REDUCED AND NONREDUCED PEROXIREDOXIN-2 PROFILE OF AGED PORK LOINS CLASSIFIED BY INSTRUMENTAL STAR PROBE

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I. OBJECTIVES

Meat tenderness improves through degradation of myofibrillar proteins in postmortem muscle. However, one source of variation in proteolysis can be the rate and extent of tissue and protein oxidation. Peroxiredoxin is an antioxidant protein ubiquitously expressed in cells which reduces reactive oxygen species. Peroxiredoxin-2 (PRDX-2) has been identified to be more abundant in aged pork that was less tender. The objective was to compare PRDX-2 in reduced and nonreduced forms during aging to understand further the relationship of PRDX-2 to meat tenderness. It was hypothesized that changes in oxidation state and abundance of PRDX-2 postmortem aging reflect variation in proteolysis and tenderness.

II. MATERIALS AND METHODS

Fresh pork loins were collected at 1 d postmortem. Pork chops (2.54 cm) were fabricated and aged for 1, 8, 14, or 21 d postmortem. After aging, chops were cooked to 68°C, and instrumental tenderness was measured using the star probe attachment on an Instron. Star probe values were used to classify chops into high- (HSP; star probe > 7.0 kg, $n = 6$) and low- (LSP; star probe < 5.8 kg, $n = 6$) star probe groups based on 21-d analysis. Sarcoplasmic proteins from the *longissimus dorsi* from each aging time were solubilized in ice-cold, low-ionic strength buffer (50 mM Tris-HCl [pH 8.5] and 1 mM EDTA), and samples with and without a reducing agent were prepared for immunoblot analysis. Reduced and nonreduced PRDX-2 and reduced intact desmin were determined using monoclonal rabbit anti-PRDX-2 antibody (ab109367; ABCam, Cambridge, UK) and polyclonal rabbit anti-desmin antibody (ISU), respectively, and normalized by a reference sample on each gel. Intact desmin and PRDX-2 were analyzed using PROC MIXED of SAS 9.4 (SAS Institute Inc., Cary, NC) with fixed effects of days aging and classification for reduced PRDX-2 and desmin. Fixed effects of days aging, classification, and migrating band were used in nonreduced PRDX-2 analysis. Significance was denoted with $P < 0.05$.

III. RESULTS

There was less ($P < 0.05$) intact desmin at 14 and 21 d in LSP compared to HSP. In LSP chops, reduced PRDX-2 decreased between 1 and 8 d ($P < 0.05$) but did not change after 8 d of aging. In the HSP chops, reduced PRDX-2 decreased between 1 and 14 d ($P < 0.05$). The LSP group had less ($P < 0.05$) PRDX-2 at 8 and 21 d compared with HSP. In nonreduced gels, PRDX-2 was identified by 3 distinct bands. The 2 slower migrating bands changed similarly during aging regardless of classification, where bands 1 and 2 decreased between 1 and 8 d and increased between 14 and 21 d of aging. Bands 1 and 2 were not different between 1 and 21 d. Conversely, band 3 increased ($P < 0.05$) between 1 and 8 d and 8 and 14 d of aging but decreased from 14 to 21 d of aging. At 21 d, the third band in the LSP had less ($P < 0.05$) PRDX-2 compared to HSP.

IV. CONCLUSION

Reduced PRDX-2 decreases at a variable rate with postmortem aging based on differences in tenderness classification. In a nonreduced state, bands 1 and 2 changed inversely compared to band 3, suggesting a transition of oxidation state during postmortem aging. The identification of the modifications between the 3 bands is essential to further interpret the relationship between PRDX-2 and meat tenderness. The change in PRDX-2 is dynamic and appears to be altered during postmortem aging and related to the proteolysis of desmin and the development of tenderness.

Keywords: nonreducing, peroxiredoxin-2, pork tenderness, reducing