Onderstepoort J. vet. Res. 45 (2), 133–140 (1978)

OBSERVATIONS ON THE EFFECT OF DIFFERENT METHODS OF PROCESSING ON THE BACTERIAL CONTAMINANTS OF BOVINE AND OVINE TRIPE

H. N. VAN DER MADE and J. J. VAN STADEN, Veterinary Research Institute, Onderstepoort, 0110

ABSTRACT

VAN DER MADE, H. N. & VAN STADEN, J. J., 1978. Observations on the effect of different methods of processing on the bacterial contaminants of bovine and ovine tripe. *Onderstepoort Journal of Veterinary Research* 45 (2), 133–140 (1978).

A comparison was made of the multiplication of bacteria in specimens of tripe processed in different ways. There was little difference in this respect between commercial tripe as offered for purchase to the consumer and rough and scraped tripe incubated at 30 °C for 24 h. Tripe stored at 4 °C or in acetic acid (pH 4) at 30 °C for 24 h, however, had appreciably fewer bacteria.

Résumé

OBSERVATIONS CONCERNANT L'INFLUENCE DE DIVERS PROCÉDÉS D'APPRÊT SUR LES CONTAMINANTS BACTÉRIENS DES TRIPES DE BOEUF ET DE MOUTON

On a procédé à un examen comparatif de la multiplication des bactéries dans des échantillons de tripes, apprêtés de diverses façons. Il n'y avait pas de différence sous ce rapport entre des tripes commercialisées, telles qu'offertes au consommateur et des tripes brutes ou dégrossies maintenues à 30 °C pendant 24 h. Cependant, des tripes conservées à 4 °C ou gardées dans l'acide acétique (pH 4) à 30 °C pendant 24 h avaient notablement moins de bactéries.

INTRODUCTION

Richardson, Burnett & Koornhof (1968) in their survey of the position found a high incidence of *Salmonella* spp., *Escherichia coli* type 1 (faecal) and *Clostridium perfringens* in tripe and intestine destined for human consumption and they concluded that the offal was inadequately cleaned. Subsequently, a reduction of bacterial content was achieved by Horton & Van den Heever (1972) by parboiling and chilling these products, and bacteria-free offal was produced as a minced and canned product (Van der Made & Van Staden, 1975).

Bovine and ovine ruminal wall for human consumption is distributed in the trade as rough or washed tripe. In the case of rough tripe, the rumen is emptied of ingesta, rinsed and sold as a fresh product, while washed tripe undergoes a further washing process with unspecified chemical additives and is sold in plastic containers as a chilled product.

The local trend to distribute and market tripe as a chilled product warranted an investigation into the situation regarding the multiplication of putrefactive bacteria and some potentially pathogenic bacteria under these conditions. Concurrently, a study was made both of the bacterial multiplication in tripe at a temperature of 30 °C, representing mismanagement of the product, and in the presence of some organic acids which might be used as preservatives.

MATERIALS AND METHODS

Rough, scraped and washed specimens of tripe were obtained from 3 different sources, namely Abattoir A, Abattoir B and a retail supermarket, as recorded in the schedule in Table 1.

TABLE 1 Schedule showing type and source of specimens of tripe

Specimen series No.	Type of tripe	Animal	Source of tripe
I.....	Rough.....	Bovine..	Abattoir A
II.....	Rough.....	Ovine...	Abattoir A
III.....	Rough.....	Bovine..	Abattoir B
IV.....	Scraped.....	Bovine..	Abattoir A
V.....	Scraped.....	Ovine...	Abattoir A
VI.....	Washed.....	Bovine..	Abattoir B
VII.....	Commercial..	Bovine..	Retail supermarket

Received 16 February 1978—Editor

The specimens of tripe were collected from normal healthy cattle and sheep of different breeds, ages and sexes which had been slaughtered and inspected according to the procedure outlined under the *Animal Slaughter, Meat and Animal Products Hygiene Act* (Act 13 of 1975/Anon., 1975).

Processing of tripe

Tripe from Abattoir A (Specimen Series No. I, II, IV & V, Table 1)

The rumina of 5 bovine and 5 ovine carcasses were emptied of ingesta and rinsed in running tap water. Each rumen was divided into 2 portions, one of which was retained as rough tripe while the other was processed as scraped tripe. Scraped tripe was prepared from rough tripe by immersion in hot water (67 °C for 3 min), scraped by hand and finally rinsed in cold water.

For further processing, specimens of 500 g each (Specimen Series No. I, II, IV & V) were collected from the above-mentioned rough and scraped tripe within 60 min of slaughter. Each specimen was then subdivided into 6 samples of 50 g each (see Tables 2, 3, 5 & 6). Sample 1 was subjected to a storage temperature of 30 °C for 24 h, Sample 2 to 4 °C for 24 h and Sample 3 to 4 °C for 18 h and 30 °C for a further 6 h. Samples 4, 5 and 6 were submerged in glass containers in acetic, lactic and citric acid solutions at pH 4 respectively, during a storage period of 24 h at 30 °C.

Tripe from Abattoir B (Specimen Series No. III and VI, Table 1)

Specimens of rough tripe were collected from bovine rumina within 2 h of slaughter, and specimens of washed tripe within 10 min of washing*. These were transported under sterile conditions to the laboratory where processing was commenced within 20 min of their arrival. Each specimen was subdivided into 3 samples of 50 g each (see Tables 4 & 7). Sample 1 was subjected to a storage temperature of 30 °C for 24 h, Sample 2 to 4 °C for 24 h, and Sample 3 to 4 °C for 18 h and 30 °C for a further 6 h.

Commercial tripe from retail supermarket (Specimen Series No. VII, Tables 1 & 8)

Five 250 g specimens of bovine tripe, each packed in low density polythene and stored in a chilled products counter, were obtained. These were opened

* The chemicals used in this washing process are unknown

under sterile precautions within 10 min of collection and specimens for bacteriological examination were taken. The specimens were finally subjected to an organoleptic examination for general appearance, odour and the presence of ingesta (see Table 9).

Bacteriological examination

At the time of the preparation of the above-mentioned samples of tripe as well as 18 h and 24 h later, a 5 g portion of each sample was homogenized* in 50 ml sterile physiological saline, resulting in a tenfold dilution. Further 6 tenfold serial dilutions in saline were made and dropped onto agar plates for counting colony-forming units (CFU) of bacteria, according to the method of Miles & Misra (1938). Bacterial counts are expressed as the CFU of bacteria per gram of material.

Total aerobic bacterial counts were done on blood tryptose** agar plates after 24 h aerobic incubation at 37,5 °C. *Staphylococcus* CFU counts were performed on *Staphylococcus* medium 110 (Chapman, 1946) after 48 h aerobic incubation at 37,5 °C, only the chromogenic colonies being counted.

Clostridial counts were done on Perfringens (SFP) agar plates (Shahidi & Ferguson, 1921) with agar overlay, according to the method of Katsaras, Wernery & Hartwigk (1974). The plates were incubated at 37,5 °C for 24 h in an anaerobic hydrogen atmosphere. All the lecithinase and H_2S positive colonies were counted as clostridia.

pH Examinations

The pH determinations*** were performed on the homogenized material as mentioned above after the bacteriological examinations were done at 0 h, 18 h and 24 h. The examinations performed on portions of samples submerged in organic acids were done at 30 min after their immersion.

* Ultra Turrax Homogenizer
** Difco
*** Metrohm pH meter type E448

Results

Rough tripe

Rough bovine tripe from Abattoir A

The mean values of pH and bacterial numbers in rough bovine tripe from Abattoir A, Specimen Series I, Samples 1–6 are given in Table 2.

Effect of storage temperature (Sample Series 1, 2 & 3, Table 2). At a temperature of 30 °C a large increase occurred in staphylococci and the total aerobic bacterial count (Sample 1). At 4 °C clostridial and total aerobic counts showed slight decreases over 24 h (Sample 2), whereas the staphylococci increased from 9×10^2–7×10^5. When the temperature was raised from 4 °C to 30 °C after 18 h, clostridia remained static, whereas the other counts showed an increase (Sample 3).

There was not much difference between the pH of the specimens kept at different temperatures, the pH ranging from 7,1–7,5 (Sample Series 4, 5 & 6, Table 2).

Effects of organic acid solutions at 30 °C (Sample Series 4, 5 & 6 Table 2). The total aerobic bacterial count of samples preserved in acetic acid for 24 h was unchanged after 18 h, but thereafter it showed a marked increase from 1×10^6–5×10^9. Clostridia initially increased slightly and then decreased to approximately previous levels, while staphylococci decreased from 2×10^2 to zero (Sample 4).

In lactic acid preservation all bacterial CFU increased appreciably (Sample 5). All the bacterial CFU increased in samples preserved in citric acid, proportionally the greatest increase being recorded for clostridia, i.e., from 0–2×10^9 (Sample 6).

Initially and before storage in organic acids, the mean pH of specimens of tripe ranged from 7,1–7,5. The lowest final pH was in the sample stored in acetic acid at 4,8, while the final pH of those samples stored in citric and lactic acids was 5,7.

TABLE 2 Summary of the processing procedure of samples, bacterial counts and pH determinations on rough bovine tripe from Abattoir A (Specimen series I)

Sample series No.	No. of samples	Storage temp. (°C)	Organic acid storage	Hours of storage	Mean bacterial counts			Mean pH
					Staphylococci	Clostridia	Total aerobic bact. count	
1	5	30	—	0	1×10^3	2×10^2	3×10^6	7,1
				18	1×10^7	1×10^6	2×10^{10}	7,3
				24	8×10^8	1×10^7	3×10^{10}	7,2
2	5	4	—	0	9×10^2	6×10^2	4×10^6	7,3
				18	1×10^3	4×10^3	5×10^5	7,3
				24	7×10^5	3×10^2	2×10^5	7,5
3	5	4/30	—	0	9×10^2	6×10^2	4×10^6	7,3
				18	1×10^3	4×10^3	5×10^5	7,3
				24	5×10^4	3×10^3	3×10^7	7,3
4	5	30	Acetic	0	2×10^2	2×10^2	1×10^6	5,7
				18	—	5×10^3	1×10^6	4,9
				24	—	6×10^2	5×10^9	4,8
5	5	30	Lactic	0	1×10^3	—	1×10^5	6,7
				18	1×10^6	1×10^6	3×10^9	5,8
				24	1×10^6	2×10^6	5×10^9	5,7
6	5	30	Citric	0	1×10^3	—	2×10^5	6,5
				18	3×10^6	1×10^5	1×10^9	5,8
				24	3×10^9	2×10^9	2×10^9	5,7

Conclusion

The lowest bacterial count was obtained in tripe stored at 4 °C. Particularly staphylococcal, but also clostridial increase was inhibited by acetic acid at 30 °C. These samples also had the lowest pH.

Rough ovine tripe from Abattoir A

The mean values of pH and bacterial CFU in rough ovine tripe from Abattoir A, (Specimen Series II Samples 1–6) are presented in Table 3.

Effect of storage temperature (Sample Series 1, 2 & 3 Table 3). A large mean increase in bacterial numbers took place in tripe stored at 30 °C and these reached a maximum after 18 h incubation (Sample 1). Except for variations in the total aerobic count, bacterial numbers remained virtually static at 4 °C (Sample 2). When the storage temperature was increased to 30 °C after 18 h, all bacterial counts increased (Sample 3).

Effect of organic acid solutions at 30 °C (Sample Series 4, 5 & 6 Table 3). In samples preserved in acetic acid, the clostridia did not multiply, the staphylococci decreased from 8×10^2 to zero and the total aerobic count only started increasing after 18 h (Sample 4).

A marked initial rise in the clostridial count in tripe placed in lactic acid was followed by a slight decrease after 18 h (Table 3). The staphylococci followed the same basic pattern, but the drop which occurred after 18 h was more pronounced, while the total bacterial count appeared to rise unchecked (Sample 5).

The samples preserved in citric acid (Sample 6) showed the same pattern of bacterial proliferation as those placed in lactic acid.

Initially and before storage in organic acids, the mean values of the pH of specimens ranged from 7,4–7,6. The final pH in acetic acid was 4,6, compared to 4,8 in lactic acid and 5,0 in citric acid.

Conclusion

In the case of rough ovine tripe, inhibition of bacterial increase was obtained with acetic acid, clostridia and staphylococci being particularly affected. Low bacterial counts were also obtained in samples stored at 4 °C. The lowest pH was obtained in samples stored in acetic acid.

Rough bovine tripe from Abattoir B

The mean values of bacterial numbers and pH in rough bovine tripe from Abattoir B (Specimen Series III, Samples 1–3) are given in Table 4.

Effect of storage temperature (Sample Series 1, 2 & 3 Table 4). A large mean increase in bacterial numbers occurred in tripe stored at 30 °C for 24 h (Sample 1).

At a storage temperature of 4 °C, the clostridial count decreased from 6×10^2–2×10^2, whereas the staphylococcal and total bacterial counts remained virtually static (Sample 2). When the storage temperature was raised to 30 °C after 18 h, all counts increased (Sample 3). The mean pH values of the samples ranged from 6,9–7,1.

Conclusion

Rough bovine tripe from Abattoir B showed bacterial increases similar to those of rough tripe from Abattoir A at comparable storage temperatures. In all samples the pH increased from 6,9–7,1 over 24 h.

Scraped tripe

Scraped bovine tripe from Abattoir A

The mean values of bacterial numbers and pH in scraped bovine tripe from Abattoir A (Specimen Series IV, Samples 1–6) are presented in Table 5.

TABLE 3 Summary of the processing procedures of samples, bacterial counts and pH determinations on rough ovine tripe from Abattoir B (Specimen series II)

Sample series No.	No. of samples	Storage temp. (°C)	Organic acid storage	Hours of storage	Mean bacterial count (CFU)			Mean pH
					Staphylococci	Clostridia	Total aerobic bact. count	
1	5	30	—	0	5×10^3	—	1×10^5	7,4
				18	1×10^9	1×10^6	2×10^{10}	7,5
				24	4×10^9	4×10^5	3×10^{10}	7,5
2	5	4	—	0	2×10^3	—	1×10^5	7,6
				18	4×10^3	—	1×10^6	7,6
				24	3×10^3	—	8×10^4	7,6
3	5	4/30	—	0	2×10^3	—	1×10^5	7,6
				18	4×10^3	—	1×10^6	7,6
				24	7×10^3	3×10^2	2×10^6	7,5
4	5	30	Acetic	0	8×10^2	—	7×10^3	5,3
				18	—	—	6×10^3	4,6
				24	—	—	7×10^5	4,6
5	5	30	Lactic	0	4×10^2	—	9×10^3	5,9
				18	4×10^8	1×10^7	3×10^8	5,2
				24	1×10^5	2×10^6	9×10^8	4,8
6	5	30	Citric	0	3×10^3	—	2×10^4	6,3
				18	7×10^5	2×10^5	1×10^8	5,1
				24	1×10^5	6×10^3	2×10^9	5,0

TABLE 4 Summary of the processing procedures of samples, bacterial counts and pH determinations on rough bovine tripe from Abattoir B (Specimen series III)

Sample series No.	No. of samples	Storage temp. (°C)	Organic acid storage	Hours of storage	Mean bacterial count (CFU)			Mean pH
					Staphylococci	Clostridia	Total aerobic bact. count	
1	5	30	—	0	2×10^4	5×10^3	1×10^6	6,9
				18	1×10^9	5×10^6	4×10^{10}	7,1
				24	1×10^9	1×10^8	5×10^{10}	7,1
2	5	4	—	0	4×10^4	6×10^2	8×10^5	6,9
				18	7×10^4	—	1×10^6	7,1
				24	5×10^4	2×10^2	2×10^6	7,1
3	5	4/30	—	0	4×10^4	6×10^2	8×10^5	6,9
				18	7×10^4	—	1×10^6	7,1
				24	3×10^6	3×10^3	3×10^8	7,1

TABLE 5 Summary of the processing procedures of samples, bacterial counts and pH determinations on scraped bovine tripe from Abattoir A (Specimen series IV)

Sample series No.	No. of samples	Storage temp. (°C)	Organic acid storage	Hours of storage	Mean bacterial count (CFU)			Mean pH
					Staphylococci	Clostridia	Total aerobic bact. count	
1	5	30	—	0	1×10^3	—	4×10^6	6,9
				18	3×10^8	7×10^6	2×10^{10}	6,9
				24	5×10^9	5×10^6	2×10^{10}	6,9
2	5	4	—	0	1×10^3	—	3×10^6	6,9
				18	1×10^6	4×10^2	2×10^6	7,0
				24	5×10^4	—	6×10^5	6,9
3	5	4/30	—	0	1×10^3	—	3×10^6	6,9
				18	1×10^6	4×10^2	2×10^6	7,0
				24	1×10^6	2×10^2	1×10^6	6,9
4	5	30	Acetic	0	4×10^2	—	4×10^4	5,3
				18	—	—	5×10^5	4,6
				24	—	—	1×10^7	4,6
5	5	30	Lactic	0	5×10^2	2×10^2	4×10^5	5,9
				18	3×10^6	6×10^4	2×10^9	5,4
				24	1×10^7	1×10^5	2×10^9	5,3
6	5	30	Citric	0	2×10^3	2×10^2	4×10^4	5,6
				18	2×10^9	1×10^5	2×10^9	4,8
				24	2×10^6	1×10^{10}	2×10^9	4,9

Effect of storage temperature (Sample Series 1, 2 & 3 Table 5). At a storage temperature of 30 °C for 24 h there was a large mean bacterial increase.

At a storage temperature of 4 °C for 24 h, both clostridial and staphylococcal counts showed an initial increase and then a decline, while the total aerobic bacterial count declined (Sample 2). When the temperature was increased to 30 °C after 18 h, all counts remained virtually unchanged (Sample 3).

Effect of organic acid solutions at 30 °C (Sample Series 4, 5 & 6 Table 5). In the case of the samples preserved in acetic acid, the total aerobic bacterial count increased from 4×10^4–5×10^5 at 18 h and to 1×10^7 at 24 h (Table 5). No clostridia could be found, and staphylococci, after an initial increase, were absent at 24 h (Sample 4).

All the bacteria in samples preserved in lactic acid showed substantial increases in numbers (Sample 5).

Except for the staphylococci, which decreased slightly after 18 h in samples preserved in citric acid, all bacteria and particularly the clostridia, increased markedly.

Initially and before storage in organic acids, these samples showed a pH range of 6,9–7,0, while the final pH in the specimens stored in acetic acid was 4,6 compared with 5,3 in lactic, and 4,9 in citric acid.

Conclusion

The overall pattern of the increase in bacterial numbers in samples of scraped bovine tripe was very similar to that of corresponding specimens of rough bovine tripe. The samples which harboured the lowest numbers of bacteria were those preserved in acetic acid, closely followed by those stored at 4 °C.

The pH of samples stored in acetic acid was the lowest, followed by that of lactic and citric acids, respectively.

TABLE 6 Summary of the processing procedures of samples, bacterial counts and pH determinations on scraped ovine tripe from Abattoir A (Specimen series V)

Sample series No.	No. of samples	Storage temp. (°C)	Organic acid storage	Hours of storage	Mean bacterial count (CFU)			Mean pH
					Staphylococci	Clostridia	Total aerobic bact. count	
1	5	30	—	0	1×10^{3}	—	6×10^{4}	7,0
				18	3×10^{9}	1×10^{6}	4×10^{10}	7,0
				24	1×10^{10}	9×10^{6}	4×10^{10}	7,0
2	5	4	—	0	2×10^{3}	—	1×10^{5}	7,2
				18	9×10^{2}	—	1×10^{4}	7,3
				24	6×10^{3}	—	1×10^{5}	7,1
3	5	4/30	—	0	2×10^{3}	—	1×10^{5}	7,2
				18	9×10^{2}	—	1×10^{4}	7,3
				24	3×10^{3}	3×10^{3}	1×10^{3}	7,2
4	5	30	Acetic	0	—	—	3×10^{3}	4,7
				18	—	—	5×10^{3}	4,4
				24	—	—	1×10^{4}	4,4
5	5	30	Lactic	0	2×10^{2}	—	7×10^{2}	5,4
				18	1×10^{6}	8×10^{2}	8×10^{8}	4,6
				24	9×10^{5}	2×10^{4}	1×10^{7}	4,5
6	5	30	Citric	0	2×10^{2}	—	5×10^{2}	4,8
				18	7×10^{4}	4×10^{2}	9×10^{4}	4,2
				24	9×10^{5}	4×10^{2}	8×10^{5}	4,2

Scraped ovine tripe from Abattoir A

The mean values of bacterial numbers and pH in scraped ovine tripe from Abattoir A (Specimen Series V, Samples 1–6) are given in Table 6.

Effect of storage temperature (Sample Series 1, 2 & 3 Table 6). All bacterial counts showed the expected increase at a storage temperature of 30 °C (Sample 1). Except for a slight increase in the clostridia, bacterial numbers remained virtually unchanged at 4 °C (Sample 2). When the temperature was increased to 30 °C after 18 h, slight to moderate increases occurred in the counts (Sample 3).

The mean pH values varied from 7,0–7,3.

Effect of organic acid solutions at 37 °C (Sample series 4, 5 & 6 Table 6). In samples preserved in acetic acid for 24 h, the total aerobic bacterial count increased slightly from 3×10^{3}–1×10^{4}, while no clostridia or staphylococci could be cultured (Sample 4).

The bacterial counts of all samples preserved both in lactic acid (Sample 5), and in citric acid (Sample 6) increased, but the increases were not as marked in the latter.

Before the samples were immersed in organic acid solution, the mean pH values varied from 7,0–7,3. The final pH of the sample stored in citric acid was 4,2 after 24 h, compared with 4,4 in acetic and 4,5 in lactic acid.

Conclusion

The bacterial counts on scraped ovine tripe showed tendencies similar to those in corresponding specimens of rough ovine tripe, the samples stored in acetic acid harbouring the lowest number of bacteria.

The lowest pH was measured in the sample stored in citric acid followed by the samples stored in acetic acid.

Washed tripe

Washed bovine tripe from Abattoir B

The mean bacterial numbers and pH in washed bovine tripe from Abattoir B (Specimen Series VI, Samples 1–3) are given in Table 7.

Effect of storage temperature (Sample Series 1, 2 & 3, Table 7). After initial low counts, considerable increases in the numbers of all bacteria occurred at a temperature of 30 °C (Sample 1).

At a storage temperature of 4 °C, a slight increase in the number of staphylococci occurred, whereas the total aerobic count dropped from 1×10^{4}–2×10^{3}, and clostridia could not be detected (Sample 2). When the temperature was increased to 30 °C after 18 h, the total aerobic bacterial count increased slightly, while the staphylococci remained virtually constant and clostridia could not be detected (Sample 3).

The pH of the washed tripe was very alkaline, the mean values of which ranged from 8,0–9,3. In all cases the alkalinity decreased during the 24 h storage time.

Conclusion

Exposure of washed bovine tripe with a relatively low bacterial content to high temperatures for 24 h resulted in high total aerobic bacterial and staphylococcal counts and the alkalinity due to chemical additives proved of no advantage. Specimens chilled at 4 °C, however, had very low bacterial counts.

Commercial tripe

The mean bacterial numbers and pH in commercial bovine tripe which had been stored in the chilled products counter of a retail supermarket, (Specimen Series VII, Samples 1–5) are presented in Table 8.

TABLE 7 Summary of the processing procedures of samples, bacterial counts and pH determinations on washed bovine tripe from Abattoir B (Specimen series VI)

Sample series No.	No. of samples	Storage temp. (°C)	Organic acid storage	Hours of storage	Mean bacterial count (CFU)			Mean pH
					Staphylococci	Clostridia	Total aerobic bact. count	
1	5	30	—	0	6×10^{2}	—	8×10^{3}	8,6
				18	1×10^{7}	4×10^{3}	1×10^{10}	8,3
				24	2×10^{8}	7×10^{2}	4×10^{10}	8,0
2	5	4	—	0	2×10^{2}	—	1×10^{4}	9,3
				18	2×10^{3}	—	2×10^{3}	8,8
				24	3×10^{2}	—	2×10^{3}	8,6
3	5	4/30	—	0	2×10^{2}	—	1×10^{4}	9,3
				18	2×10^{3}	—	2×10^{3}	8,8
				24	2×10^{2}	—	6×10^{4}	8,8

TABLE 8 Summary of samples, bacterial counts and pH determinations on commercial bovine tripe from a retail supermarket (Specimen series VII)

Sample series No.	No. of samples	Bacterial count (CFU)			pH
		Staphylococci	Clostridia	Total aerobic bacterial count	
1	1	6×10^{5}	—	3×10^{10}	8,0
2	1	2×10^{6}	—	2×10^{10}	8,3
3	1	8×10^{5}	—	2×10^{10}	8,0
4	1	2×10^{5}	4×10^{2}	1×10^{10}	7,9
5	1	8×10^{5}	—	5×10^{10}	7,9
Mean values		9×10^{5}	80	2×10^{10}	8,0

TABLE 9 Organoleptic examination of tripe from a retail supermarket

Specimen No.	General appearance	Presence of ingesta	Odour
1	White, slimy on the underside	None	Fresh
2	White, slimy on the underside	None	Fresh
3	Light brown, slimy all round	Present	Not fresh
4	White, slimy on the underside	Present in small amounts	Fresh
5	White, not slimy	None	Strong soda smell

The bacterial counts were high in all 5 samples (Table 8). Alkaline pH values ranging from 7,9–8,3 were measured with a mean value of 8,0.

The result of the organoloptic examination is shown in Table 9.

Conclusion

The bacterial counts obtained from commercial tripe were roughly comparable with those of washed tripe stored at 30 °C for 24 h. It is clear that the organoleptic examination gave no indication of the bacteriological content of the product.

Alkalinity did not inhibit bacterial multiplication.

Discussion

The results of the bacteriological examinations presented in this paper indicate that rough tripe contains very high bacterial counts which are not materially reduced by scraping. At elevated storage temperatures the clostridia and staphylococci show similar patterns of increase in both rough and scraped tripe.

The washing of tripe in an alkaline solution, as is done in Abattoir B, reduces the bacterial numbers. However, this advantage is lost if the product is not properly chilled, as was the case with specimens from the supermarket.

Tripe chilled at 4 °C showed low bacterial counts, but this should be regarded as insufficient for preservation as staphylococci still tended to increase.

When acetic acid was used as a preservative, very low clostridial and staphylococcal counts were recorded. The addition of acetic acid could be considered as an additional preservative where chilled tripe is marketed and would serve as an insurance against improper chilling.

References

ANON., 1975. *The Animal Slaughter Meat and Animals Products Hygiene Act* (Act 13 of 1975) and the Standing Regulations R3503, Pretoria: Government Printer.

CHAPMAN, G. H., 1946. A single culture medium for selective isolation of plasma coagulating staphylococci and for improved testing of chromogenesis, plasma coagulation, mannitol fermentation and Stone reaction. *Journal of Bacteriology*, 51, 409–410.

HORTON, B. G. W. & VAN DEN HEEVER, L. W., 1972 Conversion of bovine digestive tract into hygienically acceptable edible offal. *Journal of the South African Veterinary Medical Association*, 43, 251–258.

KATSARAS, K., WERNERY, U. & HARTWIGK, H., 1974. Isolierung Reinzüchtung und Differenzierung von *Clostridium welchii* (*perfringens*) aus stark kontaminiertem Unterzuchungsmaterial. *Zeitblatt für Veterinär-Medicin*, B., 21, 280–289.

MILES, A. A. & MISRA, S. S., 1938. The estimation of the bactericidal power of blood. *Journal of Hygiene, Cambridge*, 38, 732.

RICHARDSON, N. J., BURNETT, G. M. & KOORNHOF, H. J., 1968. A bacteriological assessment of meat, offal and other sources of human enteric infections in a Bantu township. *Journal of Hygiene, Cambridge*, 66, 365–375.

SHAHIDI, S. A. & FERGUSON, A. R., 1971. New quantitative, qualitative and confirmatory media for rapid analysis of food for *Clostridium perfringens*. *Applied Microbiology*, 21, 500–506.

VAN DER MADE, H. N. & VAN STADEN, J. J., 1975. The preparation, mincing and canning of bovine offal (ruminal and intestinal wall) for human consumption. *Journal of the South African Veterinary Association*, 46, 277–280.