H- 4 160

X^th CONFERNCE OF EUROPEAN MEAT RESEARCH WORKERS
10 - 15 August 1964 Roskilde - Denmark

PHYSICAL PROPERTIES AND MICROFLORA OF TREATED AND UNTREAT... SHEEP CASINGS USED IN THE PRODUCTION OF CANNED FRANKFURTE...

Žakula,R., Popović,P., and Ljubica Nikolić

Institute of Food Industry, Department for Meat Technology
Novi Sad, Yugoslavia

Novi Sad,1964

PHYSICAL PROPERTIES AND MICROFLORA OF TREATED AND UNTREATED SHEEP CASINGS USED IN THE PRODUCTION OF CANNED FRANKFURTERS

R. Žakula, P. Popović and Ljubica Nikolić

Institute of Food Industry, Department for Meat Technology
Novi Sad, Yugoslavia

The canned frankfurtera have a number of components, such as meat, fatty tissue and spices, and as a wrapper the sheep casings. Each of theese components has its characteristic microflora which influences microflora of the final product - canned frankfurters.

In a series of studies we included a complex study of microbiology of canned frankfurters, beginning with raw materials through technological phases of processing, and final product stored under different conditions at different time intervals. In this work, the part of results on microflora of sheep casings treated with different substances in order to decrease total count of bacteria, and to eliminate undiserable species, will be shown.

Microflora of sheep casings, estimating after the available data has not so far been thoroughly studied, and one can be sure that it varies greatly in different areas of the world.

Sheep casings with no visible changes, contain the rule a great number of bacteria and of spores. /Baleler, Piening, Schönberg, Reuter and Watts/. The treatment od casings with hydrogene peroxide and sodium peroxide for bleaching purpose, and to decrease total count of bacteria, is discussed by Schönberg in one of

his papers. The same author thinks that bleaching should not be allowed, but a much greater care to the adequate processing of casings should be taken. Reuter suggests that sheep casings, prior to their use on canned frankfurters, should be soaked in water at 37°C for 5 hours. In that time, by his statement, germinates most of spores, and so, due to washing most of bacteria are mechanically eliminated. Trumić reports that the propagation of microorganisms could be prevented by treating the casings with chloride of lime which contains 0.1% of active chlorine.

Assuming that substances used for treating sheep casings, could have affected the resistance of casings walls, by increasing or decreasing it, parallel studies in that direction were carried out.

MATERIALS AND METHODS

For our studies 10 samples of sheep casings, 8 of which were of domestic origin /from 1 do 8/, and 2 were of australien origin, were used.

The bacteriological examinations were carried out immediately after salt had been shaken off, as well as after treatment of the casings with distilled water, 0.5% lactic acid, 0.5% acetic acid at different time intervals /2,4,6 and 8 hors/. Then, after treatment with tartaric acid for 24 hours, and with hydrogene peroxide in 0.4% solution, and 0.4% sodium peroxide for 8 and 24 hours. The weight of samples was 10 g. The material was powdered in a stamp-mill, dilutions in saline solution were made, well homogenized and made into adequate number of dilutions.

By bacteriological examination were determined: total bacteria count, sulphite-reductive clostridia, and the percentage of certain bacteria species. For determining the total bacteria count, the Koh treatment was used. For counting sulphite-reductive clostridia, the Leistner treatment was used, using sulphite triptone yeast extract, ferric citrate agar. On the surface of neutral agar, poured in Petrie plate, 0.1 ml of examined material in adequate dilution was inoculated and incubated at 30°C for 48 hours. From each plate 6-10 colonies were transfered to slant agar, thereafter their morphological and biochemical properties were determined by the method of Bergey and Smith-Gordon-Clark.

Resistance to the mentioned substances of the treated, as well as of the untreated casings, which served as controls, was measured with a modified apparatus by ingineer A. Sipos. The resistance value till the moment of bursting are expressed in millimetres of mercury column, mounted in the apparatus.

RESULTS AND DISCUSSION

The results of bacteriological examinations of sheep casings treated with lactic acid, acetic acid and tartaric acid, and with hydrogene peroxide and sodium peroxide, are shown in tables 3 to 8. In the tables one and two, are shown the results of bacteriological examination of sheep casings after salt had been shaken off, and after washing in distilled water.

170

The results shown in the table 1, in fact, represent normal microflora of sheep casings cured by salt. The total bacteria count ranges widely from 1.020 /sample 10/ to 720,000.000 /sample 9/ Number of sulphite-reductive clostridia also has a wide diapason, and in all the samples is in proportion with the total number. By the percentage of aerobes, one can observe that in the case of shepp casings, after shaking off salt, most often were isolated Gram-positive bacilli, then micrococci and streptococci, and the fewest to be isolated were Gaffkya and Sarcina. From bacteria species that were being determinded: B.cereus, Strep. faecium, Staph. epidermidis, B. pumilus, and some species of micrococci were to be found.

By washing sheep casings in distilled water, we were able to observe an appreciable reduction of total bacteria number /table a/, so that the highest determined number was 23,110.000 /sample 6/. The same as with the sample 3, sulphite-reductive clostridia could not be counted on some plates with the sample 6. In the most examined samples, the treatment with distilled water brought about the reduction of total bacteria count, as well as the reduction of sulphite-reductive clostridia. In percentage, Gram-positive bacilli are of the predominating type, and in most cases they are the only microflora of examined samples. From the determined species most often found were: B. firmus, B. pumilus, B. licheniformis, B. laterosporus, Staph. aureus, M. agilis, M. luteus and M. conglomeratus.

Soaking sheep casings in 0.5% lactic acid solution /table 3/ has a great effect on the reduction of total bacteria count so that the maximum of 20.700 in sample 4 was

found after 2 hours treatment. A longer treatment with 0.5% lactic acid /4,6, and 8 hours/ greatly reduces the number of bacteria in almost all the samples, except in sample 2, where after treatmnet for 6 and 8 hours was found an exceptionally high number of bacteria. In sample 6, after 6 hours treatment, the total number increased, but after further treatment for 8 hours, it was again reduced. The used lactic acid solutin had also a great effect in reducing the number of sulphite-reductive clostridia. Only in two samples /3 and 6/ after this treatment were found 1.700 and 2.040 sulphite-reductive clostridia. In all other examined samples the number was far lower. Lactic acid in concentration used in our studies, had a great effect on the composition of microflora, and so, in table 3 it can be observed that, with a few exceptions, Gram-positive bacteria are the predominating type. This relation is not kept only in the sample 7, where Staph. epidermidis takes about 50%. Moreover, after the 8 hours treatment, the only isolated species were Staph. epidermidis. After the treatment with lactic acid in microflora of sheep casings mostly represented were Gram-positive bacilli: B.cereus, B.pumilus, B.subtilis, B.licheniformis, B.lentus, B.laterosporus, and much less represented were Staph. epidermidis, Strep. faesium and M. agilis.

In realtin to the total bacteria count, 0.5% acetic acid solution /table 4/ gave much lower results than the treatment with lactic acid in the same concentration, and at the same time intervals. For example, after 2 hours treatment in the sample 1 there were 903.333, in the sample 7 there were 684.500, and in the sample 8 there were 102 [illegible]. In the sample 1, after 8 hours treatment, there was an almost tenfold increase in bacteria number as compared with the 6 hours treatment. The number of sulphite-reductive clostridia is somewhat greater as compared with that of lactic acid treatment, and in one case /sample 8/ after

172

2 hours treatment 26.000 bacteria were found. The percentage relation between Gram-positive bacilli and micrococci in some samples was not the same as with the one treated with lactic acid. In the samples 1,2,3 and 9, there is nearly the same representation of micrococci and Gram-positive bacilli, and in the sample 7, after 4,6 and 8 hours treatment, only Staph. aureus were isolated. In four samples /4,5,8 and 10/ only Gram-positive bacilli were found. From bacteria species, quite often are observed micrococci /M.caseoliticus, M.conglomeratus, M.flavus, M.agilis, M.varians/, and in adittion, Gram-positive bacilli /B.cereus, B.pumilus, B.licheniformis, B.subtilis, B.firmus, B.lentus/.

Tartaric acid in 4% solution /table 5/, after 24 hours treatment gave excellent results in decreasing the total bacteria count. The highest number after the treatment with this acid was in three samples: 1.120, 1.080, and 1.030. Tartaric acid also displayed a very good effect upon sulphite-reductive clostridia, so that they could not be isolated from the samples 2,3,4,5 and 6. The sample number 1 had 3.050 sulphite-reductive clostridia, and other three, from which they were isolated had an appreciably smaller number, From the sample 1, micrococci were isolated in pure culture, and from other eight only Gram-positive bacilli /B.cereus, B.pumilus, B.licheniformis, and B.subtilis/.

The treatment of sheep casings with 0.4% hydrogen peroxide solution /table 6/ greatly decreases the total bacteria count, completely destroys sulphite-reductive clostridia, and microflora consists largely of Gram-positive bacilli: B.cereus, B.pumilus, B.subtilis, B.lentus, B.firmus, B.licheniformis/, and of M.conglomeratus in only one sample.

The total bacteria count of sheep casings treated with 0.4% sodium peroxide solution /table 7/ is appreciably smaller than the average total count in the casings treated with hydrogene peroxide solutin of the same concentration. Sulphite-reductive clostridia were not found after this treatment also. Very interesting is the relation between micrococci and Gram-positive bacilli. While in before mentioned examinations, in the casings treated with hydrogene peroxide were almost exclusively found Gram-positive bacilli, in the casings treated with sodium peroxide in most cases there were micrococci /M.agilis, M.flavus, M.varians M.luteus/, and in a small number of samples only B.pumilus.

All the used substances for treatment of sheep casings have in a certain way some effect upon the decrease of the total bacteria count and sulphite-reductive clostridia, as well as upon the relation between some bacteria species. After the treatment with each of the substances used, there was a decrease of the total count, but the best effect was obtained with 0.4% sodium peroxide solution, although nearly the same results were obtained with 4% tartaric acid solution. The best result in the way of destroing the sulphite-reductive clostridia had sodium-peroxide solution. It is necessary to emphasize the fact, and a very important one in the production of canned frankfurters, and that is, the disappearence od Gram-positive bacilli, which by all means have a greater thermoresistance than micrococci, which remain in sheep casings after the treatment with sodium peroxide.

The treatment of sheep casings with substances, has affected the resistance of their wall. The results of resistance of sheep casings are shown in table 8. So as to have an indicator with which to compare changes in the resistance

of the casings treated with different methods, the first experiments were carried out after salt had been shaken off. By comparing the results obtained, one can observe that by washing the casings in distilled water, their resistance is increased, which can be explained by rehydradation and increase of the casing wall elasticity. Soaking the casings in lactic acid increases the resistance of the wall within first 4 hours, while within next 4 hours, it decreases. The casings treated with acetic acid increases their reeistance appreciably more than those treated with any other substances, but after an 8 hours treatment their resistance decreases greatly. Tartaric acid decreases the resistance of the casing wall, and the same is with hydrogene peroxide. The treatment with hydrogene peroxide increases the resistance of the casing wall very slightly after an 8 hours treatment, but it is well increased after 24 hours treatment.

SUMMARY

On the ground of results obtained, the following conclusions could be drawn:

1. The best results in bacteriological sense are obtained with sheep casings treated in 0.4% sodium peroxide solution, which are very similar to those obtained with treatment with 4% tartaric acid solution.

2. In relation to bacteria species, the best results are obtained by treating the casings in 0.4% sodium peroxide solution, because as microflora in so treated casings can be found micrococci as the prodominating type, and

3. The highest degree of resistance had sheep casings treated with 0.5% acetic acid solution.

LITERATURE:

1. Bergey: Manual of determinative bakteriology, Baltimore, 1957.
2. Clark,E.F.: Aerobic sporeforming bacteria, Agr. Monogr. 16,1952.
3. Leistner,L:Die Fleischwirtschaft 3,109,1955.
4. Mossel,D.A.A., Krol,B.:Arch.Lebensmitt.Hyg.7,193,1956.
5. Mossel,D.A.A.,Bruin,A.S.,Diepen A.M.:J.Appl.Bact. 1,142,1956.
6. Piening: Zbl.Bakter. I,124,216,1932.
7. Reuter,H.: Die Fleischwirtschaft, 7, 1953.
8. Schönberg,J.: Arch.Lebensmitt Hyg. 7, 1960.
9. Trumić,Ž.: Prehrana, 3,16, 1958.
10. Watts: Vet.J. 94, 112, 1938.
11. Wilson,W.J., Blair,E.M.: J.Path.Bact. 27,119,1924.
12. Wynne,E.S., Schmiedig,W.R.,Daye,G.T.:Food Res.1,9, 1955.

THE BACTERIOLOGICAL PICTURE OF SHEEP CASINGS AFTER SHAKING OUT OF SALT

Table 1

Number of sample	Total bacterial count	Sulphit reducing clostridia	Proportion of bacteria types				Determined bacteria species
			Micrococci	Streptococci	Gram+ bac.	Gaffkya & Sarcina	
1	1,85o.ooo	2.6oo	28	14	58	-	M.caseolyticus,M.varians, B.cereus,B.pumilus,B.koagulans, B.licheniformis,Str.faecium
2	1,216.666	76o	5o	13	37	-	M.conglomeratus,M.agilis,M.candidus,Staph.epidermidis,B.cereus Str.faecium,B.koagulans,B.licheniformis
3	12,933,333	bb	2o	2o	4o	2o	M.conglomeratus,B.koagulans, B.cereus,Str.faecium,Gaffkya i Sarcina
4	4,253.333	1.65o	16	32	52	-	M.agilis,B.brevis,B.subtilis, Str.faecium
5	131,ooo.ooo	22.ooo	33	-	67	-	Staph.aureus,M.caseolyticus, B.subtilis,B.cereus
6	8.ooo	24o	32	32	36	-	M.luteus,Staph.epidermidis, B.cereus,B.lentus,Str.faecium
7	25,ooo.ooo	7.ooo	33	-	67	-	Staph.epidermidis,B.pumilus, B.koagulans,B.cereus
8	4,45o.ooo	23.ooo	-	-	84	16	B.alvei,B.firmus,Gaffkya i Sarcina
9	72o,ooo.ooo	9.ooo	32	-	68	-	M.agilis,Staph.epidermidis, B.firmus,B.cereus,B.subtilis, B.pumilus
1o	1.o2o	2.o7o	-	2o	8o	-	Str.faecium,B.laterosporus, B.licheniformis,B.pumilus, B.lentus

176

THE BACTERIOLOGICAL PICTURE OF SHEEP CASINGS TREATED WITH DISTILLED WATTER

Table 2

Number of sample	Time in hours	Total bacterial count	Sulphit reducing clostridia	Proportion of bacteria types: Micrococci	Streptococci	Gram+ bac. &	Determined bacteria species
1	2	1,201.500	2.030	-	25	75	B.cereus, B.pumilus, B.subtilis, Str.faecium.
	4	64.500	220	-	50	50	B.cereus, B.subtilis, Str.faecium.
	6	58.333	2.040	-	-	100	B.cereus, B.licheniformis.
	8	109,133	150	-	-	100	B.cereus, B.subtilis, B.pumilus.
2	2	188.300	310	25	25	50	M.candidus, B.cereus, Str.faecium.
	4	266.666	20	50	-	50	M.agilis, Staph.epidermidis, B.cereus
	6	286.666	10	50	-	50	M.conglomeratus, M.halodenitrificans B.megatherium, B.cereus.
	8	173.333	60	33	-	67	M.conglomeratus, B.licheniformis, B.cereus.
3	2	2,700.000	88.000	-	-	100	B.koagulans, B.firmus, B.cereus.
	4	1,700.000	bb	-	-	100	B.koagulans, B.laterosporus.
	6	540.000	bb	50	-	50	M.varians, M.conglomeratus, B.laterosporus, B.koagulans.
	8	470.000	bb	20	-	80	M.varians, B.cereus, B.lentus, B.firmus.
4	2	2,036.666	3.105	50	25	25	M.agilis, B.brevis, Str.faecium.
	4	188.666	60	33	-	67	M.agilis,B.brevis.
	6	7.333	50	33	-	67	M.agilis, B.brevis.
	8	2.250	40	-	-	100	B.brevis
5	2	126.000	-	32	-	68	M.caseolyticus, Staph.aureus, B.subtilis,B.licheniformis.
	4	3.150	-	37	-	33	Staph.aureus, M.halodenitrificans, B.subtilis
	6	300	-	67	-	33	Staph.aureus, B.subtilis.
	8	700	-	67	-	33	Staph.aureus, B.subtilis.
6	2	3.950	505	50	25	25	M.luteus, Staph.epidermidis, B.cereus, Str.faecium.
	4	1.240	50	33	33	34	M.luteus, B.cereus, Str.faecium.
	6	23.110.000	5.240	50	-	50	M.luteus, Staph.epidermidis, B.cereus,B.pumilus
	8	77.500	10	50	-	50	M.luteus, Staph.epidermidis, B.cereus, B.lentus.
7	2	980.000	1.700	50	-	50	Staph.aureus, B.cereus, B.koagulans.
	4	24.000	1.050	50	-	50	Staph.aureus, B.cereus.
	6	19.900	535	50	-	50	Staph.aureus, B.cereus.
	8	19.900	1.600	64	-	36	Staph.aureus, B.cereus.
8	2	4.400.000	3.205	-	-	100	B.firmus
	4	953	5.600	-	-	100	B.firmus
	6	8.333	50	-	-	100	B.firmus
	8.	10.566	40	-	-	100	B.firmus
9	2	670.000	2.580	25	-	75	M.agilis, B.pumilus, B.cereus, B.subtilis.
	4	58.000	1.053	25	-	75	M.agilis, B.cereus, B.subtilis.
	6	10,000.000	555	32	-	68	M.agilis, Staph.epidermidis, B.subtilis, B.cereus.
	8	77.000	525	40	-	60	M.agilis, Staph.epidermidis,B.subtil
10	2	1.650	50	-	-	100	B.laterosporus, B.licheniformis.
	4	4.900	50	-	-	100	B.laterosporus, B.firmus.
	6	4.400	-	-	-	100	B.laterosporus, B.licheniformis.
	8	2.550	-	-	-	100	B.laterosporus.

bb = by the dilution 10^3 uncountable number of colonies

THE BACTERIOLOGICAL PICTURE OF SHEEP CASINGS TREATE WITH 0,5 LACTIC ACID

Table 3

Number of sample	Time in hours	Total bacterial count	Sulphit reducing clostridia	Proportion of bacteria types			Determined bacteria species
				Micrococci	Streptococci	Gram+ bac. &	
1	2	2.040	40	-	50	50	Str. faecium, B. koagulans, B. licheniformis, B. cereus.
	4	783	10	-	-	100	B. licheniformis, B. koagulans, B. pumilus, B. subtilis.
	6	525	40	-	-	100	B. pumilus,
	8	270	10	-	-	100	B. pumilus, B. cereus.
2	2	390	80	50	-	50	M. agilis, B. cereus, B. pumilus.
	4	700	20	-	-	100	B. cereus.
	6	5.033	580	-	-	100	B. cereus, B. pumilus.
	8	5.150	20	-	-	100	B. cereus.
3	2	12.831	160	-	-	100	B. laterosporus, B. cereus, B. pumilu
	4	1.800	1.700	-	-	100	B. cereus ,
	6	1.100	60	-	-	100	B. pumilus, B. cereus.
	8	780	10	-	-	100	B. laterosporus.
4	2	20.700	90	-	50	50	Str. faecium, B. brevis, B. subtilis
	4	2.043	-	-	-	100	B. subtilis.
	6	150	-	-	-	100	B. subtilis.
	8	70	-	-	-	100	B. subtilis
5	2	60	-	-	-	100	B. cereus
	4	40	-	-	-	100	B. cereus
	6	50	-	-	-	100	B. licheniformis, B. cereus
	8	-	-	-	-	-	
6	2	510	525	-	-	100	B. lentus, B. cereus
	4	100	50	-	-	100	B. lentus, B. cereus
	6	1.033	2.040	-	-	100	B. lentus, B. cereus
	8	205	-	-	-	100	B. lentus, B. cereus
7	2	17.800	170	50	-	50	Staph. epidermidis, B. koagulans B. firmus
	4	3.200	90	50	-	50	Staph. epidermidis, B. firmus
	6	3.950	20	50	-	50	Staph. epidermidis, B. pumilus.
	8	1.126	10	100	-	-	Staph. epidermidis.
8	2	5.066	200	-	-	100	B. alvei, B. firmus
	4	1.100	40	-	-	100	B. alvei, B. firmus
	6	1.100	20	-	-	100	B. alvei.
	8	125	20	-	-	100	B. alvei
9	2	1.330	30	-	-	100	B. pumilus, B. cereus
	4	115	30	-	-	100	B. pumilus, B. cereus, B.subtil
	6	10	10	-	-	100	B. cereus, B. subtilis
	8	30	100	-	-	100	B. lentus, B. licheniformis, B. laterosporus
10	2	85	40	-	-	100	B. lentus, B. licheniformis, B. laterosporus
	4	-	30	-	-	-	
	6	-	10	-	-	-	
	8	-	10	-	-	-	

THE BACTERIOLOGICAL PICTURE OF SHEEP CASINGS TREATED WITH 0,5 ACETIC ACID

Table 4

Number of sample	Time in hours	Total bacterial count	Sulphit reducing clostridia	Proportion of bacteria types: Micrococci	Proportion of bacteria types: Streptococci	Proportion of bacteria types: Gram + bac.	& Determined bacteria species
1	2	903.333	520	20	20	60	M. caseolyticus, Str. faecium, B. pumilus, B. licheniformis, B. subtilis
	4	320.250	10	33	33	34	M. conglomeratus, Str. faecium, B. subtilis
	6	6.610	30	-	-	100	B. pumilus, B. subtilis
	8	58.178	560	-	-	100	B. subtilis
2	2	4.100	80	40	20	40	M. conglomeratus, M. candidus, B. licheniformis, B. cereus, Str. faecium
	4	1.850	525	50	-	50	M. conglomeratus, M. candidus, B. licheniformis
	6	1.500	-	-	-	100	B. licheniformis,
	8	1.100	-	-	-	100	B. licheniformis, B. pumilus
3	2	36.500	90	50	-	50	M. conglomeratus, M. flavus, B. subtilis, B. cereus
	4	6.450	10	50	-	50	M. conglomeratus, B. subtilis, B. cereus
	6	4.250	10	36	-	64	M. conglomeratus, B. laterosporus, B. firmus
	8	1.523	10	50	-	50	M. conglomeratus, B. cereus
4	2	3.050	-	-	-	100	B. brevis, B. subtilis
	4	410	-	-	-	100	B. brevis, B. subtilis
	6	215	-	-	-	100	B. subtilis,
	8	110	-	-	-	100	B. subtilis
5	2	546	-	-	-	100	B. subtilis, B. cereus
	4	105	40	-	-	100	B. subtilis,
	6	145	-	-	-	100	B. subtilis
	8	100	-	-	-	100	B. subtilis, B. pumilus
6	2	870	1.650	-	50	50	Str. faecium, B. lentus
	4	325	510	-	-	100	B. lentus, B. cereus
	6	5.100	110	-	-	100	B. lentus, B. cereus
	8	120	20	-	-	100	B. lentus
7	2	684.500	3.135	50	-	50	Staph. aureus, B. licheniformis
	4	50.950	80	100	-	-	Staph. aureus,
	6	160	70	100	-	-	Staph. aureus
	8	150	-	100	-	-	Staph. aureus.
8	2	102.000	26.000	-	-	100	B. firmus
	4	47.000	150	-	-	100	B. firmus
	6	135	120	-	-	100	B. firmus
	8	230	-	-	-	100	B. firmus
9	2	190	90	50	-	50	M. agilis, M. varians, B.pumilus
	4	260	70	50	-	50	M. varians, M. agilis, B.pumilus
	6	205	30	50	-	50	M. agilis, B. pumilis
	8	145	-	50	-	50	M.varians, M. agilis, B. firmus, B. pumilus.
10	2	50	60	-	-	100	B. lentus
	4	40	40	-	-	100	B. lentus
	6	30	30	-	-	100	B. lentus
	8	-	10	-	-	-	

THE BACTERIOLOGICAL PICTURE OF SHEEP CASINGS TREATED WITH 4% TARTARIC ACID

Table 5

Number of sample	Time in hours	Total bacterial count	Sulphit reducing clostridia	Proportion of bacteria types			&	Determined bacteria species
				Micrococci	Streptococci	Gram + bac.		
1	24	1.036	3.050	100	-	-		Staph. epidermidis
2	24	1.120	-	-	-	100		B. lentus, B. brevis
3	24	390	-	-	-	100		B. subtilis, B. vrevis
4	24	20	-	-	-	100		B. koagulans
5	24	260	-	-	-	100		B. cereus, B. lentus
6	24	1.080	-	-	-	100		B. cereus, B. koagulans
7	24	40	120	-	-	100		B. firmus
8	24	65	80	-	-	100		B. subtilis, B. pumilus, B. licheniformis
9	24	205	525	-	-	100		B. licheniformis, B. pumilus

THE BACTERIOLOGICAL PICTURE OF SHEEP CASINGS TREATED WITH 0,4 HYDROGEN PEROXIDE

Table 6

Number of sample	Time in hours	Total bacterial count	Sulphit reducing clostridia	Proportion of bacteria types: Micrococci	Proportion of bacteria types: Streptococci	Proportion of bacteria types: Gram + bac. &	Determined bacteria species
1	8	526	-	-	-	100	B. pumilus, B. cereus
	24	110	-	-	-	100	B. pumilus, B. cereus
2	8	2.350	-	-	-	100	B. licheniformis
	24	70	-	-	-	100	B. licheniformis
3	8	610	-	36	-	64	M. conglomeratus, B.cereus, B. firmus
	24	380	-	36	-	64	M. conglomeratus, B. koagulans
4	8	510.000	-	-	-	100	B. subtilis
	24	480	-	-	-	100	B. subtilis
5	8	70	-	-	-	100	B. subtilis, B. cereus
	24	-	-	-	-	-	
6	8	130	-	-	-	100	B. lentus
	24	20	-	-	-	100	B. lentus
7	8	80	-	-	-	100	B. lentus
	24	-	-	-	-	-	
8	8	30	-	-	-	100	B. firmus
	24	-	-	-	-	-	
9	8	1.700	-	-	-	100	B. firmus, B. pumilus
	24	1.700	-	-	-	100	B. pumilus
10	8	20	-	-	-	100	B. lentus
	24	-	-	-	-	-	

THE BACTERIOLOGICAL PICTURE OF SHEEP CASINGS TREATED WITH 0,4% SODIUM PEROXIDE

Table 7

Number of sample	Time in hours	Total bacterial count	Sulphit reducing clostridia	Proportion of bacteria types: Micrococci	Proportion of bacteria types: Streptococci	Proportion of bacteria types: Gram + & bac.	Determined bacteria species
1	8	1.600	-	50	-	50	M. agilis, B. pumilus
	24	165	-	100	-	-	M. flavus, M. agilis
2	8	420	-	64	-	36	B. pumilus, M. caseolyticus, M. varians
	24	40	-	100	-	-	M. caseolyticus, M. varians
3	8	90	-	100	-	-	M. agilis
	24	-	-	-	-	-	
4	8	60	-	100	-	-	M. candidus
	24	-	-	-	-	-	
5	8	170	-	100	-	-	M. luteus
	24	110	-	100	-	-	M. luteus
6 I	8	50	-	100	-	-	Staph. epidermidis
	24	-	-	-	-	-	
7	8	50	-	100	-	-	M.agilis, Staph.epidermidis
	24	-	-	-	-	-	
8	8	30	-	-	-	100	B. pumilus
	24	10	-	-	-	100	B. pumilus
9	8	-	-	-	-	-	
	24	-	-	-	-	-	

THE RESISTANCE OF SHEEP CASINGS TREATED WITH DIFFERENT SUBSTANCES

Table 8

Number of sample	After shaking out of salt	After rinsing in dist.watter	Lactic acid 2	Lactic acid 4	Lactic acid 6	Lactic acid 8	Acetic acid 2	Acetic acid 4	Acetic acid 6	Acetic acid 8	Tartaric acid	Hydr.per. 8	Hydr.per. 24	Sod.per. 8	Sod.per. 24
1.	83	95	75	92	78	62	98	88	98	70	79	70	93	81	80
2.	77	91	77	85	88	57	104	144	110	64	62	62	53	82	50
3.	71	89	104	77	116	78	96	88	80	68	67	68	62	76	63
4.	84	87	102	105	86	60	95	98	140	70	53	62	57	80	67
5.	76	81	78	113	84	72	107	106	120	68	58	66	75	78	55
6.	82	83	77	98	79	64	113	100	110	69	62	68	66	82	50
7.	75	92	82	78	82	76	100	94	90	66	60	70	72	81	78
8.	81	85	80	82	95	68	98	102	96	68	78	68	88	76	69
9.	77	84	102	105	88	74	96	90	98	70	62	64	70	80	75
10.	78	90	83	85	80	70	98	98	120	70	66	68	92	82	52
Average value	79,4	87,7	86,0	92,0	77,6	68,1	100,5	100,8	102,2	68,3	64,7	66,6	72,8	79,8	63,9