Impact of aging technique and muscle on oxidative stability of beef packaged under high-oxygen atmosphere

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INTRODUCTION

Two common techniques of beef aging are “dry” and “wet” aging:
- dry aging: ancient process of placing an entire carcass or a wholesale cut in a refrigerated room
- wet aging: aging of meat in a sealed barrier package at refrigerated temperatures.

The shelf life of meat is mainly limited by the development or pathogenic of spoilage microorganisms, and by oxidation of lipid and pigments.

The meat sector often complains of a sensitivity of beef to oxidation processes, in particular the discoloration of high-oxygen modified atmosphere packaged (MAP) meat previously aged in vacuum conditions.

OBJECTIVE

To evaluate the potential effect of aging technique (wet vs. dry), muscle (longissimus dorsi vs. rectus femoris) and previous storage time in vacuum conditions on the physicochemical stability of meat packaged in high-oxygen atmosphere.

MATERIALS AND METHODS

slaughter
(8 half carcasses)

“½ carcass”
(dry)

under vacuum at −1 °C
under MA* at +4 °C
under MA* at +4 °C
under MA* at +4 °C

chilling
aging at +1,5 °C
storage

Belgian blue cows
7.9 ± 1.4 yr

2 muscles : longissimus dorsi (LD) rectus femoris (RF)

MAP: effect of previous storage time in vacuum atmosphere
VP: no significant loss of redness

Performed analysis:
- color (CIE L*a*b*)
- pigment oxidation (metmyoglobin %)
- fat content
- lipid oxidation (TBARS)
- antioxidant enzyme activities (catalase (CAT), glutathione peroxidase (GSH-Px) and superoxide dismutase (SOD))
- α-tocopherol content

RESULTS

Color (a*)

Fat content

Antioxidant enzyme activities (d<sub>24h</sub>)

LD aged on carcass presented higher pigment stability
Wet-aging favored pigment oxidation

Higher fat content in LD samples

Only catalase activity differed according to muscle: possible explanation to the higher sensitivity of RF to oxidation

α-tocopherol (d<sub>24h</sub>)

Higher content of α-tocopherol did not prevent RF from being more oxidative
Fat content not directly proportional to α-tocopherol content: higher capillarity supply or mitochondria content of RF?

CONCLUSIONS

A higher sensitivity to oxidation was observed with seven-day wet-aging, and LD showed a higher oxidative stability than RF. The length of previous vacuum storage favored oxidation reactions when the samples were repackaged under modified atmosphere. Oxidation stability could be associated with the catalase activity in samples, but no association could be found regarding the α-tocopherol content.

Further research will be conducted to study the fatty acid profile in order to better understand the lipid oxidation process.