SHELF LIFE OF SLICED CURED MEAT PRODUCTS

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SUMMARY

Some cured meat products are heat processed in moulds, then taken out and placed in a chill room for some days in order to stabilize the product. For two commercially produced products it has been examined how the interval between heat processing and packaging influenced the storage life at 5°C. Five different intervals were used, namely 7 days, 10 days, 14 days, 17 days and 21 days. Once a week sensorial and microbiological analysis was carried out.

It was found that a longer interval caused a considerable reduction of the storage life of the sliced products. Also, a longer interval reduced the total shelf life of the products. Rolled meat sausage had shorter shelf life than cooked pork loin, probably caused by higher numbers of *Brochothrix thermosphacta*.

INTRODUCTION

A considerable part of the Danish production of cured meat products is sliced and vacuum packed in retail packs. Some of these products are heat processed in moulds (to a centre temperature of about 72°C) and then taken out and stored in a chill room for some days prior to slicing and packaging. The purpose of this "interval" is to stabilize the product in order to improve the slicing, e.g. the yield.

In most companies, the length of this interval is something like 7-10 days, but in some cases the product is kept longer. Some Danish companies have introduced rules on this interval, for example that for each two days above an interval of 10 days the declared storage life should be reduced with one day. As a part of the so called Bandolé-control with retail packed cured meat products, the Danish Meat Products Laboratory (DMPL) checks that the open date marking is correct, i.e. it is checked that the declared storage life is realistic. Most companies declare a storage life of about 4 weeks at a maximum temperature of 5°C for most sliced cured meat products.

One of the purposes of this experiment was to examine how the interval between heat processing and slicing/ packaging influenced the storage life of two commercially produced meat products.

MATERIALS AND METHODS

The two products - Rolled meat sausage and Cooked pork loin - were produced as normally at a commercial Danish factory. The heat processing should result in a centre temperature of 72-75°C. Right after the meat blocks were taken out of the moulds, samples for bacteriological analysis were taken by a person from DMPL. The slicing and packaging (in MAP) operation took place after an interval of 7-10-14-17-21 days.

Each time, 25 packs were sent to DMPL. It must be mentioned that at least twice the samples were above 10°C on arrival to DMPL.

At the beginning of the first slicing on the first day, cleaning control was carried out by means of contact plates.

The samples, a total of 250 packs, were stored at 5°C, and once a week three packs of each product were taken for sensory and bacteriological analysis.

Sensory analysis. DMPL's trained panel (of housewives from outside the laboratory) evaluated the samples and scored for appearance, odour, and taste, using a hedonic -5/+5 scale.

Bacteriological analysis.

The samples were tested for total count (PCA agar), lactic acid bacteria (MRS agar) and *Brochothrix thermosphacta* (STAA).

Chemical analysis.

DMPL analysed three packs of Rolled meat sausage for salt and water, while the company carried out chemical analysis on several samples of each product.

Product	% H_2O	% Fat	% Protein	% Salt	g salt/ 100 g H_2O
Rolled meat sausage	55.1	24.6	16.6	2.8	5.1
Cooked pork loin	69.8	7.3	19.7	3.1	4.4

Table 1. Results of chemical analysis. Each figure represents four packs.

1. Day of analysis	2. Interval (days	Total count	Lactic acid bacteria	Brochothrix
14	7	3.1	2.9	2.3
21	7	6.2	5.9	5.9
	10	6.4	6.1	5.9
	14	6.2	5.6	5.1
	17	5.0	3.8	4.7
29	7	7.4	7.1	6.8
	10	7.4	7.1	7.2
	14	7.3	6.5	6.9
	17	6.4	5.8	6.4
	21	6.4	6.1	6.4
35	7	7.0	6.4	6.4
	10	7.7	7.4	7.2
	14	7.7	7.3	7.2
	17	7.6	7.1	7.4
	21	7.7	7.3	7.5
43	7	6.8	7.1	6.5
	10	7.3	6.0	5.7
50	7	7.4	7.2	7.0

Table 2. The results (log) of bacteriological analysis on Rolled meat sausage during storage at 5°C. Each figure is the average of three packs.
1. Day of production (heat processing) = Day 0.
2. Interval (days) between heat processing and slicing (= Day of slicing).

1. Day of analysis	2. Interval (days)	Total count	Lactic acid bacteria	Brochothrix
14	7	2.3	2.3	2.3
21	7	2.9	2.3	2.3
	10	3.8	3.8	2.3
	14	3.7	3.4	2.3
	17	3.1	2.6	2.3
29	7	3.4	3.1	2.4
	10	5.6	5.5	2.3
	14	5.9	5.6	3.5
	17	5.6	5.7	2.3
	21	5.7	5.6	2.8
35	7	2.9	2.3	2.5
	10	7.6	7.4	2.3
	14	7.1	6.9	3.8
	17	5.5	4.4	2.3
	21	6.4	6.4	2.3
43	7	2.3	2.3	2.3
	10	6.3	6.5	2.3
	14	7.3	7.2	2.3
	17	7.4	7.2	2.3
	21	6.2	6.2	4.3
50	7	2.3	2.3	2.3
	10	7.6	7.6	2.3
	14	7.1	7.0	2.3
57	7	2.3	2.5	2.3
	10	7.7	7.6	2.3
	14	7.8	7.8	2.3

Table 3. The results (log) of bacteriological analysis on Cooked pork loin during storage at 5°C. Each figure is the average of three packs.
1. Day of production (heat processing) = Day 0.
2. Interval (days) between heat processing and slicing (= Day of slicing).

Interval	7 days			10 days			14 days			17 days			21 days		
Evaluation Day	A	S	T	A	S	T	A	S	T	A	S	T	A	S	T
15	1.3	0.9	0.9	0.3	0.4	0.3	-			-			-		
29	0.1	0.2	-0.2	-0.4	-0.6	-0.4	0.1	-0.3	-0.3	-1.3	-1.8	-2.0	0.5	-0.6	-0.6
36	0.7	0.9	0.6	-1.3	-1.4	-1.0	0.1	-1.1	-1.1	rejected*			-0.4	-1.6	-1.2
43	-0.3	-0.4	-0.4	-1.4	-0.2	-0.3	rejected*						rejected*		
50	-0.6	-0.2	-0.1	rejected*											

Table 4. Rolled meat sausage. The results of sensory analysis.
A = Appearance ; S = Smell ; T = Taste.
Each figure is the average of three packs.
*rejected when the packs were opened for bacteriological analysis.

Interval	7 days			10 days			14 days			17 days			21 days		
Evaluation Day	A	S	T	A	S	T	A	S	T	A	S	T	A	S	T
15	0.4	0.7	0.7	-0.1	0.3	0.4	-			-			-		
22	0.7	0.6	0.6	0.3	0.4	0.4	0.4	0.4	0.5	0.7	0.8	1.1	-		
29	-0.3	0.2	0.4	-0.4	0.4	0.4	-0.2	-0.1	0.1	0.3	0.7	0.9	0.0	0.0	0.4
36	0.3	0.6	0.6	0.0	0.7	0.7	-0.1	0.2	0.2	0.2	0.3	0.4	0.2	0.6	0.3
43	0.2	0.0	0.2	-0.3	-0.4	0.0	0.0	-0.2	0.1	0.1	0.0	0.4	-0.6	-0.8	-0.2
50	0.5	0.8	1.0	-0.6	-0.5	-0.1	-0.8	-0.2	0.9	rejected*			rejected*		
57	-0.7	0.2	0.5	-1.1	-0.8	0.0	-0.9	-0.7	-0.3						

Table 5. Cooked pork loin. The results of sensory analysis.
A = Appearance ; S = Smell ; T = Taste.
Each figure is the average of three packs.
*rejected when the packs were opened for bacteriological analysis.

Product	1. Interval (days)	2. Total storage life (days)	Storage life after slicing (days)
Rolled meat sausage	7	>50	>43
	10	50	40
	14	43	29
	17	36	19
	21	43	22
Cooked pork loin	7	>57	>50
	10	>57	>47
	14	>57	>43
	17	50	33
	21	50	29

Table 6. Keepability times for Rolled meat sausage and for Cooked pork loin, given as Total storage life and as storage life after slicing and packaging.
1. Interval between heat processing an slicing/packaging.
2. Total storage life = Storage life from heat processing.

RESULTS AND DISCUSSION

Chemical analysis

The results of chemical analysis are summarized in table 1, showing the average of 4 packs. There were great differences, e.g. in Rolled meat sausage % H_2O varied from 50.6% to 56.9%, and % fat from 21.0% to 32.0%.

Bacteriological analysis

The samples taken right after heat processing had low counts, i.e. total count less than 120/gram, lactic acid bacteria less than 75/gram, and *Brochothrix* was not found.

The cleaning control showed very low counts on all three types of contact plates.

The bacteriological numbers of the samples during storage at 5°C are given in tables 2 and 3.

For Rolled meat sausage (see table 2) total count and lactic acid bacteria rise quickly to high numbers, and the same is true for *Brochothrix*.

For Cooked pork loin (see table 3), total count and lactic acid bacteria rises quickly, except for the samples sliced on Day 7. *Brochothrix thermosphacta* was found in very low numbers.

Sensory analysis

The results from the sensory analysis are given in tables 4 and 5. The resulting keepability times are shown in table 6, which gives total storage life, i.e. time from heat processing to rejection, as well as storage life after slicing.

For both products a pronounced - and not unexpected - effect of an increasing interval between heat processing and slicing/packaging is found. An interval above 7-10 days will reduce the shelf life of the sliced product.

The total shelf life (the sum of interval and shelf life after packaging) is not affected very much by the interval, but there is a tendency that a larger interval will result in a reduction of the total shelf life.

Rolled meat sausage had a shorter shelf life than Cooked pork loin. One of the reasons is presumably much higher numbers of *Brochothrix* in Rolled meat sausage. Apart from this, the bacteriological analysis did not give us useful results as the total count/lactic acid bacteria rose to 20-50 millions per gram in a rather short time, about two weeks, while the shelf life is some cases was more than 8 weeks.