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Biomarkers of beef tenderness, moving towards analytical tools

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Variation in beef tenderness is a major problem for the beef industry. Currently, there are no accurate commercial techniques available to evaluate the tenderness of carcasses, and this capacity is even poorer for live animals. The beef industry needs commercially viable tenderness measurements for progress to occur. For years, functional genomic programs have been conducted to search for biomarkers of this quality. The main results showed that, in the Longissimus thoracis of the tenderest animals, the muscle proteins associated with the fast glycolytic type (phosphoglucosmutase, lactate dehydrogenase B, triphosphate isomerase, glyceraldehyde 3-phosphate dehydrogenase, isoforms of fast troponin T, β enolase ...) were less abundant. Several proteins involved in calcium metabolism such as parvalbumin were also identified as positive markers of tenderness, in agreement with the role of calcium in post-mortem ageing. Proteins of heat shock (Hsp) family have been revealed as markers of tenderness at mRNA and protein levels in different experiments (Hsp40, Hsp27, Hsp20, α -B crystallin, Hsp70). This is consistent with a theory that the anti-apoptotic activity of Hsp could slow down the process of cell death early post-mortem and consequently improve tenderness. Other proteins involved in oxidative stress, such as superoxide dismutase 1 or peroxiredoxin 6, have been related negatively with tenderness. Currently, the abundance of these proteins is being measured in different muscles within a representative sample of the French production systems. The final step is to provide a tool for the beef industry to enable it to measure the abundance of these tenderness markers. Its use will provide objective data on the potential tenderness of individuals pre or post slaughter allowing production to be tailored to maximise tenderness and/or decide the appropriate market.

