EFFECTS OF TRANSPORT ON POST-MORTEM PARAMETERS OF BEEF CARCASSES

ROÇA, Roberto de Oliveira[1], JOAQUIM, Celso Fernandes[2], JOAQUIM, Jean Guilherme Fernandes[2], GOMES, Luis Alberto[2], CHAVES, Carlos Augusto Batista[2]

[1] Departamento de Gestão e Tecnologia Agro-industrial. UNESP, Campus de Botucatu. PO Box 237. 18603-970 – Botucatu/SP/Brazil.
E-mail: robertoroca@fca.unesp.br
[2] Serviço de Inspeção Federal – M.A.P.A. – POINS Bauru .

Background

The transport of farm animals to the slaughterhouse has been one of the steps of humane slaughter with significant effect on meat quality. Under unfavorable conditions, it can lead animal death, bruising, weight loss and animal stress (KNOWLES, 1999; ROÇA, 2001). Stress increasing during transport is promoted by unfavorable conditions, like food and water starvation, high relative humidity and stocking density. (SCHARAMA et al., 1996). The extension of bruising has been an evaluation way of transport quality affecting carcass quality, as its the affected areas has been cut, resulting in economic loss. These factors are indicative of animal welfare problems (JARVIS & COCKRAM, 1994). Bruising extension increases with the stocking density increasing, mainly with values higher than from 600kg/m2 (TARRANT et al., 1992). The greatest transport influence on meat quality is the muscular glycogen depletion by physical activity or physical stress promoting an anomalous fall of pH post-mortem, leading to a D.F.D. meat (dark, firm, dry). These stress conditions have been caused by extended journey (KNOWLES, 1999).

Objectives

The aim of this work was to investigate the transport distance effect on *post-mortem* parameters, establishing the relationship among transport, fasting and hydric diet on D.F.D (dark, firm and dry) meat occurrence and anomalous reduction of pH. As the D.F.D. meat cannot be exported because sanitary reasons, economic losses have been resulted.

Methods

One hundred and eighty castrated Nelore beef cattle, were divided into three groups of 60 animals each, according to the transport distance. Group I: animals were transported for distances less than 100 kilometers; Group II: animals were transported from 101 to 330 kilometers and Group III: animals were transported for distances above 331 kilometers. The samples were divided into 36 lots of 5 animals each one, with 12 lots (60 animals) for each Group. The animals were slaughtered at a slaughterhouse under Federal Inspection Service, in Bauru city, São Paulo state. Transportation characteristics, like distance and time, road conditions, arriving time at the slaughterhouse, starvation time and hydric diet, were collected and registered. After slaughtering, the animals were submitted to *post-mortem* inspection, weighed and classified according to weight, age, conformation and fat cover measurement. The carcasses were sent to the cooling room, where the following parameters were collected at 2, 6, 12 and 24 hours *post-mortem*: relative humidity and temperature in the chilling room, carcass pH and chilling temperature. The weight loss during chilling was also measured.

Results and Discussion

The loss of weight was 1.78% at average, and the final average temperature in *L. dorsi* to 2.9°C (Figure 1) and 5.6°C in *T. brachii* (Figure 2) which can be considered high at the cooling conditions of relative humidity varying from 54 to 72%. In this slaughter conditions, the Nelore cattle shows average pH values of 6.44, 6.18, 5.95 and 5.68 in *L. dorsi* muscle 2, 6, 12 and 24 hours post mortem, respectively (Figure 3) and 6.43, 6.04, 5.72 and 5.58 pH for the *T. brachii,* respectively (Figure 4). According to European Community Rules, it is not allowed to export the beef cuts that came from carcasses with pH $\geq$ 6 after cooling in *L. dorsi* muscle. It has been found in this work that 5 % of the carcasses have pH $\geq$ 6 in *L. dorsi* muscle for the animals transported from distances up to 331 km and in 26.6% for the animals transported above 331 km (Table 1).

Conclusions

Distance of transport has affected the fall of pH *post-mortem*. Animals carried out for over 330 km have presented higher average values of pH compared to the ones carried for lesser distance. According to European Community Rules, where it is not allowed meat importation with pH $\geq$ 6.0, an incidence of 5% (meat with pH $\geq$ 6.0) and 26.6% where found for animals for carried up to 330 km and above this distance respectively.

The *L. dorsi* muscle was considered a better tool than *T. brachii* the *post-mortem* pH evaluation as it showed more uniformity along pH reduction. Younger and lighter animals showed a better conformation and carcass classification. Older and heavier animals, on the other hand, showed better fat cover. The weight loss during chilling was higher in heavier animals and with worse conformation.

References

JARVIS, A.M.; COCKRAM, M.S. Effects of handling and transport on bruising of sheep sent directly from farms to salughter. **Veterinary Record**, London, v.135, n.11, p.523-527, 1994.

KNOWLES, T.G. A review of the road transport of cattle. **Veterinary Record**, London, v.144, n.8, p.197-201, 1999.

ROÇA, R.O. Abate humanitário de bovinos. **Revista de Educação Continuada do CRMV – SP,** v.4, n.2, p.73-85, 2001.

SCHARAMA, J.W.; van der HEL, W.; GORSSEN, J., et al. Required thermal thresholds during transport of animals. **The Veterinary Quartely**, Dordrecht, v.18, n.3, p.90-95, 1996.

TARRANT, P.V.; KENNY, F.J.; HARRINGTON, D.; MURPHY, M. Long distance transportation of steers to slaughter: effect of stocking density and physiology, behaviour and carcass quality. **Livestock Production Science**, Amsterdam, v.30, p.223-238, 1992.

WARRISS, P.D.; BROWN, S.N.; KNOWLES, T.G.; KESTIN, S.C.; EDWARDS, J.E.; DOLAN, S.K.; PHILIPS, A.J. Effects on cattle of transport by road for up 15 hours. **The Veterinary Record**, London, v.136, n.1, p.319-323, 1995.

Acknowledgements

The authors thank Frigorífico Mondelli and Federal Inspection Service for valuable assistance.

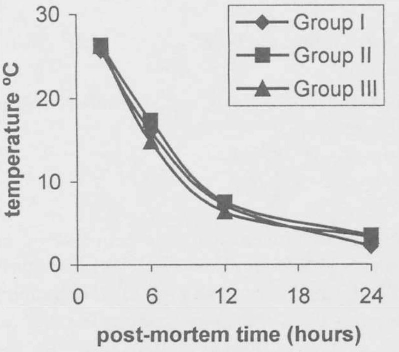

Figure 1. Temperature fall *post-mortem* in *L. dorsi* muscle.

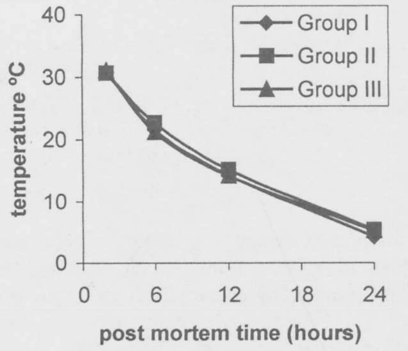

Figure 2. Temperature fall *post-mortem* in *T. brachiii* muscle.

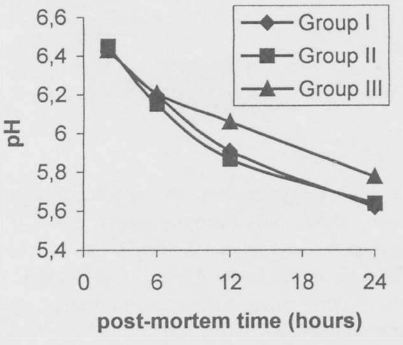

Figure 3. pH fall *post-mortem* in *L. dorsi* muscle.

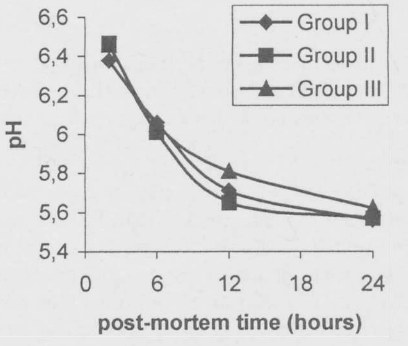

Figure 4. pH fall *post-mortem* in *T. brachiii* muscle.

Table 1 – Number of animals D.F.D. ($pH_{24} \geq 6,0$).

Groups	L. dorsi	T. brachii
Group I (< 100km; n = 60)	3 (5,0%)	0
Group II (101 a 330 km; n = 60)	3 (5,0%)	0
Group III (> 331 km; n = 60)	16 (26,6%)	3 (5,0%)
All (n=180)	22 (12,22%)	3 (5,0%)