MICROBIOLOGICAL ASSESSMENT OF A FRANKFURTER-TYPE SAUSAGE MANUFACTURING PROCESS IN A SMALL PROCESSING PLANT OF VENEZUELA

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Background

Meat and meat products are important vehicles of foodborne illness around the world (USDA, 1996; MMWR, 2000; FAO/WHO, 1995; INPPAZ- OPS/OMS-SIRVETA, 2001). Further contamination of meat after harvesting may originate from sources in the processing environment (Gill et al., 1998; Labadie, 1999). Microbiological testing is necessary for the implementation and maintenance of Good Manufacturing Practices (GMP) and Hazard Analysis Critical Control Points (HACCP), which are the only means of assuring the microbial safety of meat and meat products (Brown et al., 2000). GMP were into effect in Venezuela since 1996 (MSAS, 1996); however, microbiological sampling and testing are not routinely effected in most small meat processing plants of the country. Currently, no surveillance testing has been carried out in Venezuela to obtain microbiological data from which to set regulatory practices and performance standards for frankfurter manufacturing plant processes.

Objectives

To conduct a microbiological evaluation of the manufacturing process to produce "Frankfurter- type" sausage at a small factory located in Táchira State, Venezuela.

Methods

Samplings were performed every Tuesday during eight consecutive weeks, from raw materials and products of different operational phases as follows: raw beef chuck in unprocessed (BEEF), chopped (CHOBEEF), and ground (GROBEEF) states; raw pork fat trimmings in chopped (PORKFAT) and ground (GROUNDFAT) states; emulsion and finished product (FRANKS); non-meat items (spices, artificial casing and shaved ice), equipment (grinder and cutter) and water for chilling FRANKS. Counts for aerobic mesophiles (AM), total coliforms (TC), fecal coliforms (FC) and *Escherichia coli* (EC) were recorded for each sample. Additionally, FRANKS were sampled for detection of Salmonella and enumeration of *Staphylococcus aureus*, *Bacillus cereus*, *Clostridium perfringens*, moulds and yeasts. The transformation $Y = \text{Log}_{10} X$ was applied. For the operative phases, a variance analysis (ANOVA) in a 7 x 8 factorial arrangement was performed (S.A.S., 1998). When significant effects were detected, means were compared by using Tukey's Test. A descriptive analysis based on mean values, standard deviation, maximum and minimum values was applied to microbial counts from non-meat items, equipment and water for chilling FRANKS.

Results and discussion

ANOVA revealed highly significant effects ($p<0.01$) of operational phase, sampling week and their interaction on AM., TC, FC and EC. AM in BEEF trended to increase by chopping (for CHOBEEF counts ranging from 4,32 to 6,65 Log10 CFU/g and significantly different from BEEF in 75% of the weeks) and grinding (BEEF significantly different from GROBEEF on week 2). TC, FC and EC in BEEF also increased by chopping (CHOBEEF counts ranging 2.66 – 3.08; 2.66 – 3.08; 0.60 – 3.08 Log_{10} MPN/g, and significantly different from BEEF in 87.5%, 62.5% and 50% of the weeks, respectively) and grinding (GROBEEF significantly different from BEEF in 50% of the weeks). In PORKFAT, AM ranged 3.97 – 6.66 Log_{10} CFU/g, and reached their higher values in weeks 6, 7 and 8. Significant increments in microbial loads of POKFAT due to fat grinding were observed when GROUNDFAT was sampled on weeks 2, 3, 4 and 5. The TC, FC and EC for PORKFAT ranged 0.00-3.08 Log_{10} MPN/g and reached their corresponding higher values in 75%, 62,5% and 37,5% of the weeks, respectively. PORKFAT TC, FC and EC levels were further increased by grinding in 100%, 100% and 87.5% of the weeks, respectively. The emulsion presented high counts of AM, TC, FC and EC (ranging 5.36 – 6.32 Log_{10} CFU/g; 2.66 – 3.08 Log_{10} MPN/g; 2.38 – 3.0 Log_{10} MPN/g and 2.38 – 3.0 Log_{10} MPN/g, respectively) in most of the weeks. Equipment, shaved ice and water used for chilling FRANKS were contaminated with FC. In FRANKS, FC and EC counts surpassed the limits (< 3.04 – 1.00 Log_{10}MPN/g) set by the Venezuelan norm (COVENIN,1996) in 50% of the weeks, indicating deficient control of the cooking-smoking cycle. However, pathogens (*Salmonella*, *S. aureus*, *C. perfringens* and *B. cereus*) were not recovered in FRANKS.

Conclusion

The elevated microbial counts present in raw material and processing products, ingredients and equipment indicated lack of GPM, which should be implanted first in order to proceed with a HACCP system.

Pertinent literature

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