

Researches Concerning the Dynamics of the Meat Bacterial Load during the Curing and Tendering Process

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Received: 03 May 2010; Accepted: 07 June 2010

Abstract

Microbiological analyses were performed on seventy-five samples of pork, first and second quality beef semi-manufactured products (minced and salted meat, in different stages of tendering process at +2...+4 Celsius degrees) used in the manufacturing process of some meat products.

During the salting and tendering process we noticed a reduction of the total number of germs, coliform bacteria's, micets' and an increased growth of staphylococcus count.

Keywords: minced and salted pork, semi-manufactured products, microbiological quality indicators.

1. Introduction

As the food industry develops there is a higher and higher need for an increase in product quality, in obtaining more hygienic products for public consumption. For achieving this goal one must respect to the letter the hygiene conditions for both raw and auxiliary materials as well as during the technological process.

The presence of certain germs in meat and meat products negatively influences their quality by alterations as well as being the cause for food poisoning.

The microbiological analysis is part of the quality control in the food industry and, at the same time, an essential factor in preserving the public health. All in all, one can understand the necessity of the complex microbiological exam in all production phases, starting from obtaining the raw material in the slaughtering units and ending with the delivery of the finished products. In this context, the bacteriological exam is an important factor in obtaining superior quality products in terms of hygiene.

2. Materials and methods

In assessing the quality of the meat semi-manufactured products used in the manufacturing process of certain assortments of meat products, 75 samples of semi-manufactured products (minced and salted pork / first quality beef / second quality beef sampled immediately after mincing-salting and after 24, 48, 72 and 96 hours of tendering at +2 ...+4 Celsius degrees) were examined under the microbiological point of view.

Table 1. Meat semi-manufactured products and the number of examined samples

No.	Product analysis	No. of samples examined
1.	Minced and salted pork/first quality beef/second quality beef	15
2.	Minced pork/1 st quality beef/2 nd quality beef, salted and aged for 24 hours	15
3.	Minced pork/1 st quality beef/2 nd quality beef, salted and aged for 48 hours	15
4.	Minced pork/1 st quality beef/2 nd quality beef, salted and aged for 72 hours	15
5.	Minced pork/1 st quality beef/2 nd quality beef, salted and aged for 96 hours	15

The microbiological examination aimed to determine the indicators presented in table 2.

3. Results and discussion

The bacteriological exam of the semi-manufactured products highlights, after the mincing and curing process, a substantial growth of the *total number of germs* in comparison with the registered values at the raw materials. Thus, *the total number of germs* varied from the average value of 750 000 /g in pork, 820 000 /g in the first quality beef to the 980 000 /g in the second quality beef. Compared to the values recorded in the raw materials, after mincing-salting is an increase of approximately 10 times in pork, about 18 times in the case of the first quality beef and about 11 times in the case of the second quality beef. During the tendering of the salted meat, in the first 72 hours of aging, a reduction in *the total number of germs* in all the samples examined is being registered, followed by a slight increase, but remaining at levels much lower than those recorded after the mincing-salting. Also, during the meat tendering, higher values of *the total number of germs* in beef are being recorded (in comparison with those registered in pork).

After 72 hours of aging of the salted minced meat *the total number of germs* is 5200 /g in pork, 12000 /g in the first quality beef and 65000 /g in the second quality beef. The number of *coliforms* after mincing-salting recorded an increase in values from 140 /g in pork to 425 /g in the second quality beef. During the tendering of the salted meat the number of *coliforms* decreases considerably, reaching after 96 hours of aging values between 10 /g in pork to 20 /g in the second quality beef.

Escherichia coli was revealed in at 4-8% of the pork samples, 4-20% samples of the first quality beef and 8-24% samples of the second quality beef. After meat mincing the incidence of *E. coli* is greatly reduced in all the samples examined.

Staphylococcus count recorded in all examined meat samples an increase during the aging of the salted minced meat.

Unlike the total number of germs (TGN), the number of coliforms (CBN) and the number of micettes, which decrease during aging of the salted meat, the number of *coaguloso-positive staphylococcus* increased progressively, due to their salt affinity. Thus, the number of *staphylococcus* increased after mincing-salting in the first 96 hours of aging from 210 /g to 17200 /g in the case of pork (Table 3), from 560 /g to 32000 /g in the case of the first quality beef (Table 4) and from 980 /g to 65000 /g in the case of the second quality beef (Table 5).

The coefficients of increasing the *staphylococcus* count are 82 times in the case of pork, 57 times in the case of the first quality beef and 66 times in the case of the second quality beef.

The sulfito-reducing clostridium and *Salmonella* gender germs were absent in all the samples of the semi-manufactured products.

Number of *micettes* recorded after mincing-salting values of 5800 /g in the case of pork, 8500 /g in the first quality beef and 15800 /g in the second quality beef.

During the tendering of the salted meat, the *micettes* count has greatly decreased reaching values of 10 /g in pork, 50 /g in the first quality beef and 100 /g in the second quality beef.

Table 2. The microbiological quality indicators of the meat semi-manufactured products samples [2-8]

No	Bacteriological indicators	Methods of determination
1.	The <i>total number of germs</i> / g product (TGN)	Dilution method of Koch, by the inoculation on the Frazier agar medium and incubation for 72 hours at 37 Celsius degrees / SR ISO 4833-2003
2.	<i>Coliform bacteria</i> count and presence of <i>E. coli</i> / 1 g product	On BBLV culture medium, incubation at 37 °C (for coliform bacteria) and passage on Levine medium at 37 °C for 24-48 hours, with confirmation at 45 °C (for <i>E. coli</i>); SR ISO 5541/1, SR ISO 5541/2 STAS 6349/4 (Bacterial count) SR ISO 11866, STAS 6349/4 (<i>Escherichia coli</i> count)
3.	<i>Coaguloso-positive Staphylococcus</i> count	Sowings on liquid Chapman medium or Giloti Cantoni medium and passage on the Chapman solid medium or Baird-Parker selective mediums - STAS 6349/12
4.	<i>Sulphite-reducing anaerobic bacteria</i> (<i>Clostridium perfringens</i> pathogenic germs) at 44 °C / 1 g product	Sowings from 10 ⁻¹ ...10 ⁻³ dilutions in sodium sulphite and ferrous sulphate medium, incubation 5 days at 44 °C - STAS 6349/10
5.	Presence of <i>Salmonella</i> bacteria / 25 g product	Sowing on preenrichment medium (tampon peptone water) and enrichment (selenit-cistin and Rappaport-Vasiliadis) and passage (on Edel and Kampelmacher medium and Istrati-Maitert medium) and biochemical and serologic confirmation / SR ISO 6785, STAS 6349/11

Table 3. The dynamics of the pork bacteriological load during the curing and tendering process (medium values) [1]

No.	Microbiological indicators		After mincing-salting	After 24 hours of aging	After 48 hours of aging	After 72 hours of aging	After 96 hours of aging
1.	The total number of germs / g product (TGN)	\bar{x}	750000	12000	10000	5200	46000
2.	Coliform bacteria count / g product (CBN)	\bar{x}	140	45	15	10	10
3.	<i>Escherichia coli</i> /g product	number of positive samples	2	1	-	-	-
		%	8	4	-	-	-
4.	Coagulase-positive <i>Staphylococcus</i> /g product	\bar{x}	210	460	580	10200	17200
5.	Sulfite-reducing clostridia /g product	\bar{x}	absent	absent	absent	absent	absent
6.	<i>Salmonella</i> /25 g		absent	absent	absent	absent	absent
7.	Micettes /g	\bar{x}	5800	1200	100	50	10

Table 4. The dynamics of the first quality beef bacteriological load during the curing and tendering process (medium values) [1]

No.	Microbiological indicators		After mincing-salting	After 24 hours of aging	After 48 hours of aging	After 72 hours of aging	After 96 hours of aging
1.	The total number of germs / g product (TGN)	\bar{x}	820000	25000	18000	12000	32000
2.	Coliform bacteria count / g product (CBN)	\bar{x}	280	145	45	20	15
3.	<i>Escherichia coli</i> /g product	number of positive samples	5	3	2	1	-
		%	20	12	8	4	-
4.	Coagulase-positive <i>Staphylococcus</i> /g product	\bar{x}	560	620	1450	25000	32000
5.	Sulfite-reducing clostridia /g product	\bar{x}	absent	absent	absent	absent	absent
6.	<i>Salmonella</i> /25 g		absent	absent	absent	absent	absent
7.	Micettes /g	\bar{x}	8500	1200	200	80	50

Table 5. The dynamics of the second quality beef bacteriological load during the curing and tendering process (medium values) [1]

No.	Microbiological indicators		After mincing-salting	After 24 hours of aging	After 48 hours of aging	After 72 hours of aging	After 96 hours of aging
1.	The total number of germs / g product (TGN)	\bar{x}	980000	120000	80000	65000	95000
2.	Coliform bacteria count / g product (CBN)	\bar{x}	425	180	90	30	20
3.	<i>Escherichia coli</i> /g product	number of positive samples	6	4	3	2	-
		%	24	16	12	8	-
4.	Coagulase-positive <i>Staphylococcus</i> /g product	\bar{x}	980	1200	1950	28000	65000
5.	Sulfite-reducing clostridia /g product	\bar{x}	absent	absent	absent	absent	absent
6.	<i>Salmonella</i> /25 g		absent	absent	absent	absent	absent
7.	Micettes /g	\bar{x}	15800	6400	500	250	100

4. Conclusion

The following conclusions ensue regarding the microbiological alterations of the meat semi-manufactured products (examined in different stages of the salting and tendering process) used in the processing technology of the meat products:

- The bacteriological exam of the meat semi-manufactured products highlights, after the mincing and curing process, a substantial growth of the *total number of germs* in comparison with the registered values at the raw materials, of approximately 10 times in pork, about 18 times in first quality beef and about 11 times in the case of the second quality beef.
- During the tendering of the salted meat a reduction of the *total number of germs*, *coliform bacteria's*, *micets'* and an increased growth of *staphylococcus* number are being registered.
- The coefficient of reduction of the *total number of germs* is about 16 times in the salted pork, 26 times in the first quality beef and about 10 times in the second quality beef.
- The coefficient of reduction of *coliforms* is 14 times in pork, about 19 times in the first quality beef, about 21 times in the second quality beef.
- The coefficient of reduction of *micets* is 580 times in pork, 170 times in the first quality beef and 158 times in the second quality beef.
- The coefficient of increasing the *staphylococcus* count is about 82 times in pork, 57 times in the first quality beef and 66 times in the second quality beef.

- The hygienic quality of the meat semi-manufactured products used in the processing technology of the meat products has, in addition to other factors (the hygienic quality of both raw and auxiliary materials, packaging, storage conditions and duration, compliance with the technological process, the speed of processing operations - avoiding interruptions of the technological process, health departments of processing, the individual hygiene of staff) a special importance in obtaining higher quality products in terms of hygiene.

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