

EFFECT OF ELECTRICAL STIMULATION ON TOTAL VIABLE COUNT OF BEEF

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Microbial contamination of meat occurs during the process of slaughter and dressing. Such bacterial contamination has a bearing on the shelf life of meat and health of the consumer. Only a few studies have been reported on the effect of electrical stimulation on microbial quality of meat. Oblinger (1983) and Paleari *et al.* (1991) have opined that electrical stimulation did not alter the microbial count and type of beef. The present paper reports the effect of electrical stimulation on total viable count (TVC) of beef samples stored both at ambient and refrigeration temperatures.

Materials and Methods

Ten beef carcasses of dairy cattle ranging between 8 to 12 years of age and 150-300 kg live weight were used for the study. After stunning with captive bolt pistol, the animals were dressed and fore-quarters were separated. Left fore-quarter was subjected to electrical stimulation (ES) within 30 min. of exsanguination, using an electrical stimulator which delivered an alternating current (pulsed - 20 pulses/second) at 110 volts and 50 Hz. The current was applied for a period of 120 seconds in a cycle of two seconds 'on' and one second 'off'. Two copper electrodes were used for delivering the current. The right forequarter was used as control (C).

Two meat samples each were taken from *Triceps brachii* muscle of both segments for analysis. One sample each from C and ES side was stored at ambient temperature and one each from C and ES side was stored under refrigeration temperature (7±1°C) for 24 h in

polythene covers.

Total Viable Count (TVC) of aerobic organisms was determined by the procedure recommended by American Public Health Association (1976). Surface swabs were taken from meat samples stored at ambient temperature at 0, 8 and 12 h. From meat samples stored at refrigeration temperature swabs were taken at 8, 12 and 24h. The swabs were then transferred into a flask containing 25 ml. of sterile 0.1 per cent peptone water (Diluent).

Swab was mixed thoroughly by shaking and 10 ml diluent was transferred to a flask containing 90 ml diluent with the help of a sterile graduated pipette. Further ten fold dilutions were made by transferring 1 ml inoculum to 9 ml of the diluent. TVC was evaluated by Pour plate method. Petriplates in duplicate were inoculated with 1 ml each of the inoculum from the selected decimal dilution of the samples and incubated at 37°C for 24 hours. The plates having 30 to 300 colony forming units (CFU) were selected and counted. After applying the dilution factor of plate counted, the counts were expressed as Log₁₀ CFU per square centimetre of the sample. The data were analysed using paired 't' Test as explained by Snedecor and Cochran (1967).

Results and Discussion

The mean TVC of control (C) and electrically stimulated (ES) samples at different intervals of storage at ambient and refrigeration temperature are given in the Table 1.

Table 1 Total viable count of beef stored at ambient and refrigeration temperatures at different intervals

Hours of storage	Ambient temperature		Refrigeration temperature	
	Control (Mean±SE)	Electrically stimulated (Mean±SE)	Control (Mean±SE)	Electrically stimulated (Mean±SE)
0	5.65±0.03	5.61±0.02	5.65±0.02	5.61±0.02
8	5.85±0.02	5.69 [®] ±0.04	5.66±0.03	5.64±0.03
12	7.03±0.02	6.84 [#] ±0.03	6.89±0.02	6.70±0.03
24	-	-	6.96±0.01	6.94±0.01

@ = P < 0.05 # = P < 0.01 TVC in log₁₀ CFU/cm²

The results obtained in the present study indicated that difference in TVC between C and ES samples varied at different intervals of storage both at ambient and refrigeration temperatures. The TVC of ES samples were slightly, lower than that for the corresponding C samples at every point of observation. But statistically significant lower counts for ES samples were obtained only at 8 and 12 h of storage at ambient temperature and 12 h of storage under refrigeration. Similar results of lower counts for electrically stimulated samples were reported by Contrevas *et al.* (1981). This reduction in count for ES samples could be due to change initiated by electrical stimulation affecting the viability of microbial cells such as a decrease in pH, proteolytic activity and increase in temperature (Mrigadat *et al.*, 1980). There was no significant difference in TVC between C and ES samples at 0, 8 and 24 h of storage under refrigeration. Paleari *et al.* (1991) have also reported that there was no significant difference in total bacterial count due to electrical stimulation.

Summary

The present study was designed to evaluate the effect of electrical stimulation on TVC of beef samples stored at ambient and refrigeration temperatures at different intervals. Significant lower counts were obtained in ES samples at 8 and 12 h at ambient temperature and 12 h under refrigeration. But this difference was not

significant immediately after electrical stimulation and at 8 and 24 h of storage under refrigeration.

References

- American Public Health Association (1976). Compendium of methods for the microbial examination of foods (Speck, M.L. Ed). American Public Health Association, Washington, DC.
- Contrevas, S.J., Harrison, L.D. and Kropf, D.H. (1981). Electrical stimulation and hot-boning : Cooking losses, sensory properties and microbial counts of ground beef. *J. Fd. Sci.* **46**(2): 457-460.
- Mrigadat, B., Smith, G.C., Dutson, T.R., Hall, C.C., Hanna, M.O. and Vandezant, C. (1980). Bacteriology of electrically stimulated and unstimulated rabbit, pork, lamb and beef carcasses. *J. Fd. Prot.* **43**(9): 686-693.
- Oblinger, J.L. (1983). Microbiology of hot-boned beef. *Fd. Technol.* **5**: 86-94.
- Paleari, M.A., Beretta, G., Panunzi, F., Parini, M., Rusi, M., Crivelli, G. and Bertolo, G. (1991). Electrostimulation: Effect of extra low voltage on the carcass quality of cows. *Fleischwirtsch* **71**(5): 553-554.
- Snedecor, G.W. and Cochran, W.G. (1967). *Statistical Methods*, Oxford and IBH Pub. Co., Calcutta, 6th ed.