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SUPERFICIAL CONTAMINATION DURING THE SKINNING PROCESS OF BOVINE MASSETER FOR HUMAN CONSUMPTION

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ABSTRACT

This work aimed to analyze the degree of contamination of the masseter muscle during the skinning of bovines. For the study, 99 samples obtained through swabs of the masseter were collected at different phases during the slaughter, and seeded in plates for bacterial total count and coliforms. The set of samples with the highest contamination was collected immediately after the removal of the head. The high counts observed occurred mainly due to the contamination by contact of the masseter with the hide. It is suggested the exchange and sanitization of knives during the procedure and alteration of the skinning site.

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INTRODUCTION

Currently, the demand for hygienic-sanitary quality of animal-origin products grows, in a context where meat stands out as one of the most consumed foods in the world. Thus, it is of foremost importance to ensure that the consumer have access to animal-origin products free of contamination, controlling the sanitary quality of these products at all the stages from the slaughter to the arrival in the consumer market. One of the steps in the cattle's slaughter process is the skinning, which is the industrial process of hide removal from a carcass. The area where this process occurs is named "unclean area" because in this area the hide, which contains contamination, is removed, and the contaminants in the hide of the animals pose a risk of carcasses' contamination. During this process, contaminations may be caused by microorganisms present in the animals' leather, legs or fur (OLIVEIRA et al., 2011). According to Roça (1999), the contamination by microorganisms depends on several factors such as the condition at the place where the animal is produced, the transport and the condition of the corrals where it is kept at the slaughterhouse.

If contamination occurs during skinning, the meat and its derivatives may be carriers of several bacteria pathogenic to humans (PINTO, 2008). The main microorganisms present in the hide and responsible for contamination include the family Enterobacteriaceae, composed by gram-negative bacteria, and present in soil, water and pasture. The best-known genera of this family that are carried by food are *Salmonella spp.* and *Escherichia coli* (ROÇA, 1999). In addition, gram-positive bacteria, such as *Staphylococcus spp.* that make up normal hide flora can also be contaminants of meat and its derivatives. Bovine head meat is formed in large quantity by the masseter muscle, which is the main and most massive muscle of the bovine head. The skinning process of the head can be carried out in three different moments and places during the slaughter: (i) in the bleeding channel immediately after respecting the three minutes of bleeding, (ii) after bleeding and out of the bleeding channel, and (iii) during the final skinning, i.e., the last skinning to be performed. Considering that the head meat is marketed for the production of cured or cooked sausages, as well as for hamburger production (BRASIL, 2000), it is fundamental that the slaughterhouses are able to guarantee the sanitary condition of the meat and to assure its quality.

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In this context, this paper addresses the quality of bovine head meat. A study was carried out to identify contaminating bacteria by total bacterial count, coliform count, and presence or absence of *Salmonella spp.* and *Listeria spp.* The study also aimed to indicate the best moment for the skinning of the head during the skinning process, and to point out precautions that should be taken during this process in order to cause the lowest risk of contamination. The samples for this study were collected through swabs applied to the medial region of the masseter muscle of bovine heads in the region of the facial vein in areas of 4 cm², using an aluminum template for demarcation. The ninety-nine samples were collected at three different times during the slaughter of the cattle: (i) immediately after the skinning of the head, performed after bleeding in the bleeding channel (33 samples), (ii) immediately after the removal of the head (33 samples), and (iii) after the head already removed from the carcass was washed with water jets with a pressure of 3 atm (33 samples). The swabs collected in these three moments were stored in vials with 1 ml of saline solution and kept under refrigeration until they reached the laboratory.

Following, each of the 99 samples were diluted in 1:10 saline solution and inoculated into four different culture plates from the Compact Dry system: TC (for total counting), EC (for *Escherichia coli* and coliforms), SL (for *Salmonella spp.*) and LS (*Listeria spp.*), used for Standard Plate Count and identification of microorganisms. The Compact Dry system was selected for being ready to use for identification and counting of microorganisms. After collection, the samples were grown to evaluate the superficial contamination by microorganisms. The inoculated plates were evaluated after 24 and 48 hours of incubation at 37°C, as recommended by the manufacturer. The analysis was carried out on 12 sets of samples, corresponding to the four different culture plates and the three different times of collection, and each set of samples was composed by 33 plates. After 48 hours, *Salmonella spp.* and *Listeria spp.* were not identified in the samples, TC and EC plates were manually enumerated and the results were recorded in a spreadsheet. Subsequently, the results were multiplied by 10 (to compensate for dilution) and divided by 4, considering that the collected area was of 4 cm². Then, the average was calculated, resulting in the Colony Forming Unit per square centimeter (CFU/cm²) for each of the 12 sets and the results are now presented. After analyzing the growth results of bacterial CFU, it was possible to identify that the most critical phase for contamination was the second one, immediately after the atlanto-occipital disarticulation of the head from the rest of the carcass (removal of the head), presenting an average Total Counting of 144,6 CFU/cm², and an average coliform count of 4,75 CFU/cm² in the 33 samples. The high counts observed in these samples occurred due to contamination by contact of the surface of the masseter with the hide, since the skinning had already been performed in the bleeding channel (OLIVEIRA, 2011). Other factors that may have contributed to this contamination could be the incorrect separation of the esophagus and trachea, as well as a poor evisceration (OLIVEIRA, 2011).

In the first phase, corresponding to the collection made immediately after the skinning of the head, performed in the bleeding channel, an average Total Count of 35,9 CFU/cm² and an average 0,45 CFU/cm² of coliforms were observed. Theoretically, at this phase, no contamination should be observed, since the subcutaneous space is free of

microorganisms, and the knives used for skinning should be sterilized at each operation (FELÍCIO, 1997). However, during the sample collection it was possible to observe that the knives were not sterilized after each process, and that the same knife used in the hide incision was also used for skinning (DOS SANTOS, 2011). Therefore, the training and the commitment of the employees with adequate sanitary practices are fundamental to avoid the contamination of material that will be used in the elaboration of meat products. Finally, in the samples collected after the head was removed and washed, it was found an average contamination of 33,25 CFU/cm² in the Total Count and 2,65 CFU/cm² of coliforms, which indicates that the washing with water jets reduces the levels of contamination but is insufficient for eliminating the microorganisms analyzed. Therefore, the importance of intense supervision in all skinning processes can be stressed, in order to avoid errors and deviation of standards that result in contamination of the meat. It also can be noted that studies such as this one help to guarantee the sanitary quality of the meat for human consumption (APHA, 2001; BRASIL, 2000). It should also be noted that the contamination found may have different sources, such as the contact of the head with microorganisms present in the animal's hide or hair, or the operator's hands and instruments not being properly sterilized. Other factors that contribute to greater or lesser contamination are the local conditions in which the animal is produced and transported, as well as those of the enclosures where the animals are kept in the slaughterhouse. Surface contamination was observed during the skinning process of the head, which is directly related to procedures performed incorrectly during the slaughter process. The study indicates two possible courses of action to avoid the contamination of the masseter muscle during the skinning process: modifications in the skinning process by adopting new standards, or alteration of the site and time of skinning of the head in the slaughter line. Regarding process standards, to obey the legislation on the exchange and sanitization of knives during the skinning procedure is of paramount importance. This is represented by the use of one knife for the incision and another one for the skinning, as well as the sterilization of both knives after each process. Concerning the time for removal of the hide from the head, it is indicated that this process could be performed as the last stage of skinning.

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REFERENCES

- APHA, American Public Health Association 2001. Committee on Microbiological Methods for Foods. Compendium of methods for the microbiological examination of foods. Washington.
- BRASIL. Ministério da Agricultura Pecuária e Abastecimento 2000. Instrução Normativa N° 4. Regulamentos Técnicos de Identidade e Qualidade de Carne Mecanicamente Separada, de Mortadela, de Lingüiça e de Salsicha, em conformidade com os Anexos desta Instrução Normativa.
- Dos Santos, J. S., Taham, T. 2011. Importância dos Procedimentos Sanitários das Operações (PSO) durante as etapas de abate bovino. *Fazu em Revista*, Uberaba, pp. 1-7.

- Felício, P. E. 1996. Fatores ante e post mortem que influenciam na qualidade da carne bovina. In: Simpósio sobre Pecuária de Corte, 4, FEALQ, Piracicaba, pp.79-97.
- Oliveira, M. G., Würfel, S. R., Grandra, T. K. V., Vecchia, J. D. and Silva, W. P. 2011. Influência da esfola e lavagem na qualidade bacteriológica de carcaças bovinas em relação à enumeração de enterobactérias. Available online at <http://www.sovergs.com.br/site/higienistas/trabalhos/10555.pdf>.
- Pinto, P. S. A. 2008 Inspeção e Higiene de Carnes, Editora UFV, Viçosa.
- Roça, R. O. 1999. Microbiologia da carne. Available online at <http://puers.campus2.br/~thompson/Roca106.pdf>.
