Microbiological evaluation of meat preparations available for purchase and consumption

S. Godinho [1], M. Moura-Alves [2,3], A. Leite [1], J. Garcia-Diez [2,3], C. Saraiva [1,2,3]

[1] Department of Veterinary Sciences, School of Agricultural and Veterinary Sciences, University of Trásos-Montes e Alto Douro, Quinta de Prados 5000 – 801, Vila Real, Portugal, www.utad.pt, [2] Animal and Veterinary Science Center (CECAV), University of Trás-os-Montes e Alto Douro (UTAD), 5000-801 Vila Real, Portugal, [3] Associate Laboratory for Animal and Veterinary Science (AL4AnimalS), Portugal

Introduction: Meat and meat preparations are a significant part of the diet for the majority of the Portuguese population. It is expected that until the second half of the 21st century there will be an increase of the global consumption of these products. The microbiota within these food kinds is, on one hand, responsible for the deterioration processes that reduce their useful life, representing economic losses and considerable environmental impact. On the other hand, food inherent microbiology is always a potential vector of pathogenicity with an important impact on human and animal public health, being a potential cause of foodborn diseases for hu- mans.

Objectives: Microbiological and pH analysis, and chloride content analysis of meat preparations in small and large commer- cial areas and determination of risk factors associated with the sale of these preparations.

Materials and Methods: Collection of 51 samples of meat preparations from hypermarkets and small traditional local shops, was undertaken, followed by subsequent analysis of the same. All samples were assigned to counting and research tests, following the ISO norms. Samples were testes for pH, chlorine amount, and microbiological examination of their content in Mesophiles, *Enterobacteriaceae*, *E. coli*, *Salmonella* spp., Lactic Acid Bacteria, *Pseudomonas* spp., *L. monocytogenes*, Moulds and Yeasts. Of the total samples, 15% were meat puffs, 17% meatloaves, 49% hamburgers and meatballs, and 17% meat breading. Approximately half of the samples came from hypermarkets and another half from small local businesses.

Results: The pH values obtained were similar in the various types of products and establishments, without exceeding 6.00. Hamburg- ers and Meatballs were the product that presented the highest amount of salt, with no significant differences compared to the other types of products. All types of products from small local establishments had a higher amount of salt, with Hamburgers and Meat- balls being the only ones showing a significant difference within the effect of establishment. In the counting averages it was ob- served that the higher prevalence of microorganisms seen in the samples were composed of Mesophiles and *Pseudomonas* spp.. Molds were the least prevalent in all products. The highest values in Mesophiles, LAB, *B. thermosphacta* and *E. coli* were obtained in Meatloaves. Meat puffs had the highest counts of *Enterobacteriaceae*. Hamburgers and Meatballs were the ones that presented the highest values of *B. thermosphacta, Pseudomonas* spp., Yeasts and Molds. Meat breading was always the type of product with lowest microbial concentrations. *L. monocytogenes* was detected in a Meat puff, although at a concentration lower than 2 log cfu/g. Regarding the establishment effect, all products showed higher levels of microbiological contamination in small local establish- ments compared to hypermarkets, with *E. coli* being the only exception. These differences were significant in Hamburgers and Meatballs for Mesophiles, B. thermosphacta and Yeasts, and in meat breading for Molds and *Enterobacteriaceae*. In *Pseudomonas* spp., the differences observed in meat breading were very significant. *E. Coli* levels of all products were higher in small local busi- nesses, albeit Meat breading having significantly lower. In terms of acceptability, all types of products obtained acceptable ratings for their concentration of Molds, Yeasts, LAB and *E. coli*. Hamburgers and meatballs were the only product with an unacceptable classification of *Pseudomonas spp*. Only Breadcrumbed meat had acceptable levels of Mesophiles and *B. thermosphacta*. Meat puffs were the only products not acceptable in *L. monocytogenes*. No type of product exhibited acceptable values for the concentra- tion of *Enterobacteriaceae*.

Conclusions: This study exhibits the need in microbiological quality improvement, namely in the case of Mesophiles, *Enterobacteri- aceae* and *B. thermosphacta*. In these, particularly, the microbial concentrations found are unsatisfactory, since the averages of the various types of products are all or almost all considered unacceptable. The present study concludes that all physical and microbio- logical parameters analyzed, with the exception of pH, are still to be improved in small local businesses. The results obtained for small local establishments are always qualitatively lower than those observed in hypermarkets, although these differences are not always significant. This fact reinforces the need to continue to implement upgrades in the quality control of products from tradi- tional local commerce.

References:
Feiner, G. (2006). *Meat prodcuts handbook - pratical science and technology* . Woodhead Publishing Limited. Forsythe, S. (2013).
Microbiologia da Segurança Alimentos, 2ª edição. artmed.
He, F. J., & MacGregor, G. A. (2010). Reducing Population Salt Intake Worldwide: From Evidence to Implementation. *Progress in Cardiovascular Disesaes, 52*, 363-382.