Early postmortem pH influences proteolysis of cytoskeletal proteins during aging in porcine longissimus muscle.

G. Bee[1], S. M. Lonergan[2], E. Huff-Lonergan[2]

[1]Agroscope Liebefeld-Posieux, Swiss Federal Research Station for Animal Production and Dairy Products (ALP), 1725 Posieux, Switzerland, [2]Iowa State University, Ames, IA 50011

The objective of this study was to determine the extent to which early postmortem (PM) pH decline influences proteolysis of the intermediate filament protein desmin and the costameric protein talin in the longissimus muscle (LM) of pigs from two genetic lines (A and B). Based on the 3 h pH (H = pH > 6.0; L = pH < 5.7) PM, 10 pigs per line and pH group were selected from 120 pigs. The average 3 h pH within pH group was 6.19 (H) and 5.41 (L) in line A and 6.27 (H) and 5.47 (L) in line B. LM samples were collected 24, 48, 72 h, and 7 d PM and percent drip loss was measured after 1, 2, and 7 d PM. These samples were also used to monitor desmin and talin degradation by immunoblotting. The ratio (relative intensity of the 53 kDa band of desmin and 225 kDa band of talin in the samples/intensity of desmin or talin in a reference) was used as a measure of proteolysis. Drip loss at all time points was lower ($P < 0.01$) in the H-pH (d 1: 1.62%; d 2: 1.80%; d 7: 2.99%) than in the L-pH group (d 1: 3.11%; d 2: 3.40%; d 7: 4.72%) regardless of line. Drip loss was lower ($P < 0.01$) in line B (d 2: 2.04%; d 7: 3.14%) than line A (d 2: 3.15%; d 7: 4.56). Independent of the line, proteolysis of desmin was faster ($P < 0.03$) after 1 and 2 d in the LM from the H- compared with those from the L-pH group. At d 7, relative abundance of intact desmin was 45% lower ($P < 0.01$) in the LM from pigs of line B than line A. Compared to the L-pH group, relative abundance of talin determined in the LM 24, 48, 72 h, and 7 d PM decreased ($P < 0.03$) at a faster rate in the H-pH group. Line effects were found at 48 h PM with 46% less intact talin abundance in the LM of pigs from line A compared with those from line B. Disappearance of desmin was positively correlated ($r = 0.51$; $P < 0.01$) with the disappearance of talin. Furthermore, proteolysis of both proteins was positively correlated ($P < 0.01$) with percent drip loss. Degradation of cytoskeletal proteins is related to early postmortem pH and improves water-holding capacity.

KEYWORDS: pH, Proteolysis, Water-holding capacity

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