

The "Salchichón de Vich" (Vich sausage). I.- Technology and evolution of the microbial flora during its maturing and curing process.

FERRER, J.; ARBOIX, P.

Laboratorio de Análisis Bromatológico-Barcelona

Introduction.

The "Salchichón de Vich" is a fermented sausage made with the whole meat of adult porks (125 Kgs/carcas at min.). The proportion of magers and fat in the initial formulation is 83-85% and 15-17% respectively. The meat of the whole carcas is carefully selected and cleaned of fats, tendons, membranes, blood. The magers are rested at 3<sup>o</sup>-5<sup>o</sup>C during 2-4 days before are minced across 4-6 mm and mixed with salt (at levels of 27-30 grs per Kg.), potasium nitrate (0,3-0,5 grs/Kg), milled pepper (1,5-2,5 grams/Kg) and grain black pepper (0,5-1.0 gr/Kg).

After mixed the sausage components, the whole mass remain 2-4 days in chamber at 3<sup>o</sup>-5<sup>o</sup>C. At the end it is stuffed in natural wide hog casings (hog bung) with a maximum long of 70cm and diameter between 60-120 mm. Is important for a good curing process the use of casings with a intense infiltration of fat.

The maduration and curing process of "Salchichón de Vich" is made exposing the sausages at natural ambient cold conditions of the city of Vich during the months of November to May and in cellars ambient in the warm months of summer season. The minimum period of curing process are six months and maximum are twelve months, although his shelf-life attaints until eighteen months.

The curing rooms regulate his temperature and relative humidity controlling the windows blinds. In cold period the temperature is maintained between 8<sup>o</sup> - 12<sup>o</sup>C and the humidity at 85-90%. In the cellar phase during the summer season, the temperature is maintained between 16-18<sup>o</sup>C and 90-95% H.R. The natural rooms fur curing and cellars of maturing process are situated at the lowest sectors of the Vich city (Barcelona).

The purpose of this study is to describe the evolution of the microbial flora, its specific and differentiated characteristics that manage the fermentation process of "Salchichón de Vich" during the two phases of his curing method, the cold fermentation in winter and the cellar maturation in summer.

Materials and Methods.

The fermented sausages of "Salchichón de Vich" examined are of one batch elaborated in November of 1984 by a manufacturer of the Vich city.

In each control we take a whole piece of "Salchichón de Vich" with a weight of  $2,5 \pm 0,3$  Kg. (at the initial time of curing process). The samples are controlled just stuffed the meat in the casings, at 15 days, 2,5,8 and 12 months of curing process. The carcass weight of the hogs utilized in the batch of "Salchichón de Vich" are of 125 Kg (mean weight).

The methods and media employed to quantitatively determine the bacterial flora in the sausage samples are the recommended by the CENAN ("Técnicas para Análisis Microbiológico de Alimentos y Bebidas del Centro Nacional de Alimentación y Nutrición-Ministerio de Sanidad y Consumo, Ed. 1982.). Five lactobacilli strains isolated of M.R.S. medium after characterization of Gram stain (all Gram positive), catalase activity (all negative), benzidine (all negative) and his homofermentative character, were screened for his physiological characteristics with API 50CH system.

Results and Discussion.

The "Salchichón de Vich" is a fermented sausage with an organoleptic quality of international renown, characterized and differentiated because in your composition are not present sugars and as unic additives the salt (NaCl), pepper and potasium nitrate. His curing process is characterized by two steps. The first step of 3-5 months during winter season is the "psicrophylic fermentation period". It means that the driveing flora of curing process are bacterial strains of psicrophylic character. The temperature in the first step not exceed 10<sup>o</sup>C and the maximum population is reached at 2 - 3 months of fermentation period.

In the second step, the "cellar curing period", the bacterial activity slows and the enzymatic actions becomes protagonists in the curing process of "Salchichón de Vich".

In the Table 1 the total bacterial counts are presented. The predominant flora consisted of lactobacilli since 10 - 15 days after stuffing process. In Table 2 are described the physiological characteristics of five lactobacilli strains isolated in M.R.S. medium in the "Salchichón de Vich" with two months of curing time. All strains of lactobacilli are Gram(+), catalase (-), benzidine (-), homofermentatives and his optimal temperature for growth is 18-20<sup>o</sup>C and at 45<sup>o</sup>C his growth is inhibited completely.

The change or decrease in bacterial activity between the 3th. and 5th. months of curing process coincides with the more intensive loss of humidity, below the 40% of sausage mass.

Table 1: Viable bacterial counts on samples of fermented sausage "Salchichón de Vich".

	Fermentation periods					
	Initial meat paste	15 days	2 months	5 months	8 months	12 months
Total counts mesophylic aerobic sp. at 32°C	1,2 · 10 <sup>5</sup>	8,0 · 10 <sup>6</sup>	1,0 · 10 <sup>7</sup>	1,2 · 10 <sup>6</sup>	9,0 · 10 <sup>4</sup>	3,2 · 10 <sup>4</sup>
Total counts mesophylic aerobic sp. at 20°C	4,5 · 10 <sup>6</sup>	9,0 · 10 <sup>7</sup>	6,0 · 10 <sup>7</sup>	2,5 · 10 <sup>6</sup>	9,0 · 10 <sup>5</sup>	5,3 · 10 <sup>4</sup>
Enterobacteriaceae	800	<100	(-)	(-)	(-)	(-)
Micrococaceae	2,0 · 10 <sup>4</sup>	9,0 · 10 <sup>3</sup>	8,0 · 10 <sup>3</sup>	4,0 · 10 <sup>3</sup>	1,0 · 10 <sup>3</sup>	<100
Streptococci/Pediococci	1,5 · 10 <sup>4</sup>	9,0 · 10 <sup>6</sup>	4,0 · 10 <sup>4</sup>	4,0 · 10 <sup>3</sup>	1,2 · 10 <sup>3</sup>	150
Lactobacilli at 32°C	2,0 · 10 <sup>4</sup>	1,4 · 10 <sup>8</sup>	4,4 · 10 <sup>8</sup>	2,2 · 10 <sup>7</sup>	1,0 · 10 <sup>5</sup>	3,0 · 10 <sup>4</sup>
Lactobacilli at 20°C	4,0 · 10 <sup>4</sup>	5,0 · 10 <sup>8</sup>	1,2 · 10 <sup>9</sup>	7,0 · 10 <sup>7</sup>	1,2 · 10 <sup>6</sup>	8,0 · 10 <sup>4</sup>
Yeast	2,0 · 10 <sup>4</sup>	3,0 · 10 <sup>3</sup>	2,2 · 10 <sup>3</sup>	500	<100	<100

The counts of Salmonella and Clostridium are negative in all samples examined

Bacteria per gram

Table nº2  
Physiological characteristics of lactobacilli isolated from fermented sausage "Salchichón de Vich"

Note: System API 50 CH

Lactobacilli strain nº 1	Lactobacilli strain nº 2	Lactobacilli strain nº 3	Lactobacilli strain nº 4	Lactobacilli strain nº 5
Control	Control	Control	Control	Control
Glycerol	Glycerol	Glycerol	Glycerol	Glycerol
Erythritol	Erythritol	Erythritol	Erythritol	Erythritol
D-Arabinose	D-Arabinose	D-Arabinose	D-Arabinose	D-Arabinose
L-Arabinose	L-Arabinose	L-Arabinose	L-Arabinose	L-Arabinose
Ribose	Ribose	Ribose	Ribose	Ribose
D-Xylose	D-Xylose	D-Xylose	D-Xylose	D-Xylose
L-Xylose	L-Xylose	L-Xylose	L-Xylose	L-Xylose
Adonitol	Adonitol	Adonitol	Adonitol	Adonitol
β Methyl xyloside	β Methyl xyloside	β Methyl xyloside	β Methyl xyloside	β Methyl xyloside
Galactose	Galactose	Galactose	Galactose	Galactose
D-Glucose	D-Glucose	D-Glucose	D-Glucose	D-Glucose
D-Fructose	D-Fructose	D-Fructose	D-Fructose	D-Fructose
D-Mannose	D-Mannose	D-Mannose	D-Mannose	D-Mannose
L-Sorbose	L-Sorbose	L-Sorbose	L-Sorbose	L-Sorbose
Rhamnose	Rhamnose	Rhamnose	Rhamnose	Rhamnose
Dulcitol	Dulcitol	Dulcitol	Dulcitol	Dulcitol
Inositol	Inositol	Inositol	Inositol	Inositol
Mannitol	Mannitol	Mannitol	Mannitol	Mannitol
Sorbitol	Sorbitol	Sorbitol	Sorbitol	Sorbitol
β Methyl-D-mannoside	β Methyl-D-mannoside	β Methyl-D-mannoside	β Methyl-D-mannoside	β Methyl-D-mannoside
β Methyl-D-glucoside	β Methyl-D-glucoside	β Methyl-D-glucoside	β Methyl-D-glucoside	β Methyl-D-glucoside
N-Acetyl glucosamine	N-Acetyl glucosamine	N-Acetyl glucosamine	N-Acetyl glucosamine	N-Acetyl glucosamine
Ameylgamine	Ameylgamine	Ameylgamine	Ameylgamine	Ameylgamine
Arbutine	Arbutine	Arbutine	Arbutine	Arbutine
Esculine	Esculine	Esculine	Esculine	Esculine
Salicine	Salicine	Salicine	Salicine	Salicine
Cellobiose	Cellobiose	Cellobiose	Cellobiose	Cellobiose
Maltose	Maltose	Maltose	Maltose	Maltose
Lactose	Lactose	Lactose	Lactose	Lactose
Melibiose	Melibiose	Melibiose	Melibiose	Melibiose
Saccharose	Saccharose	Saccharose	Saccharose	Saccharose
Trehalose	Trehalose	Trehalose	Trehalose	Trehalose
Inuline	Inuline	Inuline	Inuline	Inuline
Mannarose	Mannarose	Mannarose	Mannarose	Mannarose
D-Raffinose	D-Raffinose	D-Raffinose	D-Raffinose	D-Raffinose
Amidon	Amidon	Amidon	Amidon	Amidon
Glycogene	Glycogene	Glycogene	Glycogene	Glycogene
Zyitol	Zyitol	Zyitol	Zyitol	Zyitol
β-D-glucobiose	β-D-glucobiose	β-D-glucobiose	β-D-glucobiose	β-D-glucobiose
D-Turanose	D-Turanose	D-Turanose	D-Turanose	D-Turanose
D-Lyxose	D-Lyxose	D-Lyxose	D-Lyxose	D-Lyxose
D-Tagatose	D-Tagatose	D-Tagatose	D-Tagatose	D-Tagatose
D-Fucose	D-Fucose	D-Fucose	D-Fucose	D-Fucose
L-Fucose	L-Fucose	L-Fucose	L-Fucose	L-Fucose
D-Altrose	D-Altrose	D-Altrose	D-Altrose	D-Altrose
L-Altrose	L-Altrose	L-Altrose	L-Altrose	L-Altrose
Glucosone	Glucosone	Glucosone	Glucosone	Glucosone
2-ceto-glucosone	2-ceto-glucosone	2-ceto-glucosone	2-ceto-glucosone	2-ceto-glucosone
3-ceto-glucosone	3-ceto-glucosone	3-ceto-glucosone	3-ceto-glucosone	3-ceto-glucosone