

## MICROBIOLOGICAL STATUS OF SMOKED MEAT PRODUCTS

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### ABSTRACT

In this manuscript are presented the results of microbiological tests on smoked boneless pork and fresh bacon (green bacon - pancetta) before injection, after injection and after heat treatment. In all trials of smoked boneless pork and pancetta, after heat treatment had the lowest total bacteria number, because the heat treatment destroys most of the bacterial flora that before treatment were present.

**Keywords:** pigs, boneless pork, pancetta, microbiological analyses

### INTRODUCTION

Smoked meat products and other meat products can be contaminated during the manufacturing process with microorganisms by raw materials, supplements, natural casing, man, water and dust.

The production of smoked meat products uses salt, nitrate, nitrite, carbohydrates, polyphosphates, products based on protein, spices, etc. Some of them are significant source of contamination of meat products. All these supplements should be microbiologically clean. Spoiling of these products primarily occurs due to inappropriate salting or brining and high storage temperatures (Belicoski et al. 1997).

Microflora of these products includes representative's bacteria of the genus *Lactobacillus*, *Micrococcaceae*, *Streptococcaceae*. After long storage these products develop different types of yeasts. Some representatives of the genus *Lactobacillus* can cause spoilage, heated and green coloration of meat and fat. *Enterobacteriaceae*, *Clostridium* species causes deep decay, followed by the appearance of unpleasant smell.

All types of meat products can't contain the type of bacteria *Salmonella* in 25 gram and coagulase positive *Staphylococci*, *Proteus*, *Clostridia* and *Escherichia coli* in 0.1 gram. Because there is very little information on this issue, the aim of this exam is to see contamination of pancetta and raw boneless pork before and during brining and after heat treatment.

### MATERIAL AND METHODS

As test material was taken fresh boneless pork meat and fresh bacon of the pigs breed Dalant. Pigs are slaughtered and processed after reaching the live weight of about 110 kg. After slaughter, primary processing and cooling of pig halves on the temperature of + 4 °C for 24 hours was performed classification and categorization of pig halves of main parts and categories. *M. Longissimus dorsi* was removed during categorization and was divided on three parts. During the cutting out of the ribs stomach part (without bones) was separated, of which were shaped small pieces mixed with muscle and adipose tissue in the form of irregular triangle called fresh bacon (pancetta). The pancetta and fresh boneless meat are measured on electronic weigh (each piece separately) where was determined their weight before brining. After brining was performed measurement again in order to determine the mass of the pieces after the meat brining. The brine recipe that brined slices of meat with the needle injection - picl injector is composed of: salt, nitrite, smoke, malkovita, and water. Preparation malkovita is product of firm REGIS SA and is made of: stabilizer for consistency of meat E 451, E 452, sugars, glucose, antioxidant E 301, E 316,

flavorings E621, flavors, salt and spices extracts. Brining machine (Picl Injector) is made by conveyor, brine reservoir, injection needle brine, electromotor. Prepared brine tank is placed in the machine. Meat ready for brine is weighed and placed to the transport machine. The speed of movement of the transport bar that meat is transferred is sync with the sting of needles, so that when the meat will come under the needles they enter the meat and brine injected into it. Depending on the number of needles and their mutual distance, the meat is injected with planned amount of brine in several places.

The thermal treatment of boneless pork and pancetta is performed at following recipe:

15 min. drying on Tk 60 °C, 45 min. smoking with hot smoke on Tk 65 °C, 45 min. smoking with thick smoke on Tk 70 °C, 120 min baking with smoking Tk 85 °C T<sub>cp</sub> 72 °C

Legend: Tk - Temperature in the smoking chamber, T<sub>cp</sub> - temperature in the center of the product.

*Microbial analysis*

Microbiological tests were performed by the following methods: Total bacteria number - ISO 4833 / 2003, *Staphiilococcus* ISO 6888 - 1 / 1999 *Enterobacteriaceae* ISO 21528 - 1 / 2004 *Clostridium* ISO 7937 / 2004.

The results were statistically processed using mathematical program EXEL ANOVA 2007 / 2010, T – test.

**RESULTS AND DISCUSSION**

The results of the examinations of the population growth on fresh bacon (panceta) pieces are given in Table 1.

Table No. 1 Fresh bacon (panceta) weight before and after the injection and after the heat treatment.

Boneless pork meat			
No of cuts	Weight injection before	Weight injection after	Weight after heat treatment
	$\bar{X} \pm Sd$	$\bar{X} \pm Sd$	$\bar{X} \pm Sd$
n = 30	0.66 ± 0.42	0.779 ± 0.42	0.590 ± 0.22
Fresh bacon - pancetta			
No of cuts	Weight before injection	Weight after injection	Weight after heat treatment
	$\bar{X} \pm Sd$	$\bar{X} \pm Sd$	$\bar{X} \pm Sd$
n= 30	0.800 ± 0.28	0.937 ± 0.32	0.667 ± 0.48

$\bar{X}$  = mean, Sd = standard deviation;

This table shows that average weigh of bonelles pork meat and pancetta is 0.66 and 0800 kg after injection is 1.50 and 1.40 and after heat treatment is 0.875 and 0.825 kg, that means that after injection growth rate of neck pieces and pancetta was 15.20 % and 17.14 % and weight loss during the heat treatment was average 23.36 % and 28.87 %.

There is no statistical significant difference between ham slices and pancetta before injection, after injection and after the heat treatment ( p > 0.05).

The results of microbiological tests on boneless pork and fresh bacon, before and after the injection showed only the presence of the total number of bacteria (bacilli) and the presence of *enterobacteria*, *clostridia* and *staphiilococcus* has not been determined.

Table No. 2. Microbiological analyses of pancetta before and after injection and after heat treatment.

Before injection	After injection	After heat treatment
2.30 log cfu/g	2.77 log cfu/g	/
2.55 log cfu/g	2.60 log cfu/g	1.47 log cfu/g
2.60 logcfu/g	2.68 log cfu/g	1.69 log cfu/g
2.62 log cfu/g	2.76 log cfu/g	1.90 log cfu/g
2.60 log cfu/g	2.79 log cfu/g	1.60 log cfu/g

In all trials of pork pancetta after heat treatment had the lowest total number of bacteria which is understandable because the heat treatment destroys most of the bacterial flora that before heat treatment were present. The statistical processing of the obtained results showed no statistically significant difference among the tested samples ( $p > 0.05$ ).

Table No. 3. Microbiological analyses of boneless pork meat before and after injection and after heat treatment.

Before injection	After injection	After heat treatment
3.0 log cfu/g	2.69 log cfu/g	1.47 log cfu/g
2.71 log cfu/g	2.68 log cfu/g	1.60 log cfu/g
2.91 logcfu/g	2.84 logcfu/g	1.69 log cfu/g
2.82 log cfu/g	2.85 log cfu/g	1.84 log cfu/g
2.74 og cfu/g	2.83 log cfu/g	1.69 log cfu/g

Heat treatment was microbiological reasonable again. In all samples after the heat treatment there were the smallest total bacteria number. The statistical processing of the obtained results showed no statistically significant difference among the tested samples ( $p > 0.05$ ).

### CONCLUSION

From the tests performed and the results it can be concluded that in the two studied products, had a higher total bacteria number before and after injection and for at least total bacteria number after the heat treatment. During the thermal processing is destroyed the biggest part from the bacterial micro flora that was present before heat treatment.

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