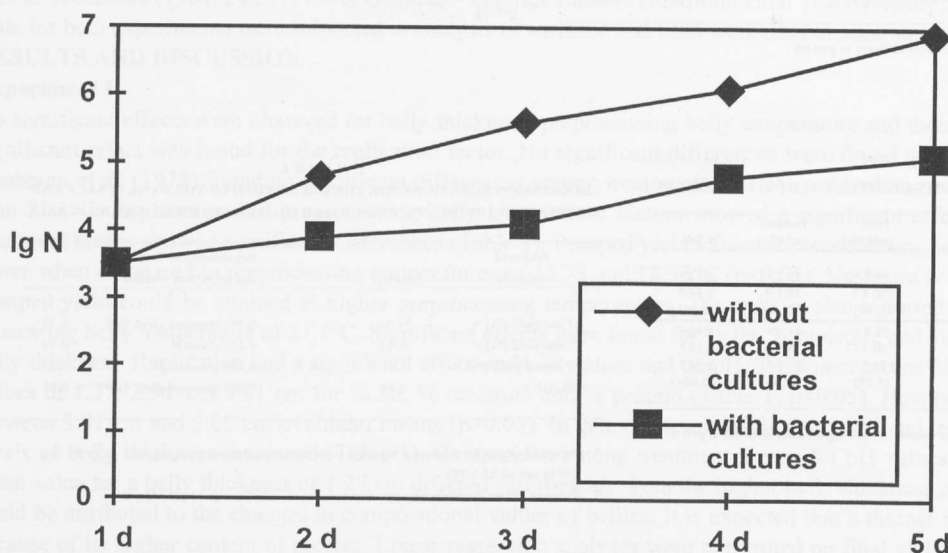


Fig. 1. Change of *E.coli* count in meat raw materials during storage at 6^o-8^oC.

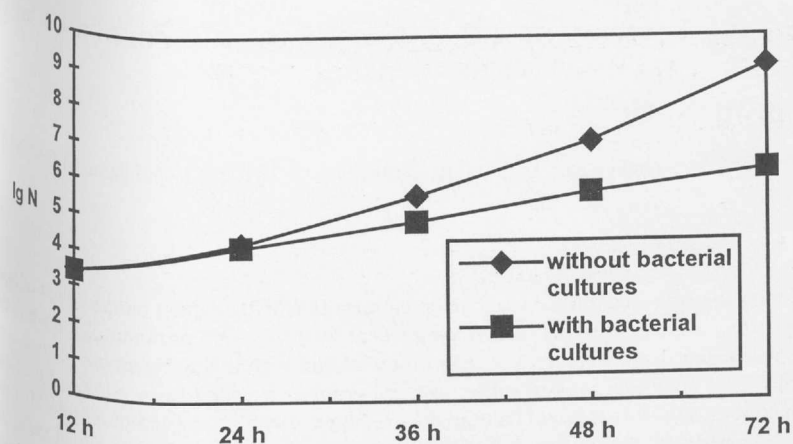


Fig. 2. Change in the the count of *P. aeruginosa* in meat raw materials during storage at 6°-8°C.

A composition of cultures *S. lactic* (st. 3), *S. diacetylactis* (st. 4), *Lb. plantarum* (st. 11) was selected for use as bacterial starter cultures in the production of cooked sausages and chilled ground meat semi-prepared foods. The introduction of bacterial cultures at a concentration 1% into the raw materials volume in the manufacture of chilled ground semi-prepared meat products and cooked sausages resulted in pH decrease by 0.15-0.20, that practically did not influence the moisture-binding capacity of the ground meat.

The sensory evaluation of the cooked sausages, as manufactured with the use of selected mixture of bacteria has shown that the added composition of lactic acid bacteria led to the formation of brighter colour. Ready products as obtained after heating the semi-prepared products with bacterial starter cultures possessed soft, juicy consistency, good taste and aroma.

Evidences of spoilage during cold storage of the semi-prepared foods with bacterial cultures came 2 days later as compared to the control samples (without starter cultures).

Studying of the group composition of microorganisms has shown that a change in percentage of microorganisms occurred during storage: lactic acid bacteria prevailed in experimental samples, while in the control ones - gram-negative and spore-forming microflora.

The obtained results suggest the possibility and practicability of use of bacterial starter cultures in the production of cooked and chilled ground semi-prepared foods with the aim of quality improvement, increase microbiological safety and storage life and are the basis for further investigations in this field.

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