USE OF SLAUGHTERING BY-PRODUCTS BLENDS IN SAUSAGE MANUFACTURE RAUL DIAZ, CELESTINO RODRIGUEZ, ROGER DE HOMBRE, CARLOS CASAL^{S,} JOSE ALVAREZ and JUAN DUQUESNE. UNIVERSITY of HAVANA, HAVANA 10400, CUBA

SUMMARY: Four slaughtering by-products blends (SBB) were used as a meat substitute in frankfurter type sausage. Blends were obtained using thermically deboned meat (TDM), cattle stomach, meat trimmings, broth, tendinous tissue ("malaya") and salt. Frankfurters were manufactured containing 36% of meat or 18% of meat plus 18% of SBB and were stored at 6-8°C. Chemical, microbiological and sensory analysis were performed as well as the Texture Profile Analysis (TPA). Chemical and microbiological parameters were not affected by meat replacement butsensoryscores became lower not even they were ranked as "I like it very much". The experienced laboratorypanel found that flavour was typical but weaker and that texture was worst. Formulae containing TDM (B3 and B4) showed undesirables TPA responses.

TDM free formulae (B1 and B2), suffer moderate changes in TPA responses when SBB was used. Shelf life for B1 and B2 formulae was similar to those of SBB free sausage.

INTRODUCTION: The majority of the protein currently discarded or merely downgraded to animal feed or fertilizer is of high nutritional quality and represents a very great economic loss to the Meat Industry (Ledward and Lawrie, 1984). The aim of this paper is to evaluate the influence of the using of four slaughtering by-products blends (SBB) in the manufacture of frankfurter type sausages.

MATERIALS AND METHODS: Four SBB developed by Hernandez et ^{al} (1981) were used in the manufacture of franfurter type sausages. The proximal composition of the blends is as follows:

SBB 1 SBB 2 SBB 3 SP Thermically deboned meat (TDM) x x Meat trimmings	ADR 4
Thermically deboned meat (TDM) x x Meat trimmings x	SDU
Meat trimmings	×
	V
Lungs trimmings x x x	~
Stomach - x -	_
Tendinous tissue (malaya) x - x	~
Broth x x x	r v
Salt x x x	~

Frankfurters were manufactured containing 36% of meat or 18% of meat plus 18% of SBB and were stored at 2-4°C, wrapped in 10W density polyethilene bags (PB) or vegetable glassine paper (GP). Preliminar sensory evaluation with seven trained judges and TextureProfile Analysis were performed in order to make a former selection of the SBB related with their sensory and textural behavior in formulae.

Chemical analysis: protein, moisture, fat, nitrite, clorure, ash pH and acidity (lactic acid).

Microbiological analysis: mesophilic aerobes and facultatives

anaerobes bacteria, Salmonellae and coliforms. Sensory analysis: Seven trained judges evaluated the sensory attributes of the products. An hedonic test was also performed by more than 80 untrained judges, using a 9-points scale where: 1- "I dislike it extremely" 9- "I like it extremely" Texture Profile Analysis (TPA) was performed according to Friedman et al (1963), using the Universal Testing Machine INSTROM mod. 1140. The prepared samples were cilynders of 22 mm diameter and 2 cm heigth and were compressed to 75% of its diameter. Hardness (H), brittleness (B), springiness (S), cohesivity (C), gumminess (G), chewiness (CH) and adhesivity were evaluated.

RESULTS AND DISCUSSION: Formulae containing TDM showed very low hardness and brittleness values and also presented adhesivity which is undesirable for this kind of meat sausages. So, SBB 3 and SBB 4 were rejected for our purposes. Remaining TPA values are presented in table 1. When SBB is added all the parameters value are lower than control values. Adhesivity was not found in any case.

Table 1.- TPA values of the studied sausage. Formulae time(days) H(Kg) B(Kg) S(mm) C CH G Control09.733.586.250.434.1826.15SBB 105.601.304.170.341.917.93 SBB 2 8.34 5.94 1.49 4.13 0.34 2.02 0
 Control
 10 GP
 9.10
 4.10
 4.25
 0.38
 3.46
 14.70

 SBB 1
 10 GP
 9.10
 4.10
 4.25
 0.32
 2.02
 6.55
SBB 1 SBB 2 10 GP 6.30 1.67 3.25 0.32 2.02 6.55 5.67 6.07 1.67 2.92 0.32 1.94 10 GP Control SBB 1 16.41 10 PB 8.98 3.90 4.25 0.43 3.86 SBB 2 10 PB 4.88 1.45 3.38 0.29 1.42 4.78 10 PB 4.95 1.46 3.50 0.36 1.78 6.24

Mean of 8 replications: value in the same colúmn not showing a common letter are signicantly different (p < 0.05)

TPA values agree with the sensory evaluation of the experienced judges (table 2) with pointed out the lack of meat substituded sausages. Also, cohesivity and springiness were lower too than corresponding control values which implies a sausage. The lack of the protein functionality in SBB which became critical for SBB 3 and SBB 4, because of the using of TDM, probably responsable of this changes in TPA values.

						Appear	ance	1.25.61
	Days	Pack	Flavor	Odor	Texture	Outer	Cut	overall
Maximum		21.0.0	6	2	4	5	3	20
Control	0	ALLAN.	5.65	1.77	3.42	4.71	2.74	19.27
SBB 1 SBB 2	0 0		4.45 4.80	1.77	2.80 2.40	4.57 4.50	2.64	15.83 15.84
Control	4	GP	6.00	1.93	4.00	4.83	2.90	19.66
SBB 1	4	GP	4.80	1.87	3.73	3.83	2.30	16.53
SBB 2	4	GP	4.80	1.80	2.33	4.33	1.67	15.93
Control	8	GP	5.40	1.90	3.50	4.63	2.63	18.05
SBB 1	8	GP	5.25	1.70	2.20	4.25	2.18	15.58
SBB 2	8	GP	4.35	1.70	2.60	4.25	2.48	15.38
Control	11	GP	5.40	1.65	3.40	4.88	2.78	18.10
SBB 1	11	GP	4.50	1.35	2.70	3.75	2.48	14.78
SBB 2	11	GP	4.35	1.40	2.90	4.00	2.70	15.35
Control	4	PB	5.85	1.85	3.70	4.88	2.70	18.98
SBB 1	4	PB	5.80	1.87	3.47	4.50	2.70	18.84
SBB 2	4	PB	5.40	1.73	3.20	.4.33	2.50	17.16
Control	8	PB	5.82	1.83	3.69	4.90	2.61	18.85
SBB 1	8	PB	4.95	1.70	2.73	3.87	2.30	15.55
SBB 2	8	PB	4.89	1.65	2.96	3.50	2.47	15.47
Control	11	PB	5.25	1.60	3.60	4.88	2.93	18.25
SBB 1	11	PB	3.30	1.35	2.80	2.63	2.48	13.55
SBB 2	11	PB	3.75	1.25	2.70	4.13	2.48	14.30
Means of	2 repl	icates	Sec. Contraction	O PARS				/

Table 2.- Sensory scores (trained judges).

The evaluation of the sensory attributes by the trained judges showed that apart from texture flavor was the most affected parameter. Judges said that flavor was typical but weaker in samples containing SBB. However, overall scores showed that sausages of good quality can be obtained using SBB 1 and 2. However, their shelf-lifes are slightly shorter specially if they are wrapped in polyethilene bags.

The overall acceptability (ranked by untrained judges) is of showed in table 3. As it was expected according to the results the descriptive test answered by the trained judges the overall acceptability was greater for control than for SBB containing sausages but those later received scores showing good sensory properties.

Product	Days	Pack	Mean	Pack	Mean
Control	0	1.64 057-1873	7.40	a surficient	State No. 95
SBB 1	0	1101080 10	7.14		
SBB 2	0		7.34		
Control	4	GP	7.99	PB	7.10
SBB 1	4	GP	7.26	PB	7.57
SBB 2	4	GP	7.41	PB	7.56
Control	8	GP	7.01	PB	7.01
SBB 1	8	GP	6.97	PB	7.04
SBB 2	8	GP	6.95	PB	6.95
Control	11	GP	7.04	PB	6.96
SBB 1	11	GP	5.10	PB	6.32
SBB 2	11	GP	6.21	PB	5.68

Chemical analysis are showed in table 4. Not important difference could be find between control and SSB containing formulae. This results could be achieved because the chemical composition of SBB was taken in account in order to adjust the original of the second descent of the second descent of the second descent descen original formula. Ashes and clorure were slightly higher for SBB containing products because there was some trend in the butchers to add me products because there was some trend in the butchers. to add more salt than necessary in order to prevent spoilage. SBB Were prepared at the slaughterhouse under the usual working conditions.

	-je varaes or	Chemical and	
	Control	SBB 1	SBB 2
	0.41	0.36	0.36
	6.4	6.4	6.4
(%)	* 3.99a	4.64b	4.73b
(ppm)	176.3	182.1	173.5
(8)	2.6a	3.1b	3.3b
8)	31.0	29.1	28.0
(%)	13.5	14.0	11.9
(%)	44.7	45.9	45.7

values with different letters differ at P<0.05

Taha

During the storage, the TPA values (table 1) were not because of the feeted, not even hardness increased slightly, because of the moisture loss.

Microbiological analysis showed that substituting meat by SBB didn't affect the microbiological safety of the sausages, disregardi disregarding if they are packaged or not. As it was expected, sanitary quality decreased when storage time increased and

consequently sensory evaluation also decreased. Shelf life can be considered appropriate for this kind of product having high water activity (0.95-0.96) values.

CONCLUSIONS: SBB can be used in order to substitute meat in frankfurter type sausage but TPA parameters are modified. REFERENCES:

- Friedman, H.N.; Whitney, J.E. and Szcezniak, A. (1963) Journal of Food Science 28:201 of Food Science 28:391
- Hernández, E. (1981) Thesis. Faculty of Biological Science. University of Havana. - Ledward, D.A. and Lawrie, R.A. (1984) Journal of Chemical
- Technology and Biotechnology 34B:223