

Microbial Risk Assessment of a Bovine Slaughtering Unit in Bistrița-Năsăud County

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Bulletin UASVM Veterinary Medicine 73(1) / 2016,
Print ISSN 1843-5270; Electronic ISSN 1843-5378
DOI:10.15835/buasvmcn-vm: 11494

Abstract

Beef is favorable environment for microorganisms spoilage, for that reason, special attention should be paid to hygiene rules in obtaining carcass microbial load as low as the legislation requires.

The aim of our research was to perform an analysis of biological risks posed by total germ count, the total *Enterobacteriaceae* count and *Salmonella spp.* from a unit in Bistrița-Năsăud.

The research was conducted between January and December 2014 in the Department of Inspection and Control Animal Origin Food in the Faculty of Veterinary Medicine Cluj-Napoca.

The conclusions from the research were: total plate count on the carcasses surface, studied, ranged between 2.43 and 2.53 log₁₀ cfu/cm² values falling within the limits of REG. 2073/2005, as cataloged in the category satisfactory; for the total load *Enterobacteriaceae* on carcasses taken in the study, the values were between 1.25 and 1.41 log₁₀ cfu/cm²; test results meet the requirements REG.2073/2005; regarding the identification of *Salmonella spp.*, all samples were negative.

Keywords: bovine, microbial risks, slaughterhouse

INTRODUCTION

Although various foods can serve as a proper environment meat is an important sources of human infections with a variety of foodborne pathogens, i.e. *Salmonella spp.*, *Campylobacter jejuni/coli*, *Yersinia enterocolitica*, *E. coli* and, to some extent, *Listeria monocytogenes*. All these may be harboured in the gastrointestinal tract of food-producing animals. The most frequent chain of events leading to meat-borne illness involves food animals, which are healthy carriers of the pathogens that are subsequently transferred to humans through production, handling and consumption of meat and meat products. Occurrences of pathogens in fresh red meat vary relatively widely, although most often are between 1 and 10%, depending on a range of factors including the organism, geographical factors, farming and/or slaughtering practices.

During slaughtering the main source of contamination are animals slaughtered itself, but also the staff and working environment (Bell and Hathwaz, 1996). Contamination of equipment, materials and personnel hands can spread harmful bacteria on contaminated carcasses. Despite the fact that most microbial contaminants are bacteria comensale, certain microorganisms such as *Salmonella spp.*, *E. coli* O157: H7 and *Listeria monocytogenes* is a threat to consumer health.

Contamination and/or cross-contamination of carcasses during slaughter operation was demonstrated and the results indicated the presence of bacteria that represent a risk to public health. The poor hand hygiene manipulator clothes and equipment slaughterhouse acts as intermediate sources contaminating meat (Gill, 1998; Gilmour *et al.*, 2004; Abdalla *et al.*, 2009). Also, Ali (2007) recorded high levels of

contamination in the lower levels of the flank and the croup region, during skinning. Furthermore, Yalcin *et al.* (2001) showed that the load of coliform bacteria is mainly localized in the chest and shoulder, while the thigh was the least affected. This was explained by the positioning of the carcass during the slaughtering process, which is suspended and undergoes a constant change in the microbes from the rear region to the previous one.

Salmonella spp. has been widely identified in cattle and the infected animals may carry these bacteria without any clinical symptoms (Narvaez-Bravo *et al.* 2013). the routes of pathogen transmission also include contaminated slaughter-house equipment, dust, operator hands, or technological water. These ways of bacteria transfer emphasise the importance of controls in the food chain to prevent transmission of *Salmonella* and other foodborne pathogens (Rhoades *et al.*, 1998; Sofos *et al.*, 1999).

MATERIALS AND METHODS

The material under investigation was represented by 12 sample gathering sessions during January-December 2014 from a slaughterhouse in Bistrița-Năsăud county. Samples were collected from the carcass immediately after slaughtering

quarters. Sampling was done randomly, from carcasses obtained both at the beginning and at the end of cut. Sampling was conducted from the surface, respecting the norms recommended by the National Sanitary Veterinary and Food Safety Agency as follows: at each sampling session shall be sampled at random from five carcasses. When sampling for analyzes of *Enterobacteriaceae* and aerobic colony count was carried out in four sites of each carcass. Four tissue samples representing a total area of 20 cm² were obtained. The samples for *Salmonella* testing were gathered using the abrasive sponge method, the most likely to be contaminated areas were selected and the total sampling area was about 400 cm².

Samples were placed in Petri dishes with a diameter of 15 cm and immediately transported to the laboratory discipline of Animal Hygiene and Public Health in the Faculty of Veterinary Medicine Cluj-Napoca.

The isolation of the pathogens present on the carcasses surface was made on account of the standardize methods in conformity with the Reg. (EC) 1441/2007: the *Enterobacteriaceae* identification respecting SR ISO 21528/2007, the aerobic plate count following SR ISO 4833/2003 the identification of *Salmonella spp.* respecting SR EN ISO 6579/2003 AC/2006. The results were

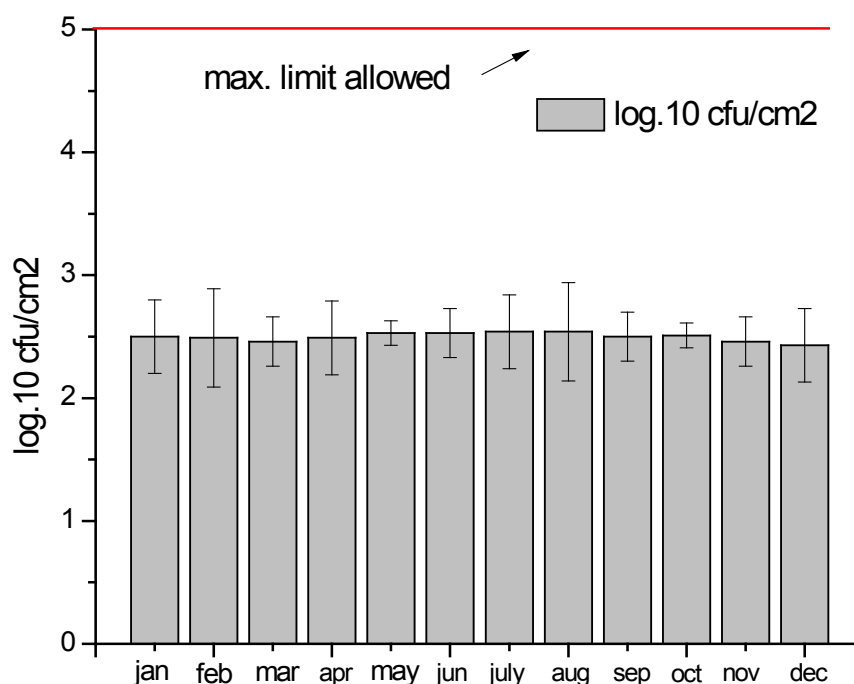


Fig. 1. Evolution of aerobic plate count during the period under study

analyzed statistical and mathematical using the Origin 8.5 program.

RESULTS AND DISCUSSION

The initial microbial configuration of the carcass and microbial load is determined by the health of the animal before slaughter, housing conditions and by the transportation conditions. TGC is also dependent on strict compliance with the hygienic process flow.

As seen from Fig. 1., for all months studied the number of colony forming units fall within the limits prescribed by law, namely between 2.43 and 2.53 \log_{10} cfu/cm².

From the analyze of the data obtained was found that the in studied unit, the minimum value for the TGC was 2.43 \log_{10} cfu/cm² in December of 2014 and the peak value was recorded in July and August of the same year, 2.54 \log_{10} cfu/cm² (Figure 1.). We can also state that in any of the months, the maximum permissible value of 5 \log_{10} cfu/cm², was not exceeded.

Comparing the results recorded in the summer months, with the ones in winter we can see that the average value of TGC during summer months (represented by June, July, August) is higher, compared to the average value during the winter (represented December, January, February). These values are correlated with the increasing temperature depending on the season.

It can be seen in Figure 1. that most of the values obtained are below the lower limit described in REG. 2073/2005, namely 83% of the cases considered. In 7% of the cases, the values reach the minimul value. None of the values recorded exceeded the upper limit.

The effect of seasonal bacterial contamination was studied by Dennie and collaborators (2001), Barkocy-Gallagher *et al.* (2003) and McEvoi *et al.* (2003) which showed that maximum TGC values are recorded during summer moths.

Analyzing the results obtained throughout the study period we observed that the minimum value was recorded in January and was 1.25 \log_{10} cfu/cm². The maximum value recorded was lower, than maximum amount stipulated in the regulations. Given the time of year this result can be attributed to the high temperature of the month.

Regarding the identification of *Salmonella* spp., this objective represents a very important part and of great interest because of the high incidence of food poisoning. After conducting the identification protocol, it was found that none of the samples tested positive for *Salmonella* spp. This is according to the regulations, that stipulated that salmonella spp. must be absent. Our study may correlate with the one made by Movassagh *et al.* (2010), in which 75 carcasses of cattle were studied, and all samples tested were negative for *Salmonella* spp.

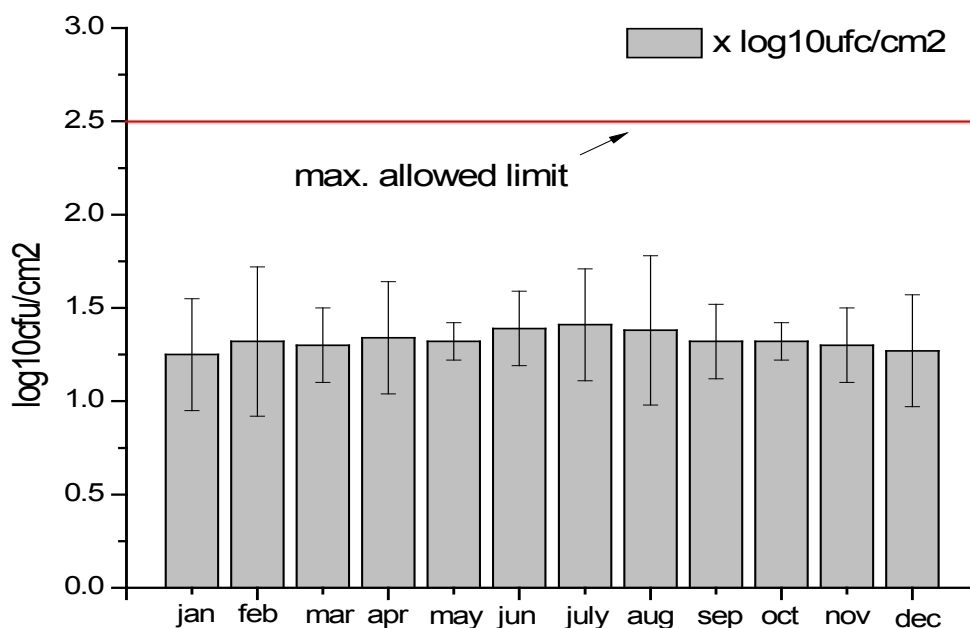


Fig. 2. Evolution of Enterobacteriaceae count during the period under study

CONCLUSION

From the the total samples analyzed regarding the aerobic plate count none exceeded the maximum admitted value. Also the values obtained for the total enterobacteriaceae count were according to the regulations. The highest values both for the aerobic plate count and Enterobacteriaceae were found during summer months due to higher temperature. We mention the fact that *Salmonella* spp. pathogens were not identified.

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