

TERMINOLOGIES RELATED TO BEEF EATING QUALITY FROM EXISTING DATABASES

Amanda G. Barro^{1,4}, Kizkitza Barrenetxea^{2,3}, Moise Kombolo¹, Marie P Ellies-Oury^{1,2},
Jean F Hocquette¹

¹ INRAE, VetAgro Sup, UMR1213, France

² Bordeaux Sciences Agro, France

³ Public University of Navarre, Arrosadía Campus, Spain

⁴ Londrina State University, Brazil

*Corresponding author email: amanda.gobeti-barro@inrae.fr

I. INTRODUCTION

Consumer demand for quality has increased with the diversification of the meat industry. Improving meat quality prediction is essential for this sector. In this sense, the Meat Standards Australia (MSA) methodology has been proven to be robust and effective. MSA is an innovative system for grading beef quality based on the prediction of beef eating quality [1]. For the implementation of this complex system, standardization of definitions is essential. The lack of consensus around shared definitions can have an impact on research, particularly for predictive biology approaches [2]. Ontologies can help in this process by facilitating communication between the different sectors in the supply chain [3]. Therefore, it is essential to analyze existing information to identify knowledge gaps. Collecting this preliminary information is a critical step to ensure the relevance and quality of the ontology that will be developed later. The objective was to identify and analyze pertinent terms associated with the quality of beef for consumption currently available in ontologies and terminological materials.

II. MATERIALS AND METHODS

The terms of the MSA methodology were used as reference points. The process involved a semi-automated search and organization of terms from existing databases, followed by a manual search for available definitions and establishing term equivalence through different databases. The equivalence of terms was recorded in French, Portuguese and English. Nineteen thesauri were consulted, including specific animal production ontologies such as ATOL, Animal Trait Ontology of Livestock [4], NAL Agricultural Thesaurus USDA [5] and the Meat Thesaurus [6] available in the AGROPORTAL ontology [7]. However, there were difficulties in finding specific ontologies related to meat and carcass classification. Consequently, additional materials were consulted such as online dictionaries and documents from reputable institutions such as MLA [8], ICAR [9], Beef Research [10] and AMSA [11]. All materials are freely accessible. The information was collected and inputted into a table based on its sources and equivalence in others languages.

III. RESULTS AND DISCUSSION

Pre-existing data were found for 56 terms of the MSA methodology used in the meat industry. No database could find all the terms used in this study. Some terms may be described differently in each country. This is particularly relevant for marbling, which is measured differently in some countries and can result in variations in carcass grading. Some definitions are more detailed than others. The definitions of available MSA materials are more detailed while the available ontologies are broader. The results for marbling are shown in Table 1. The utilization of standardised tables can assist in disseminating and improving data derived from various sources. By implementing a consistent terminology for the MSA methodology, this promotes the execution of meta-analyses while minimizing inconsistencies or imprecisions in the analyses. Ultimately, offering transparent and easily comprehensible information regarding meat quality can enhance consumers' comprehension and valuation of meat, in addition to guiding meat professionals in their decision-making process. This is expected to promote sustainable beef production in the future, over the long term.

Table 1: Partial result of the developed table showing the different definitions and sources: example of marbling

Definition	Source
Any measurable or observable characteristic related to the visible intramuscular fat	ATOL
The presence of thin strips or flecks of fat within a meat cut. More marbling is usually associated with greater palatability.	NAL
Visual aspect of bovine meat in which large quantities of intramuscular fat is found. Marbling is sought-after by the American, Australian, Korean and Japanese consumer but not by the European, who prefers only a small amount of fat. In the US, marbling is officially classified: Prime, Choice, Select, Standard, then Utility, Cutter, Canner. The first three categories are the most sought-after.	Meat Thesaurus
Marbling or intramuscular fat is the flecks of fat dispersed within the lean. The USDA grader evaluates marbling within the longissimus dorsi (ribeye) muscle that has been cut, or ribbed, between the twelfth and thirteenth ribs	USDA
Marbling is the fat that is deposited between muscle fibres of the <i>M. longissimus dorsi</i> muscle. Marbling is assessed and scored against the AUS-MEAT Marbling reference standards. Marbling is an assessment of the chilled carcass and scored by comparing the proportion of marble fat to meat at the surface of the assessment site which lies within the <i>M. longissimus dorsi</i> boundary.	AUS-MEAT

IV. CONCLUSION

In conclusion, there is still a lack of a single source associated to the robust definitions of the MSA grading system with associated methods of carcass evaluation. In addition, there is no global ontology of beef quality related to the whole meat chain, from the producer to the consumer. Comparing existing ontologies is a key issue towards a common international set of definitions related to beef quality.

ACKNOWLEDGEMENTS

This work was supported by the INTAQT project that has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101000250.

REFERENCES

1. Watson, R., Polkinghorne, R. & Thompson, J.M. (2008). Development of the Meat Standards Australia (MSA) prediction model for beef palatability. *Australian Journal of Experimental Agriculture*, 48: 1368-1379.
2. Hocquette, J. F., Ellies-Oury, M. P., Legrand, I., Pethick, D., Gardner, G., Wierzbicki J. & Polkinghorne, R. (2020). Research in Beef Tenderness and Palatability in the Era of Big Data. *Meat and Muscle Biology* 4(2): 1-13.
3. Pizzuti, T., Mirabelli, G., Grasso, G. & Paldino G. (2017). MESCO (MEat Supply Chain Ontology): An ontology for supporting traceability in the meat supply chain. *Food Control* 72: 123–133.
4. ATOL, Animal Trait Ontology of Livestock, <https://sicpa-web.cati.inrae.fr/ontologies/visualisation/ontologie/?ontologie=atol>
5. National Agricultural Library Thesaurus, <https://agclass.nal.usda.gov/>
6. Kombolo, N.M., Yon, J., Landrieu, F., Richon, B., Aubin, S. & Hocquette, J.F (2022). A new semantic resource responding to the principles of Open Science: The meat thesaurus as an IT tool for dialogue between sector actors. *Meat Science* 192: 108849.
7. Meat Thesaurus (2022), <https://agroportal.lirmm.fr/ontologies/MEAT-T?p=classes>
8. Meat Standards Australia beef information kit (2011), https://www.mla.com.au/globalassets/mla-corporate/marketing-beef-and-lamb/msa_tt_beefinfokit_jul13_lr.pdf
9. ICAR, Glossary for animal production sector, <https://www.icar.org/index.php/technical-bodies/working-groups/interbeef-working-group/glossary-for-animal-production-sector/>
10. Beef Research, <https://www.beefresearch.org/resources/product-quality/fact-sheets/beef-grading/>,
11. American Meat Science Association, <https://meatscience.org/docs/default-source/publications-resources/amsa-sensory-and-tenderness-evaluation-guidelines>