

ANTIMICROBIAL PROTECTION FOR FOODSTUFF'S SURFACE - GENERAL FACTOR OF THE NUTRITATION CULTURE
IN THE FUTURE

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One of the main causes of the deterioration of quality and nutritive valuability of meat and dairy products is the impact of moulds, fungi and other microorganisms on their surface.

Traditionally the different preservative additives are used for foodstuffs protection from microbial deterioration, the efficient concentrations of which excess in the some cases the hygienic standards (limits). The existing tendency to the decreasing of quantity of the synthetic ingredients including conservants in food demands the special detail investigations of foodstuffs protection against the contamination with undesired microflora.

The research program on the antimould protection of meat products surface include the next directions:

- immediately (at once) treatment of foodstuff's surface by antimicrobial and antimoulden compounds, involving minimal (minimized) quantities of preservative additives;
- the immobilization of conservants to the surface of protective coverages (casing, coating, film) from natural and synthetic polymer to regulated changes of their properties (f.e. solubility and migration into foodstuffs) and to decrease the conservant toxicity.
- the implementation of sanitary procedures to reduce the microbiological effort in production, freezing, storage and shopping areas.

The first part of investigation was dwelt to exploration of antimicrobial and antimoulden properties of new preservative adds in comparison with traditionally and most commonly used conservants. By application of microbiological analyzer «Bioscreen» it was determined the minimal inhibiting concentrations and concentrations which completely suppress the growth of vegetative cells of tested microorganisms; it was investigated the number of preservative additives in comparison with sorbinic acid and its salts.

Under production conditions the most dangerous are the conidia and yeast. Due to that, we studied the antimoulden properties of chemical conservants on solid nutrients with help of special methods. The elaborated evaluation of antimicrobial activity of traditional and new conservants showed that the best antimoulden properties have the Na-salt of dehydroacetic acid (DAS). On the table the zones of conidia inhibition by sorbinic and dehydroacetic acids are exhibited.

Table 1

Studied preservatives	Concentrations, %	The zone of conidia inhibition, mm			
		2 days	3 days	4 days	5 days
Sorbinic acid	0,5	1	1	0	0
	1,0	1	1	1	0
	1,5	2	1,5	1,5	1
	2,0	2,5	2,5	2,0	1,5
Dehydroacetic acid	0,5	15	15	10	8
	1,0	15	15	11	8,5
	1,5	15	15	14	12
	2,0	15	15	15	15

For the manufacture of DAS with necessary purity and toxicity the special technology of synthesis and clearing of substance was developed. DAS with excellent physico-chemical and microbiological properties was produced via this technology. Suggested DAS has been certified and was recommended as surface preservatives for foodstuffs.

The next stage of investigation had the goal to minimize the efficient concentration of DAS via the combination with commonly used concervants such as sorbats, benzoats, food acids, antioxidants. As the result the number of promising compounds was developed; new compounds were applied for protection of foodstuffs surface (sausage, meat products, cheese). The correct choice of protective compositions have to provide the limited migration of conservant into food and interaction between preservative additives and foodstuffs components.

The DAS migration from protective casings into food was researched by method of gas-liquid chromatography (GLC) which has been developed in MSUAB laboratory. As it was shown by the GLC-method the residual quantity of DAS in product surface lay is the considerably smaller (by 10-20 times) than specifications value. Such low migration of DAS into foodstuffs can be attributed to DAS immobilization in polymer matrix of protective casing (films, coatings etc.). For example, the natural sausage casings are impregnated by suggested compounds before stuffing. This way was applied under production conditions for protection of smoked sausages.

The particular interest presents the fact that suggested treatment have the positive influence on composition of fat acids in undercasing lay of sausage. So, this impregnation provides the keeping of fraction of unlimited fat acids that as it's known, increases the nutritive valuability of foodstuff.

The second research direction supposes study of DAS immobilization in matrixes of synthetic materials formed from latexes and melts of polymers. The materials in forms latex coatings on foodstuffs surface and films produced by extrusion included the DAS; and by GLC-methods it was shown that DAS is strongly fixed in polymer structure on the boundary «film-food», as the result the DAS migration into food medium is absent. The supplementary merit of materials modified by DAS is the increased value of mechanical properties without change of permeability.

The developed methods for conservant immobilization allow not only to decrease the toxicity and to regulate the transport antimicrobial agent but make possible the increasing of storage terms of foodstuffs in modified polymer packages.

The implementation of number of sanitary operations in-plant areas is one of the main factor for foodstuffs protection against the contamination by unwanted microflora. The combination of such procedures supports the reducing of microbiological effort (contamination) and keeping food fresh for longer time.

The technology of new disinfectant production «POLYSEPT» was developed. The active substance (the base) of developed agent is polyhexametilen guanidin chloride. «POLYSEPT» is characterized with reduced concentrations of low molecular impurities forbidden for application in food industry. The interested distinction of developed agent is its adjunct for new type of disinfectants based on high molecular biocides. Polymer base shows a low volatility and stability during storage in forms of water solutions. Polymer nature makes available the formation the film (coating) on treated food surfaces that supports prolonged biocidic effect.

«POLYSEPT» can be applied for disinfection of walls, ceilings, floors, constructions, equipment surfaces, inventory; it can be added as biocidic agent into lacquers, paints, whitewashes, etc. «POLYSEPT» has been approved for meat, dairy and poultry plants as well as shops under different climatic zones and different weather conditions. The example of agent's effective action is the result of analysis of washes from walls clad with glazed tiles in meat plant. As it's shown, «POLYSEPT» application (1% water solution) decreases the quantity of bacterias and moulds after 3 months in more than 30 times. The cleaning of struts for sausage hanging (in smoking chambers) maintains the required sanitary level during all production stages.

Table 2

Place of sampling	Concentration of «POLYSEPT»	Quantity of microorganisms' cells on 1 sm ² of surface				
		Before treatment	After treatment within			
			2 days	2 weeks	1 month	2 month
Wall clad with glazed tiles	1,0	3,80 / 3,25 *)	0,10 / 0,08	0,13 / 0,10	0,18 / 0,15	0,20 / 0,16
Struts for sausage hanging (in smoking chambers)	5,0	Before treatment	1 day	3 days	5 days	10 days
		30,0 / 15,0	4,0 / 0,2	10,0 / 2,0	10,5 / 4,0	12,0 / 10,0

*) The first number (before slant) is the quantity of bacterian cells, the second number (denominator) - same for moulden cells.

So, the new combined approach of protection of foodstuffs surface has been developed by authors. Suggested approach consists of treatment of production areas with «POLYSEPT» and local protection of foodstuffs surfacs with polymer casing or coating modified by DAS. Developed approach has been approved for smoked sausages and cheese.