STUDIES ON THE MICROFLORA OF STERILIZED CANNED DISHES

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ABSTRACT: The technology for preparing of sterilized ready-to-eat canned dishes includes preliminary cooked processing of raw materials, during which the initial microflora decreases from 10^5-10^7 kl/g to 10^2 kl/g. After sterilization of the finished product, only in 8% of the packages are established spores to 10 kl/g of mesophile aerobic microorganisms. In samples, inoculated with spores of Cl.sporogenes 25 and Bac.stearothermophilus, and sterilized in vertical static autoclave and in rotating autoclave (rotomat) with control and rendering units, according to examined thermal regimes, viable microorganisms were not detected.

INTRODUCTION: Thermal sterilized meat/vegetable canned dishes occupy greater part of existing nutrition, nevertheless the use of other new methods and means of canning. Because of specificity and variaty of raw materials and technological regimes of these type products, there must be expected some peculiarities in residual microflora, which will be a foundation for making corrections in definite production stages. The optimization of thermal regimes will assist in killing or maximum inhibiting of the available microorganisms at the best preservation of nutrition and flavour properties (Flaumenbaum, 1965; Dean, Evans 1976; Stambo 1975; Wirth, Leistner, Rödel, 1975).

MATERIALS AND METHODS: The examination of raw materials and finished products, as well as the manufacture of meat products without casings - "Ljutenki", "Birenki", "Frikadelli" and "Apetitki" - is carried out at industrial conditions, in a meat processing plant. The four assortments are produced according to developed from us technologies and formulations /Glavev et al., 1978; Manev et al., 1976/, line /"Seffelaar & Looyen B.V."/, as the differences are determined from the quantitative relationships between the meat raw materials types and the seasonings. These meat products are completed with four types dressing: tomato sauce, peas, French beans, kidney beans and different vegetables, which also are subjected on preliminary cooked processing as semiready-to-eat products. Sterilization of the finished cans was conducted according to examined thermal regimes in vertical static autoclave and in rotating autoclave (rotomat), equiped with control and reading mechanisms. Microbiological investigations of raw materials and finished products are carried out according to accepted standard methods, described in BSS, ST of COMECON and ISO and according to modern microbiological methods and requirements in order to determine different groups microorganisms, as the cans are passed through thermostat 10 days preliminary, at 37°C. In order to determine the safety of sterilization regimes of finished dishes, part of cans are inoculated with spore suspension of standardized strains of Cl.sporogenes 25 , and other part with - Bac.stearothermophilus. In the filling mass is added such a part of reduced twomilliard strain suspension,

so that 10^4 spores/1g product must be received. Before microbiological investigation, the cans pass through thermostat for 10 days at 37°C, and these, which contain spores of Bac.stearothermophilus, the last three days are placed at 55°C. Sterilization is carried out in vertical static autoclave at 121°C and in rotating autoclave (rotomat) at temperature of heated medium - 121°C, 125°C and 130°C, where for the different assortments is ensured F_o - effect between 10 and 25.

RESULTS AND DISCUSSION: It is known, that at the process of meat communition and its mixing with seasonings and ingredients, the bacterial counts of meat mass increases significantly. Regarding this, the data, presented in table 1, do not differ substantially from the results of numerous investigations in this field /Baird Parker 1963, Bergey's 1974, Heidmann, Reichert 1969, Reichert 1978, Seelemann 1954/.

Table 1.-Microbiological characteristic of raw materials, designed for production of meat products without casings

Meat mass designation	Total count	Spore-forming mesophile aerobe Total	% from total count	Coliforms /titre/	Spore-forming anaerobe in 1 g
1.Ljutenki	$2,85.10^5$	550	0.19	10^{-4}	0
2.Birenki	$9,2.10^6$	1700	0.02	10^{-3}	0
3.Frikadelli	$7,4.10^4$	1150	1.55	10^{-2}	0
4.Apetitki	$9,5.10^5$	1400	0.15	10^{-4}	0

Note: The data are average arithmetic from 5 examined samples. More interesting in this case is the availability of spores and mesophile aerobic microorganisms, which are the prevailing group in thermal treated food products. Because they are with predominantly soil origin, their availability in meat raw materials is insignificant and in this case presents 0.02-1.55% of total quantity available microflora. The low percent of these microorganisms gives possibility to use comparatively "milder" regimes of thermal treatment. Coliforms, as indicated microorganisms, are in normal quantity at the use of fresh obtained raw materials. Their titre immediately increases after breaking of technological regimes or use of raw materials with high bacterial counts. The availability of anaerobic mesophile microorganisms also is doubtless, regarding quality of raw materials, designed for processing. During cooked processing of ingredients, designed for cans in boxes /table 2/, the great part of available microflora is killed and the total microorganisms counts declines from 10^5-10^7 kl/g to 10^3 kl/g product. In this residual microflora prevail spore-forming aerobic microorganisms, as their relative share is significantly higher in meat ingredients, where exist more protective factors. In dressings this ratio is a bit different because of different principle,

according to which is carried out their processing.

Table 2.-Microbiological characteristic of ready-to-eat meals, designed for production of ready-to-eat sterilized foods

Type of ready-to-eat meals	Total count	Spore-forming aerobe Total	Spore-forming aerobe % from total count	Coliforms in 1 g	Spore-forming anaerobe in 1 g
I.Semiready-to-eat meat products without casings:					
1.Ljutenki	3.400	820	24.1	0	0
2.Birenki	1.450	600	41.4	0	0
3.Frikadelli	1.900	900	47.4	0	0
4.Apetitki	7.828	1.458	18.6	0	0
II.Dressings:					
1.Tomato sauce	200	66	33.00	0	0
2.French beans	3.150	50	1.53	0	0
3.Kidney beans	4.060	85	2.09	0	0
4.Vegetables	1.325	25	1.90	0	0

In this respect the exception is tomato sauce dressing, which is close to meat component regarding the procent of spore-forming microorganisms (33%), but in contrast to other dressings it has low bacterial counts (200 kl/g). Coliforms bacteria are not established in the samples, which show not only a good thermal processing, but a lapse of complement contamination in the following procedures. When finished cans are examined, prepared with different dressings (table 3), all batches show commercial sterilization, which is demonstrated with absence of swellings during 10 days passing of samples through thermostat. At investigation of absolute sterilization in some of the boxes of particular batches is established growth of aerobic spore-forming mesophile microorganisms. Batches with one or more of these samples are detected as non-sterilized (table 3). More frequently this availability is found in batches, sterilized in rotomat at 125°C, until in other batches these are only single packages. These results do not give foundations, that the batches must be considered as batches with decreased shelf life, because not only in our country, but in more industrial developed countries, is allowed availability of spores from aerobic mesophile microorganisms, which are not developed at normal storage conditions. Usually the permissible norms are till 10 spores/ 1 g product, which are not surpassed in the examined samples. At the investigation of contaminated with test-microorganisms

cans, after sterilization are not established viable spores. After passing through thermostat and plate count technique on selective medium, the variations are not detected, due to their viability. Obviously, the used sterilization regimes ensure industrial sterilization in production of these cans.

Table 3.-Spores availability of aerobe or facultative, mesophile microorganisms in sterilized according to different formulae cans with ready-to-eat meals "Apetitki"

Type of steri-lizer	Type of can "Apetitki" with:	Sterilization formula	F_0 effect	Examined for sterility batches Total	Sterile	Non-sterile	Anaerobe mesophile microorganisms
Auto-clave	Tomato sauce	$\frac{15-70-20}{121°}$	12.79	4	3	1	0
	Peas	$\frac{15-70-20}{121°}$	12.42	3	3	0	0
	Kidney beans	$\frac{15-70-20}{121°}$	11.65	3	2	1	0
	Vege-tables	$\frac{15-70-20}{121°}$	11.28	3	3	0	0
Roto-mat	Tomato sauce	$\frac{30-20}{121°}$	22.29	5	5	0	0
	Peas	$\frac{35-25}{121°}$	21.97	3	3	0	0
	Kidney beans	$\frac{35-20}{121°}$	20.07	3	2	1	0
	Vege-tables	$\frac{45-25}{121°}$	18.15	3	3	0	0
Roto-mat	Tomato sauce	$\frac{25-20}{125°}$	23.36	4	3	1	0
	Peas	$\frac{30-25}{125°}$	23.77	3	1	2	0
	Kidney beans	$\frac{30-20}{125°}$	19.20	3	2	1	0
	Vege-tables	$\frac{40-25}{125°}$	22.10	3	3	0	0
Roto-mat	Tomato sauce	$\frac{20-20}{130°}$	18.90	4	3	1	0
	Peas	$\frac{25-25}{130°}$	23.63	4	4	0	0
	Kidney beans	$\frac{25-20}{130°}$	21.06	3	3	0	0
	Vege-tables	$\frac{35-25}{130°}$	24.54	4	4	0	0

CONCLUSIONS: Ready-to-eat dishes are produced on the base of semiready-to-eat canned meat products without casings "Apetitki", which are controlled with microbiological methods during technological process. The efficiency of examined thermal

regimes is established, which influence is controlled by contamination with spores of thermal stable test-microorganisms. The treatment ensures commercial safety and the examined formulations and technology can be used successfully by the producers.

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