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INFLUENCE OF NEW TECHNOLOGY PRODUCTION OF COOKED HAM ON THE PRESENCE OF SOME BIORESIDUA

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INTRODUCTION

The presence of harmful substances, like heavy metals and mycotoxins in the meat of slaughtered animals, can be the consequence of their natural presence in the soil or water, industrial pollution or irresponsible deposit of waste materials in our environment. These toxic substances enter the organism through the supply circuit, and can be found, in the first place, in the internals as well as in the meat of animals. As these substances may provoke serious health problems, their presence is undesirable both in human food and animal feed.

Sulfonamides are being used as prophylactic and preventive measures for sanitary protection of animals. Their use is especially necessary on large farms, where there is a big possibility for the appearance and spreading of infective and parasitic diseases. These substances are accumulative and very resistant to different agents, so they may be found in the meat products if they were present in the meat used.

Having all this in mind, the aim of this study was to investigate the effect of the new technology of cooked ham, a traditional Yugoslav export meat product, on the eventual presence of some mycotoxins, heavy metals and sulfonamides.

MATERIAL AND METHODS

In the scope of the investigations of the rationalization possibility of cooked ham production, the influence of new production technology on the presence of some bioresidua (sulfonamides, mycotoxins, heavy metals) was examined. Insufficiently cooled meat (10° to 15°C), deboned early post-mortem, cured with brine of different temperature and mechanically treated for different period of time was used for the production of cooked ham.

The experimental halves processed in the usual way on the slaughtering line were transferred to the freezing tunnel (-30°C), with intensive air circulation (4 to 5m/sec), and kept there for two hours. Approximately three hours post-mortem the halves were transferred to the equalizing chamber (2°C±2°C, without air circulation) and the insufficiently cooled hams were deboned after three and five hours (six hours and eight hours post-mortem). The brine of usual composition was injected into the deboned, processed and insufficiently cooled ham. The temperature of the brine was +5°C or -10°c. The four prepared groups of samples were mechanically treated (by tumbling) for 16 or 20 hours, and during that time 6.000, e.g., 7.500 revolutions were made. After the mechanical treatment, the cured meat was packed in foils and pasteurized in the usual way.

The control products were obtained by the usual technological procedure (cooling for 24 hours at 0°±2°, brine temperature =5°C, mechanical treatment 16 hours). The finished products (experimental and the control ones) were examined for the presence of sulfonamides, mycotoxins (aflatoxin B_1, B_2, G_1, G_2, aflatoxin A and F-2 toxin) and heavy

metals (arsenic, cadmium, mercury and lead).
The qualitative and quantitative determination of mycotoxins was performed by TLC method, and of heavy metals by atomic absorption spectrometer (AAS Perkin Elmer), according to A.O.A.C. methods (1990).

The qualitative determination of sulfonamides was performed by the "screening" method, which is based on the growth inhibition of certain test microorganism (*Bacillus subtilis* ATCC 6633 and *Sarcina lutea* ATCC 9341).

RESULTS AND DISCUSSION

Investigating the finished products, experimental and control ones, it was found that neither one product was contaminated with sulfonamides.

The feed used for the feeding of pigs, is often more or less contaminated with different toxigenic fungi. Especially frequent in our climate conditions are the fungi from the Fusarium species, which produce zearalenone or F-2 toxin, trichotecene and other toxin metabolites, as well as the fungi that produce ochratoxin A (Skrinjar *et al.*, 1993).

At the farms, where the animals used for this experiment were bred, the swines were given concentrated feed. One of the main components of this feed is maize, which is an extremely convenient substrate for the growth of fungi and synthesis of mycotoxins (Smith and Hacking, 1983). The contamination of maize with fungi is especially pronounced during the rainy season and in the seasons after it. Under such conditions, the presence of certain mycotoxins can be expected in the first place, in internal organs but also in the meat as they enter the organism of the animal with the feed.

Although the feed in our country is very often contaminated with zearalenone, and particularly with ochratoxin A (Skrinjar et al., 1992), these mycotoxins were not found during our investigations. Neither one product (both experimental and control ones) was contaminated with the mentioned aflatoxins.

The content of metal traces in the examined samples is give in Table 1. As it can be seen, mercury was not present in neither one product. Arsenic, cadmium and lead were present but according to our rules (Rule book on content of pesticides, metal and metaloids and other poisonous substances hemiotherapeutics, anabolycs and other substances that can be present in the foodstuffs, Yugoslav Official Register, No. 5, 1992) in permitted amounts.

The concentration of arsenic ranged from 0.011 (deboned 6h post-mortem, brine +5°C, mechanical treatment 16h) to 0.042mg*kg^{-1} (deboned 6h post-mortem, brine -10°C, mechanical treatment 20h).

Cadmium was found in all products in concentrations from 0.01 (deboned 8h post-mortem, brine +5°C, mechanical treatment 20h) to 0.013mg*kg^{-1} (deboned 8h post-mortem, brine -10°C, mechanical treatment, 20h).

Lead was also found in all samples of cooked ham. The concentrations were inside the permitted values and ranged from 0.008 (deboned 8h post-mortem, brine +5°C, mechanical treatment, 20h) to 0.008 (deboned 8h post-mortem, brine -10°C, mechanical treatment, 16h).

Having in mind that according to Yugoslav normative regarding the presence of heavy metals, 1g of cooked ham in can may contain 1mg of lead, 0.1mg cadmium, 0.05mg mercury and 0.3mg arsenic, all the obtained products were harmless to health.

On the basis of the obtained results, considering the content of mycotoxins and heavy metals, it can be stated that the modification of cooked ham production technology, by . . . [section of paper missing] . . .

CONCLUSION

From the aspect of presence of sulfonamides, mycotoxins and heavy metals, the product ham is sanitarily correct.

The sulfonamides, mycotoxins and mercury were not found while the concentration of arsenic, cadmium and lead were in the permitted limits. The lowest content of the toxic metals was found in cooked ham obtained by the new technological process after cooling and deboning eight hours post-mortem, curing with brine +5°C and mechanically treated 20 hours.

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Table 1. Occurence of heavy metals in cooked ham.

Deboning time post-mortem (h); Curing brine temp (°C); Mechanical treatment (h)	Arsenic	Cadmium	Mercury	Lead
6				
+5				
16	0.011	0.010	0.000	0.183
20	0.018	0.003	0.000	0.156
10				
16	0.022	0.008	0.000	0.211
20	0.042	0.002	0.000	0.062
8				
+5				
16	0.035	0.012	0.000	0.127
20	0.018	0.001	0.000	0.008
10				
16	0.021	0.004	0.000	0.142
20	0.025	0.013	0.000	0.179
24				
+5				
16	0.033	0.004	0.000	0.060