



HAL
open science

Effect of rearing practices on the abundance of protein biomarkers of tenderness and intramuscular fat content in the French Rouge des Prés cows

Brigitte Picard, Mohammed Gagaoua, Muriel Bonnet

► To cite this version:

Brigitte Picard, Mohammed Gagaoua, Muriel Bonnet. Effect of rearing practices on the abundance of protein biomarkers of tenderness and intramuscular fat content in the French Rouge des Prés cows. 10. International Symposium on the Nutrition of Herbivores (ISNH10), Sep 2018, Clermont-Ferrand, France. Cambridge University Press, *Advances in Animal Biosciences*, 9 (3), 2018, 10th. International Symposium on the Nutrition of Herbivores (ISNH10). hal-02734240

HAL Id: hal-02734240

<https://hal.inrae.fr/hal-02734240v1>

Submitted on 16 Oct 2024

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Distributed under a Creative Commons Attribution 4.0 International License

Effect of rearing practices on the abundance of protein biomarkers of tenderness and intramuscular fat content in the French Rouge des Prés cows

Brigitte Picard, Mohammed Gagaoua, Muriel Bonnet

INRA, Université Clermont Auvergne, INRA, VetAgro Sup, UMR Herbivores, F-63122 Saint-Genès-Champanelle, France

E-mail: brigitte.picard@inra.fr

Take home message The abundance of some protein biomarkers of tenderness or intramuscular fat content are modified by rearing practices during the finishing period with differences depending on the muscle type.

Introduction Tenderness and intramuscular fat content (IMF) constitute internationally major quality traits to be controlled in beef. Recently some proteins considered as biomarkers of these quality traits have been identified (for review: Picard and Gagaoua, 2017; Ceciliani *et al.*, 2018). The present study used multivariate analyses to assess the effect of rearing practices applied during the finishing period on the relative abundance of 20 of these proteins quantified in 86 Rouge des Prés cows.

Materials & methods The relative abundance of 20 biomarkers of tenderness and/or IMF content were quantified by Reverse Phase Protein Array technique (RPPA) in 5 muscles: *Longissimus thoracis* (LT), *Semimembranosus* (SM), *Rectus abdominis* (RA), *Triceps brachii* (TB) and *Semitendinosus* (ST) (Picard *et al.*, 2017). The finishing period data [part of hay, haylage and/or grass in the finishing diet (% w/w)]; amount of concentrate (kg); duration (days) and physical activity (% days out) were used to identify rearing practise classes. For that we used the procedure based on principal component analysis (PCA) and *k*-means, recently reported by Gagaoua *et al.* (2017). The clusters were then compared for muscle biomarkers relative abundance by using the PROC GLM of SAS.

Results Rearing practise analysis allowed to distinguish 3 clusters mainly characterized by “Grass”, “Haylage” or “Hay” diet during the finishing period (Figure 1, only biomarkers with eigenvectors >0.5 were considered). Grass finishing diet had an impact mainly on the properties of the SM and ST muscles known as fast glycolytic muscles. This cluster is characterized by higher relative abundance of MLC1F and PRDX6 (an antioxidant enzyme). Hay finishing practice impacted the properties of RA muscle known as slow oxidative muscle. This cluster is characterised by high abundance of small Heat Shock Proteins (HSP) (HSP20, 27, CRYAB) and HSP70-1A, TNNT1 (slow isoform) and ALDH1A, and by a low abundance of MyHC IIX (fast glycolytic). The results revealed also that LT and TB muscles, known as mixed oxido-glycolytic muscles, were less impacted by finishing diet than the 3 other muscles. Interestingly, the abundances of 3 proteins: FHL1, MDH1 and PYGB were not modified by rearing practices whatever the muscle.

Conclusion These data highlighted at which extent the abundance of some proteins biomarkers of tenderness and IMF traits could be affected by the rearing practices applied during the finishing period in Rouge des Prés cows. This knowledge is important for the management of beef quality as well as to establish a molecular phenotyping strategy.

Acknowledgements The authors thank SICA Rouge des Prés and Région Pays de la Loire for the financial support and Institut Curie centre de recherche, Plateforme RPPA, Paris France, for the quantification of the biomarkers.

References

- Ceciliani F, Lecchi C, Bazile J and Bonnet B 2018. In: *Proteomics in Domestic Animals: from Farm to Systems Biology*. 233-255. Springer
- Gagaoua M, Monteils V, Couvreur S and Picard B 2017. *Journal of Agricultural and Food Chemistry* 65, 8264-78.
- Picard B, Al Jammal M., Couvreur S, Pécot M, Aminot G, Leger S, De Koning L, Valais A and Bonnet M 2017. In: *Proceedings of the 63rd International Congress of Meat Science and Technology*. 819-820, Cork, Ireland.
- Picard B and Gagaoua M 2017. Chapter 11 - In: *Proteomics in Food Science: from farm to fork*. 177-197. Academic Press.

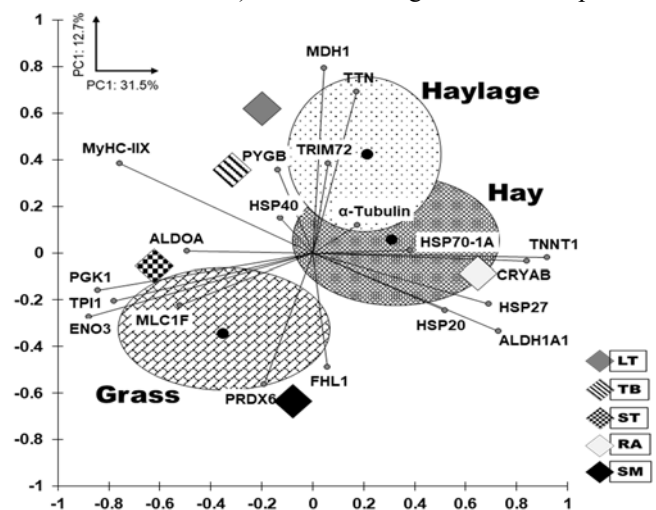


Figure 1: PCA highlighting both the projection of the variables in the first two axes and the relationships between rearing practices with the relative abundance of the 20 biomarkers by muscle type.