

Effect of freezing duration on oxidation of backfat stemming obtained from pigs fed n-3 PUFA rich diets

Aurélie Promeurat¹, Alain Le Roux¹, Antoine Vautier¹, Thierry Lhommeau²

¹ IFIP (French Institute for pig and pork industry), Le Rheu, France

² IFIP, Le Rheu, France

Introduction: Lipid oxidation is decisive.

Lipid oxidation is decisive for the final quality of meat and meat products. That oxidation affects: 1) safety of (pork fat) consumption because of the development of secondary peroxidation products which are assumed toxic for humans, 2) the nutritional value with the degradation of essential fatty acids and 3) the sensory quality with changes of flavour (rancidity) and colour which are unpleasant for consumers. The unsaturated fatty acids are highly sensitive to the oxidation process. Hence, increasing degree of more polyunsaturated fatty acids (PUFA) in meat products leads to a higher susceptibility to oxidation. Concerning above the aim of this study is to evaluate the effect of freezing duration on lipid oxidation of back fat enriched in PUFA by feeding pigs with linseed.

Experimental design: At the experimental station of Romillé (France, 35), 96 growing-finishing crossbred (Pietrain male X (Large White X Landrace) female) were assigned to 3 equal groups. Each group received feed ad libitum and was fed with one of 3 experimental diets, a control diet (TEM), a control diet plus 1.5% (OM15) extruded linseed (Valomega®, Valorex, Combourtillé, France) and a control diet plus 3% (OM30) of the same source of extruded linseed. Subcutaneous backfats, were collected in slaughterhouse, packaged in open plastic bags then in boxes. Frozen and storage were performed on an industrial platform over 6-month period with samplings every 2 months for oxidation analyses. Total lipid content and fatty acid composition were analysed on minced fat (20 samples per group) according to the methods NFV04-403 and Rule et al. (1997), respectively. Lipid oxidation was evaluated by the measurement of peroxide index on frozen backfat (T2, T4, T6) and fresh backfat (T0).

Results: Effect of the lipid composition and frozen duration on lipid oxidation.

Total lipid content was in the range of 83,68g and 84,93g per 100g of adipose tissue. Diets had no effect on total lipid content ($P = 0,531$). In contrast, the total content of saturated fatty acids (SFA) and mono unsaturated fatty acids (MUFA) decreased with the increasing level of linseed, respectively ($P < 0.01$) and ($P < 0.001$). Effects were more pronounced with the diet OM30. Total polyunsaturated fatty acids progressively increased with increasing level of linseed with +14,7% for OM15 and +35,9% for OM30 ($P < 0.001$). The n-3 PUFA level increased from twice for OM15 diet and threefold for OM30 ($P < 0.001$). This effect was expected and agrees with literature data that indicates a threefold increase in α -linolenic acid (ALA) with a diet enriched in extruded linseed. A significant effect of diet ($P < 0.01$) and freezing duration ($P < 0.001$) on lipid oxidation was observed. The maximum value was obtained with OM30 diet and after 6 months of freezing.

Conclusion: PUFA are more susceptible to oxidative damage.

In summary, this study showed an increase of PUFA level with n-3 PUFA rich diets. This effect induces pork backfat which is more sensitive to the oxidation process (OM30 > OM15 > TEM) that occurred during the freezing storage. Higher oxidation in adipose tissue should impact the final products made with frozen backfat. We have planned to study this effect.

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