EFFECTS OF WELFARE CONDITIONS ON *POST-MORTEM* EVOLUTION OF KID MUSCLE PROTEINS

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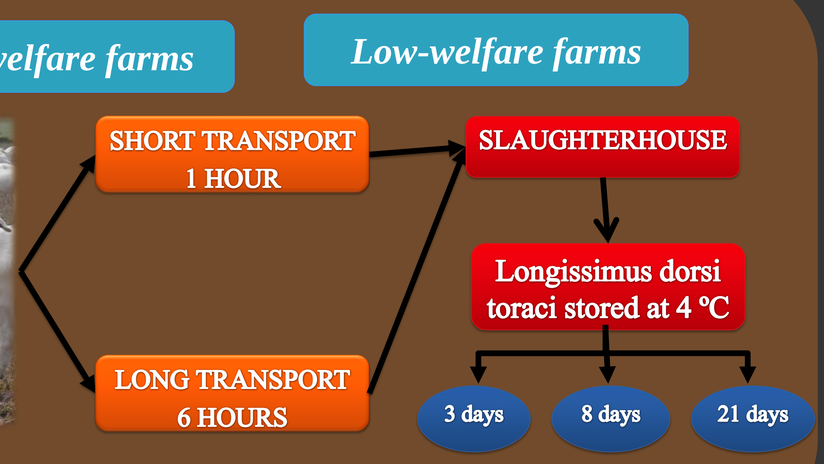
INTRODUCTION

Current social demands related to the context of farm production are oriented to systems that respect the animal welfare. The management practices that improve animal welfare in goat farms results in a higher performance, because stress conditions diminish productivity (Kannan 2002, 2006; Casey & Web 2010) throughout a wide variety of physiological mechanisms (Broom & Johnson, 1993). The interest for animal welfare has focused research to set the identification of parameters indicative of "stressing management" during the productive cycle both in intensive and extensive systems. Various parameters have been proposed as indexes of animal welfare; however some authors consider more efficient a combination of different measurements in order to evaluate the effect of a given management practice (Haresign *et al.*, 1995). Previous studies in PSE pork meat have found significant changes in sarcoplasmic proteins in early phases after the sacrifice (Laville *et al.*, 2005). These changes are attributable to altered proteolysis due to stress previously to slaughtering, and consequently, they have been proposed as promising indicators the relationship between muscular proteolysis and animal welfare. This work was aimed to assess the influence of on-farm management conditions and transport time on the electrophoretic pattern of *Longissimus dorsi toraci* sarcoplasmic proteins during *post-mortem* storage.

MATERIALS AND METHODS

Sixty-four kids (Blanca Celtibérica breed) (10.05±0.15 kg), reared in extensive systems in two farms in Huéscar (Granada, Southeast Spain), designed as high-welfare (HW) and low-welfare (LW). This classification was based on a 120 items survey related to welfare topics. Animals were transported to the slaughterhouse under two transport conditions: short transport (one hour) and long transport (six hours). The kids were slaughtered immediately, and carcasses were kept for 24 hours at 4ºC. Then different portions of *Longisimus dorsi toraci* muscle were vacuum packed and stored at 4ºC in a cold room. Muscle samples were taken at 3, 8, and 21 days after slaughtering, frozen in liquid nitrogen, and stored at –80 ºC until the extraction of muscle proteins, and further SDS-PAGE separation. Densitometry of gels was performed for quantifying the relative contribution of each individual fraction to the total optical density of each lane.



RESULTS AND DISCUSSION

The management in low welfare farms scarcely influenced the electrophoretic pattern of sarcoplasmic proteins (Figs. 1, 2 and 3). Only a significant decrease in their relative contribution occurred in the bands 97 kDa and 46 kDa at 3 and 8 d storage when the transport was long. These results suggest that it is necessary the action of both on-farm, long-term stress together with the short-term effect of transport to cause a significant proteolysis of sarcoplasmic proteins. The main changes occurred fundamentally during the goat meat ripeness, causing a significant decrease of relative optical density (ROD) of the band 97 and 38 kDa at 21d storage, and a increase in the ROD of 58, 40 and 35 kDa fractions in those animals subjected to long transport occurred. The 26 kDa fraction ROD increased both with short and long transport. The ROD increase of 46 kDa band was significant in muscle of animals subjected to short transport after 8 and 21 d post-mortem. This phenomenon could be explained by the apparition of peptides as a consequence of the hydrolysis of high molecular mass proteins (over 250-300 kDa). Given that SDS-PAGE separation carried out in this work was performed with poliacrilamide concentration 12%, it was not possible to establish the origin of those low molecular mass fractions. These findings suggest the possibility of the electrophoretic separations of muscle sarcoplasmic proteins as a feasible procedure aimed to assess the influence of previous welfare conditions on kid meat properties during *post-mortem* storage.

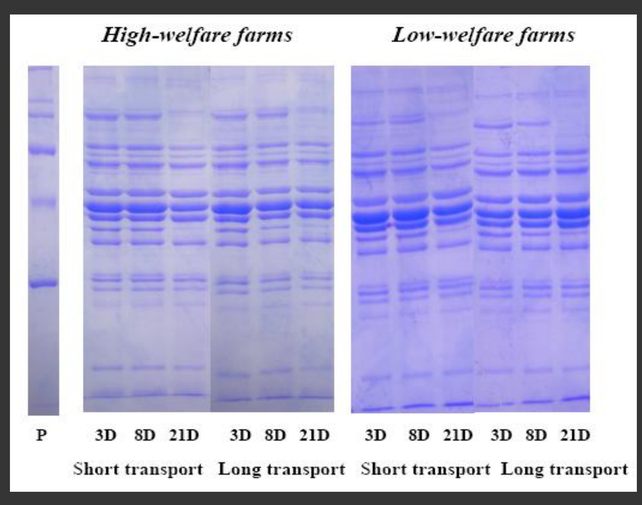


Fig. 1. SDS-PAGE separation of muscle sarcoplasmic proteins

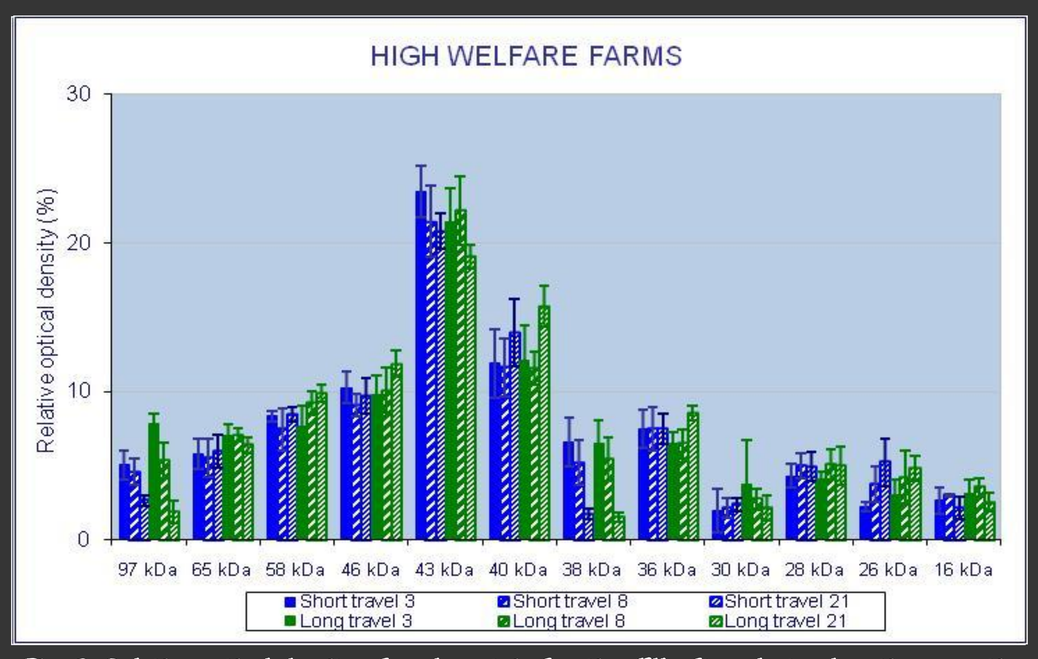


Fig. 2. Relative optical density of each protein fraction (%) after electrophoretic separation of the samples from highwelfare farms.

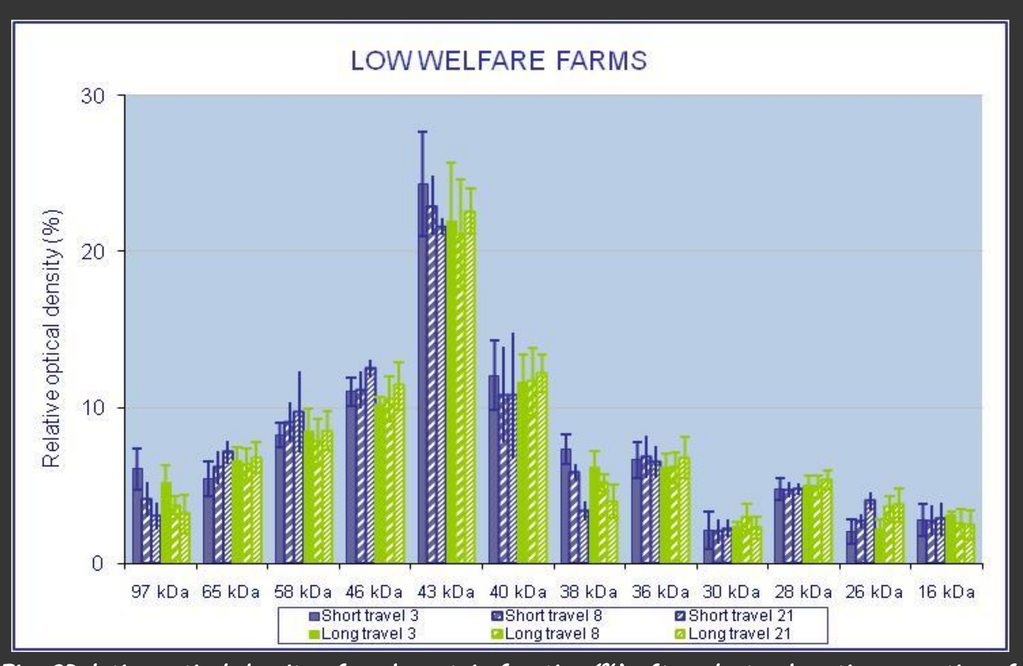


Fig. 3Relative optical density of each protein fraction (%) after electrophoretic separation of the samples from Lowwelfare farms.

REFERENCES

•**Casey, N.H., Webb, E.C. (2010).** Managing goat production for meat quality. Small Ruminant Research xxx (2010) xxx–xxx.

• **Kannan, G., Chawan, C.B.,Kouakou, B., Gelaye, S. (2002).** Influence of packaging method and storage time on shear value and mechanical strength of intramuscular connective tissue of chevon. J. Anim. Sci. 80, 2283–2389.

• **Kannan, G., Gadiyaram, K.M., Galipalli, S., Carmichael, A., Kouakou, B., Pringle, T.D., McMillin, K.W., Gelaye, S. (2006).** Meat quality in goats as influenced by dietary protein and energy levels, and postmortem aging. Small Rumin. Res. 61, 45–52.

• **Haresign W., Williams R.J., Khalid M., Rodwa y R., (1995).** Heart rate responses and plasma cortisol and β-endorphin concetrations in ewes subjected to laparoscopy and its associated handling procedures. Animal Science 61, 77-83

• **Laville, E, Sayd, T., Santé-Lhoutellier, V., Morzel, M., Labas, R., Franck, M., Chambon, C., Monin, G. (2005).** Characterization of PSE zones in semimembranosus pig muscle. Meat Sci. 70:167-172.

•Broom, D.M. y Johnson, K. G. 1993. Stress and animal welfare. Chapman and Hall, London.

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