EFFECT OF MANAGEMENT AND TRANSPORTATION TIME ON THE *POST-MORTEM* CHANGES IN PROTEIN CONTENT OF KID MUSCLE

SORIANO, J.D.[1]; SUÁREZ, M.D.[1]; MARTÍNEZ, T.F.[1]; PÉREZ-ALMERO, J.L. [2]; ALCALDE, M.J. [3]

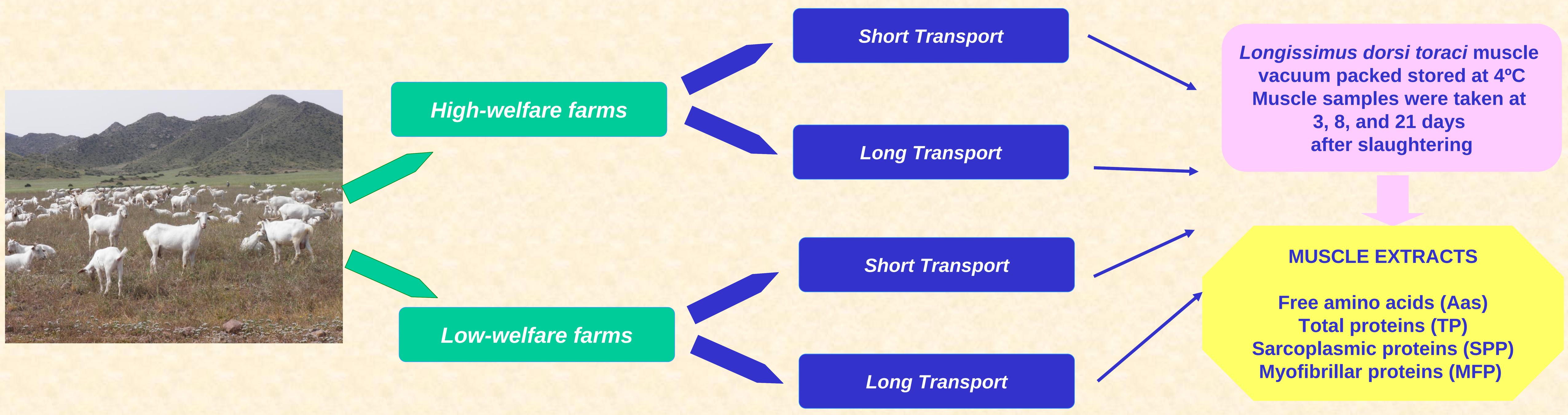
[1] Departamento de Biología Aplicada. Universidad de Almería. 04120-Almería. [2] IFAPA-Las Torres 41200-Alcalá del Rio (Sevilla). [3] Departamento de Ciencias Agroforestales. Universidad de Sevilla. 41013-Sevilla.

INTRODUCTION

In a similar way than described for most of the domestic animals, it is assumed that the quality of kid meat is influenced by factors related to handling, transport, and *post-mortem* storage; these factors determine, with others, the intensity of *post-mortem* proteolysis in muscle cells.

Previous studies carried out related to muscle proteolysis after slaughtering reported disparate results and, thus, McKeith *et al.* (1979) did not observe post-mortem softening of goat *Longissimus dorsi* after 7 d storage. In a similar manner, King *et al.* (2004) did not report muscle early softening in *Longissimus*, *Biceps femoris*, *Semimembranosus*, and *Semitendinosus* in kids (23 Kg live weight) after 3 d storage, although after longer periods (14 d storage) softening was evident. In the study of Kannan *et al.* (2002), however, muscle firmness decreased after 4 d post-mortem storage, together with an increase in the the myofibrilar index, and no modifications in the connective tissue. In agreement with this study, Kadim *et al.* (2003) also found a decrease in hardness of goat meat after 6 d storage, compared to 1 d. Simela *et al.* (2004) shown that both muscle color and firmness were highly influenced by the evolution of pH. It is accepted that the evolution of firmness during goat meat ripening is depending on the disorganization of the structural proteins, this process depending on post-mortem endogenous proteolysis. In the case of goat meat, Kannan *et al.* (2006) described a low post-mortem proteolytic activity in this species, this causing weak softening during meat storage. These authors considered that the small size of carcasses, and the scarce lipid coating, were responsible for lower autolytic activity of endogenous proteases, this leading to increased hardness of goat meat compared to other domestic mammals. The aim of the present work was the estimation of the previous on-farm welfare conditions and transportation time on *post-mortem* muscle proteolysis in kids, measured by extraction and quantification of total soluble protein (TP), sarcoplasmic (SPP) and myofibrillar (MFP) fractions, and total free amino acids (Aas).

MATERIALS AND METHODS



RESULTS AND DISCUSSION

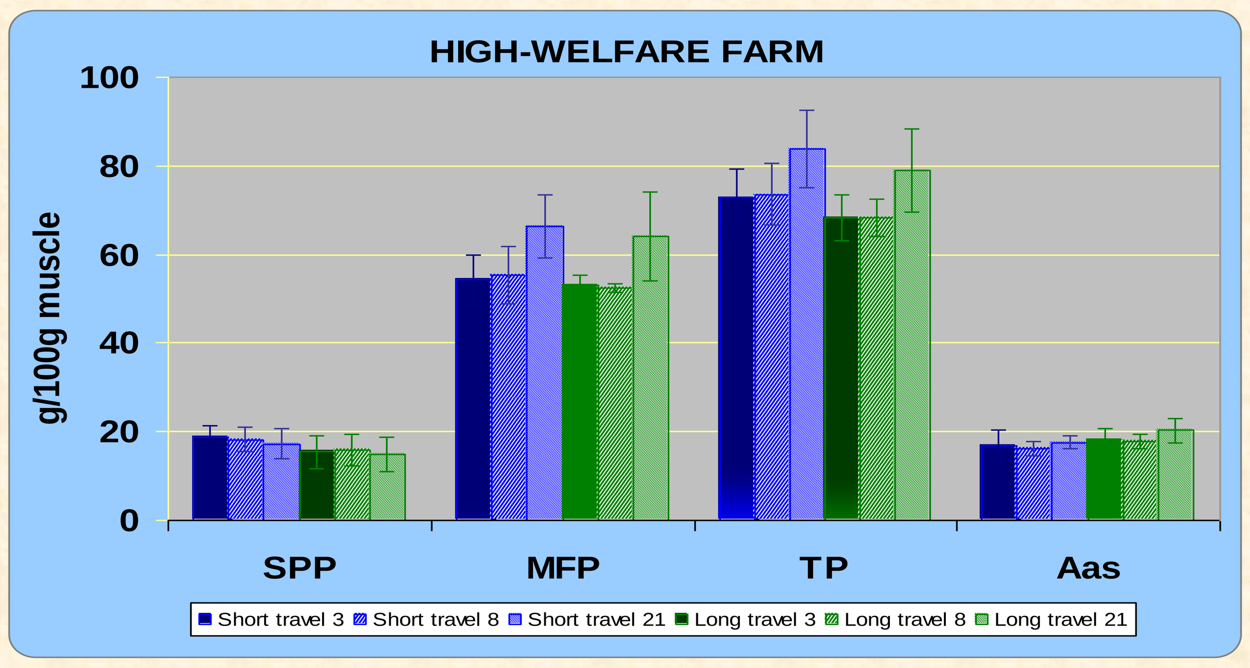


Figure 1. Effect of transportation time (long vs. short) and *post-mortem* storage (3, 8, and 21 d) on protein content in muscle of kids reared in high-welfare farms. **SPP**: sarcoplasmic proteins; **MFP**: myofibrillar proteins; **TP**: total protein; **Aas**: free amino acids.

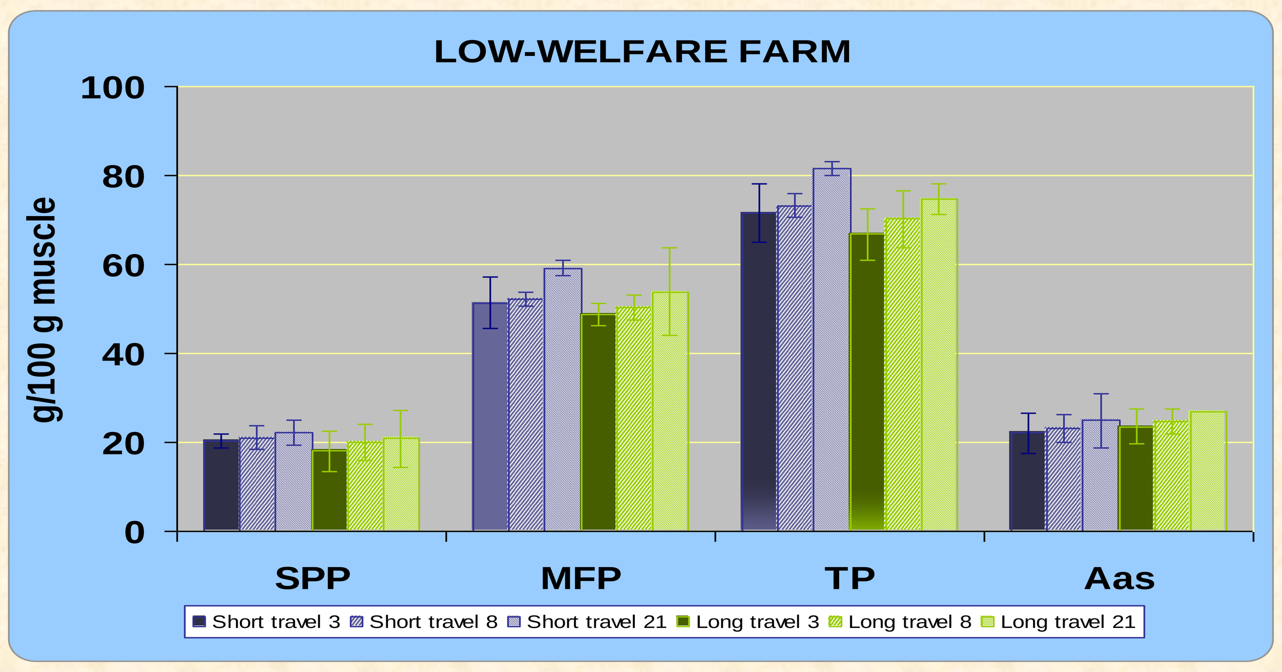


Figure 2. Effect of transportation time (long vs. short) and *post-mortem* storage (3, 8, and 21 d) on protein content in muscle of kids reared in low-welfare farms. **SPP**, **MFP**, **TP**, and **Aas**: same than Fig. 1.

Animals kept in high-welfare farms showed higher contents of myofibrillar protein (MFP), and low sarcoplasmic protein (SPP) and free amino acids concentration (Aas) in muscle extracts than those reared under lower welfare conditions (Fig. 1 and 2). These differences were more marked after 21 d storage, which might be indicative of increased protein hydrolysis in these animals. Differences could be interpreted as the result of an increased *post-mortem* proteolysis of endogenous origin in those kids kept under poor management conditions in farm, this fact resulting in degradation of structural muscle proteins, together with a simultaneous increasing of soluble protein fractions.

In relation to transport time previously to slaughtering, longer transportation time decreased SPP content in kid muscle, with no effect on MFP or free amino acids. The lack of effect on MFP and Aas could be explained by a short-term stress due to the transport, that was not enough to be reflected in modifications in structural proteins. These results suggest that structural proteins are scarcely influenced as a result of short-term stress (like that caused by 6 h road transport), when compared to the consistent effect of on-farm deficient management kept throughout the productive cycle on MFP . Storage time did not cause alterations in Aas, and this is in agreement with the reports indicating very limited proteolysis of goat meat (McKeith *et al.*, 1979; King *et al.*, 2004) during short time storage. After 21 d *post-mortem* storage, SPP concentrations were significantly increased in muscle of kids reared on low-welfare farms. Given that the biological significance of SPP is not ascertained in most of the domestic species, it was not possible to explain this effect. However, it is suggested that this fraction could reflect an increased catabolism in those animals subjected to stressing management.

References

Kadim, I.T., Mahgoub, O., Al-Ajmi, D.S., Al-Maqbaly, R.S., Al-Saqri, N.M. and Ritchie, A. (2003). Meat Science, 66, 203–210.
Kannan, G., Chawan, C.B.,Kouakou, B., Gelaye, S. (2002). J. Anim. Sci. 80, 2283–2389.
Kannan, G., Gadiyaram, K.M., Galipalli, S., Carmichael, A., Kouakou, B. et al. (2006). Small Rumin. Res. 61, 45–52.
King, D.A., Voges, K.L., Hale, D.S., Waldron, D.F., et al. (2004). Meat Sci. 68, 529–535.
McKeith, F.K., Savell, J.W., Smith, G.C., Dutson, T.R., Shelton, M. (1979). J. Anim. Sci. 49, 972–978.
Simela, L., Webb, E.C., Frylinck, L., (2004).S. Afr. J. Anim. Sci. 34, 208–211.

Acknowledgements

The present work was supported by a grant of the Spanish Government. J.D. Soriano acknowledges the Ministerio de Educación y Ciencia and the Escuela Politécnica Superior (Universidad de Almería) the financial support.