MEAT PLANT RESILIENCE TO TEMPORAL VARIABILITY OF PORK MEAT QUALITY

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I. INTRODUCTION

In 2008, the listeriosis outbreak in Ontario, caused by a bacterial biofilm in a meat slicer, led to improved surveillance and sanitation procedures [1]. Despite a more stringent regulation, the development of bacterial biofilms in meat plants (equipment, drains, etc.) remains a threat for meat spoilage and safety. In addition, unforeseen events such as repairs, floods, strikes disturb normal meat plant activities, causing animals to be retained for a longer period on farms and other supply-related challenges. The cessations of regular activities, which normally limit bacterial growth, could be conducive to the development of bacterial biofilms, particularly in drains [2]. Consequently, our hypothesis is that microbiological quality of meat products could be affected when plant activities resume, because as the biofilm matures, bacteria in it become more resistant to cleaning and disinfection procedures [3]. The main objective of this study was to measure the impact of an 18-week production downtime on the quality of commercially produced meat from three hog groups.

II. MATERIALS AND METHODS

Three groups of 150 commercially raised barrows (female (Landrace X Yorkshire) X Duroc male) were slaughtered in a federally inspected plant 37 weeks before (Bf) and 8 and 12 weeks after (Af1 and Af2) an 18-week production downtime. Environmental samples were collected at the evisceration (conveyor, blood collecting gutter, drain surface and water) and the cut-out (conveyor and drain water) zones right after the preoperational procedures. A total of 25 blast-chilled carcasses were sampled and 30 left loins were randomly collected the next day, after carcass breaking and packaging. Microbial enumerations included total aerobic mesophilic bacteria (TAM; PCA, 35 °C, 48 h), *Enterobacteriaceae* (Petrifilms™, 37 °C, 24 h) and *Staphylococcus aureus* (Petrifilms™, 37 °C, 24 h), and for each loin, lactic acid bacteria (MRS, 25 °C, 48 h), presumptive *Pseudomonas* spp. (CFC, 25 °C, 48 h), *Salmonella* spp. (CHROMagar™, 37 °C, 24 h), and *Listeria monocytogenes* (PALCAM + selective supplement, 30 °C, 48 h) counts were also evaluated. Meat quality analysis (pH, water loss, colour) was performed to determine meat quality class (RFN, PFN, RSE, PSE, DFD) according to Faucitano *et al.* [4]. Microbiological counts of loins were subjected to an analysis of variance (ANOVA) using Prism software. Tukey's multiple comparisons test was carried out to compare differences between the three experimental groups. Significant difference was declared at $P < 0.05$.

III. RESULTS AND DISCUSSION

The evisceration environmental samples of Af1 group showed, in general, numerically higher TAM and *Enterobacteriaceae* counts (>1 $\log_{10}$) than the two other groups (Fig. 1). The carcass composite sample of Af1 group had TAM counts above the two other groups (difference

≤2.78 log_{10} CFU/100 cm^2), while *Enterobacteriaceae* counts were similar and *S. aureus* counts were under the detection limit (<0.52 log_{10} CFU/100 cm^2). Hence, these results suggest that high microbial counts on Af1 carcasses might be linked to high environmental microbial counts at evisceration (Fig. 1). For the three groups, *S. aureus* and *L. monocytogenes* counts on loins were under the detection limit (<1.28 log_{10} CFU/100 cm^2). Some significative differences (P<0.05) were observed between the three groups for TAM, *Enterobacteriaceae*, lactic acid bacteria and presumptive *Pseudomonas* spp. counts on loins, but they were all <1 log_{10} unit which suggest a low practical impact [5]. Despite high counts on Af1 carcasses (6.31 log_{10} CFU/100 cm^2), those on loins were considered similar suggesting that cutting procedures limit the transfer of microorganisms from the carcass and the environment onto meat, resulting in a constant product no matter the group. Meat quality analysis results revealed that RFN (normal) meat class accounted for 37, 20 and 43 % loins in Bf, Af1 and Af2 groups, respectively.

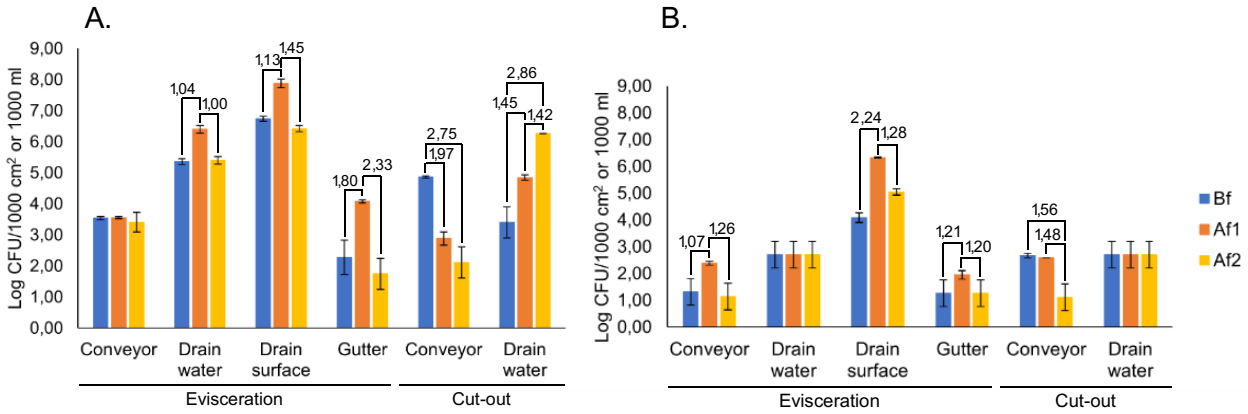

Figure 1. Descriptive statistics of the enumeration (log_{10} colony forming units (CFU) per 100 cm^2) of total aerobic mesophilic (TAM; A) and *Enterobacteriaceae* (B) counts from meat plant environmental samples.

IV. CONCLUSION

The results of loins microbiological count indicate that the production downtime had low practical impact on meat microbial quality when activities resumed. Farm factors such as animal raising conditions or health status appear important to investigate because Af1 animals came from a lower health status maternity and presented the lowest number of RFN (normal) loins.

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