

## SURVEY ON MICROBIOLOGICAL AND BROMATOLOGICAL QUALITY OF DIFFERENT BRANDS OF FROZEN HAMBURGERS COLLECTED IN THREE RETAIL MARKETS OF MARACAIBO, VENEZUELA.

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### Background

Change in lifestyles in the last decade, have modified alimentary habits of Venezuelans, resulting in some nutritional unbalances, since the current trend is toward the consumption of fast foods, rich in fat and other ingredients. Hamburger processing involves extensive manipulation and a sanitary risk. Usually, during the processing of these processed meats, the muscular ingredient (lean meat) is mixed with fats of animal origin, which in turn increases the ingestion of saturated fat and cholesterol. The grinding process is the most probable source in microbial contamination. Therefore, the risk of food borne illnesses (FBI) exists. In Venezuela there is a lack of knowledge about the genera and load of microorganisms contaminating ready-to-cook hamburgers. There are not index values that might allow to establish guides of composition for domestic raw meat sources utilized for hamburger processing nor handbooks detailing nutrient composition of the finished product.

### Objectives

To assess the microbiological and bromatological quality of domestically produced hamburgers segregated by processor (popular brand names) and retail market categories.

### Methodology

Twenty seven samples of frozen hamburgers were selected randomly (brands "A" and "B" representing beef and brand "C" representing chicken), in three retail markets of the city of Maracaibo, recording the storage temperature for the exhibit on point of sale. Samples were collected a constant day, during three successive weeks. After transportation samples were stored briefly at 0°C and prepared immediately for laboratory analyses. Microbiological tests were evaluated according to the methodologies described by the norms of the national standards commission (COVENIN) as follows: heterotrophic counts by COVENIN 902-78, total coliforms (CT), fecal coliforms (CF) and *Escherichia coli* (Ec) by COVENIN 1104-77, *Staphylococcus aureus* (Sa) by COVENIN 1292-79 and *Salmonella* by COVENIN 1291-79. Bromatological analysis determined proximal components. Moisture and total solids were determined according to COVENIN 1120-80 methodology, protein content was determined according to AOAC 24.051-73 (1990), fat determination followed the FOLCH (1957) procedure and ash was determined according to AOAC 24.036-73 (1990).

### Results and discussion

#### Microbiological analyses

The "A" brand in the three retail markets and the brand "B" in markets 1 and 2, presented heterotrophic counts that surpassed the permissible limits established by the COVENIN norm 2127:1998 ( $< 10,000,000$  ufc/g), therefore, the organoleptic characteristics of the product (retail case life) could be compromised.

The "C" brand in the three markets fulfilled the microbiological criterion established by the COVENIN norm, suggesting a good microbiological quality, attributable to adequate sanitary conditions during processing and to maintaining the time/temperature conditions required during its frozen storage.

Total coliforms count is not considered as a sanitary indicator in the national norms, hence, its magnitude cannot determine if the product offers a potential hazard due to contamination of fecal origin. Therefore, the significant market x brand interaction remains to be elucidated in terms of public health implications.

*E. coli* counts in the three brands in all markets under study were below the minimum limit ( $< 10$  NMP/g) indicating safety of the product in this regard.

Presence of *Salmonella* in 33.3% of brand "B" hamburgers allow to infer the use of raw material of poor microbiological quality, inadequate hygienic practices during the process and/or excessive manipulation (cross contamination) by the operators.

#### Bromatological analyses

Variation in the protein content in the three brands could be attributed to possible differences in the protein content of the respective raw materials. When comparing the protein values with that established by the COVENIN norms, it was observed that only the "A" brand was in compliance. However, these results don't allow to qualify the nutritional quality of the product regarding to this nutrient, since complementary tests for aminoacidic profile or biological value of the protein were not performed.

The "A" brand in market 1, presented moisture values over the maximum permissible limit allowed by COVENIN. This finding can be related to the lowest fat content found for this brand in relation to the "B" and "C" brands in all markets. It is well known that beef imported from North America present a higher fat content than the domestic beef product (Huerta-Leidenz, 1998). This fact could explain the evident differences in moisture content found between hamburger from the different brands as compared to the values given by compositional tables for foods in other countries.

Since the total solids content are inversely related to percentage of moisture in the food, the interaction brand x market was expected. Total solids, in spite of not being officially listed as a bromatological criterion for describing the hamburger quality, it reflects the total content of macro and micro nutrients in the samples. The use of carbohydrates (possibly starch), and spices in the formulation, could explain the elevated total solids content.

Fat content of products sampled at all three retail marks was in compliance to the COVENIN norm 2127:1998. Despite fat content values allows for the label "Extra lean", an important claim from the nutritional point of view it is not printed in the packages.

The high content of ash found for all the samples doesn't correspond to the typical low ash content of Venezuelan beef (Huerta Leidenz, 1998), suggesting the abundant use of spices and condiments, generally rich in sodium.

Table 1  
EFFECT OF BRAND x MARKET INTERACTION  
ON THE MICROBIOLOGICAL AND BROMATOLOGICAL  
ANALYSES OF HAMBURGERS

	A mark			B mark			C mark		
	Market 1	Market 2	Market 3	Market 1	Market 2	Market 3	Market 1	Market 2	Market 3
C. heterotrofic ufc/g	31.603.625,00a/c	1.565.600.000,00b/c	18.575.125,00a/c	37.712.500,00a/c	14.578.750,00a/c	240.000,00b/c	1.278.750,00ab/d	106.750,00b/d	5.437.250,00a/c
Total C. NM/P/g	76.150,00a/c	61.085a/c	28.825,00a/c	240.001,00a/d	240.001,00a/d	120.458,00a/d	120.001,00a/c	185.250,00b/c	110.000,00a/d
Fecal C. NMP/g	97,00	17,00	52,00	633,00	598,00	16,00	602,00	860,00	34,00
E. coli NMP/g	8,30	5,26	0,02	4,22	1,54	0,76	1,56	1,81	3,63
Moisture% p/p	66,60a/c	57,75b/c	60,43b/c	49,26a/d	51,19a/c	52,08a/c	61,92a/c	62,60a/c	62,71a/c
Solids% p/p	33,39a/c	42,25b/c	39,56b/c	50,73a/d	48,80a/c	47,91a/c	38,07a/c	37,39a/c	37,28a/c
Fat % p/p	9,19	15,83	13,61	15,31	15,28	16,01	15,46	13,88	14,88
Protein% p/p	19,50	16,78	17,26	13,70	12,30	13,23	15,71	16,46	16,65
Ash% p/p	1,45	2,15	2,29	1,86	2,07	2,00	1,77	1,85	2,15

ab /: different letters in same line for different markets inside same mark indicates significant differences ( $p < 0.05$ )

/cd: different letters in the same row for different brands within market cells indicate significant differences ( $p < 0.05$ )

### Conclusions

Variability in heterotrophic and total Coliforms counts across brands and retail markets indicates that a good microbiological quality depends in large extent of the good manufacturing and sanitary practices applied in the factory, as well as the level of product management in the market.

Levels of risk of contamination for *S. aureus* is quite low according to the international normative consulted.

Brands of hamburgers, present high recounts of heterotrophics in all markets, and this indicates a doubtful microbiological quality. The recovery of *Salmonella* in the B brand evidences failures in the factory and sanitary practices during its processing.

In all markets, the brand selected to represent the chicken hamburgers (C brand) fulfilled the microbiological criterion established by the domestic standards, indicating sound practices in its factory.

Variability of the protein values in the three hamburger marks indicates that large heterogeneity exists in the quantity and quality of the raw source added during the hamburgers process. The low protein content of a B mark (meat patties), evidences a poor bromatological quality. Differences in moisture and total solids contents among brands in the different markets under study, reflects the variability in commercial recipes and also, possible deficiencies in the management of cold storage during display in some markets.

### Pertinent Literature.

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