Effect of replacing pork fat with healthier oils on lipid profile of dry- fermented foal sausages

Aurora Cittadini [1], M.V. Sarries [1], P.E. Munekata [2], M. Pateiro [2], R. Dominguez [2], J.M. Lorenzo [2,3]

[1] Instituto de Innovación y Sostenibilidad en la Cadena Agroalimentaria (IS-FOOD), Universidad Pública, de Navarra, Campus de Arrosadía, 31006, Pamplona, Spain, [2] Centro Tecnológico de la Carne de Galicia, Avid. Galicia, 4, 32900, San Cibrao das Viñas, Ourense, Spain, [3] Universidade de Vigo, Área de Tecnología de los Alimentos, Facultad de Ciencias de Ourense, 32004, Ourense, Spain

Objectives: This work pursues to evaluate the influence of partial replacement of animal fat by healthy oil mixtures, algal oil mixed with tiger nut (treatment 1 - T1) or sesame oils (treatment 2 - T2), on the fatty acid profile of dry-fermented foal sausages.

Materials and Methods: The elaboration of three distinct batches of dry-fermented sausages was carried out: control (CON) - containing 100% of pork back fat as fat source (18.2 g/100 g) and other two experimental batches in which 50% of animal fat (9.1 g/100 g) was replaced by the alginate-based hydrogels (9.1 g/100 g) consisting of algal oil blended with tigernut oil (T1) or sesame oil (T2), depending on the batch. The emulsion-hydrogels were elaborated according to Cittadini et al. (2021). All batches were formulated with the same ingredients, except for fat source as above described. In particular, the foal sausages included lean meat from Burguete foals (74 g/100 g), pork back fat, water (3.2 g/100 g) and the "542 Salchichón" supplement (Laboratorios Ceylamix, Valencia, Spain) (4.6 g/100 g). The manufacturing process employed for the three treatments was previously described by Bis-Sou- za et al. (2019) with some modifications. Eight replicates were elaborated for each batch and the same manufacturing process was repeated three times, on different months. Fatty acids determination was carried out following the protocol explained by Domínguez et al. (2022) and the health indices were calculated according to Cittadini et al. (2021). ANOVA of one-way using SPSS statistical software was performed.

Results and Discussion: Data showed that the fatty acid (FA) composition of foal dry-fermented sausages was affected ($P < 0.05$) by the fat reformulation. In this regard, it was observed a significant ($P < 0.001$) decrease of the saturated fatty acid contents, and an increase ($P < 0.001$) of mono- (T1) and polyunsaturated (T2) fatty acids. Moreover, statistical analysis indicated a significant ($P < 0.001$) increment of omega-3 (n-3) fatty acid values of the reformulated sausages, probably related to the use of algal oil in the emulsion hydrogels. In fact, it recognized that this marine oil represents a valuable source of long-chain n-3, as eicosapentaenoic (EPA) and docosahexaenoic (DHA) acids. Our outcomes, actually, reflected this fact and T1 and T2 sausages reported values of 130.49 and 155.15 mg EPA+DHA/100 g of product, respectively. Thus, in line with the European Regulation (EU) No 116/2010 (2010), "source of omega-3 fatty acids" and "high omega- 3 content" claims could be conferred to these treatments. Furthermore, an improvement of all health indices was observed in both reformulated sausages, obtaining values in line with the health recommendation explained by Cittadini et al. (2021), a part from n-6/n-3 ratio in T2 samples. Therefore, it seems that the lipid profile of our samples reflects the fatty acid composition of the fat source employed in their formulation.

Conclusions: The results indicated that the use of T1 and T2 emulsion hydrogels as partial animal fat replacers in dryfermented foal sausages significantly affected the fatty acid composition of samples, improving their nutritional profile. Hence, this fat reformulation, in particular T1, could be considered an encouraging solution to obtain healthier foal sausages.

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