Increase of Geometrical and Positional Fatty Acid Isomers in Dark Meat from Broilers Fed Heated Oils

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Oils rich in polyunsaturated fatty acids are prone to lipid oxidation which can occur at low or high temperatures such as occurs during long-term storage at room temperature or frying. Both caused a decreased nutritional value and other undesirable effects. In order to reach two different kinds of lipid oxidation we heated a refined sunflower oil at 60 ºC for 12 days (namely peroxidised oil) or at 190 ºC for 28 h (namely very oxidised oil).

We compared the fatty acid composition of a refined sunflower oil (fresh oil), the peroxidised oil, the very oxidised oil, and a mixture (1+1) of fresh and very oxidised oil (namely oxidised oil). Oil fatty acid composition was affected by the heating treatment. Linoleic, linolenic and total polyunsaturated fatty acids content were different for each oil treatment being lower when high temperatures were applied due to their oxidation susceptibility. In addition, an increase in trans-18:1, monotrans and ditrans-linoleic acids were observed in both oxidised and very oxidised oil (very ox. > ox. > perox. = fresh). Similar results were observed for 9c,11t-linoleic acid and ditrans-non-methylen interrupted octadecadienates (ditrans-NMIOd). However, there were not significant differences between oil treatments for 10t,12c-linoleic acid.

Then, these oils were added to broiler diets (6% added fat) and their effect on fatty acid composition of raw dark chicken meat was assessed. In meats, conversely to what happened in oils, there were only significant differences in the fatty acid isomer composition. Ditrans-linoleic acid content in meat from chickens fed very oxidised oil was higher than in meat from other dietary treatments. Monotrans-linoleic acid content in meat from chickens fed very oxidised or oxidised oils was higher than in meat from chickens fed peroxidised or fresh oils. Furthermore, ditrans-NMIOD content showed significant differences between chickens fed with the two oxidised oils and the other oils (very ox. > ox. > perox. = fresh). In addition, we carried out a Principal Component Analysis for meat fatty acid composition. The resulting 2nd component grouped these geometrical and positional isomers, which indicates the ability of some these isomers as potential markers for the use of thermally abused oils in animal feeding.