XII INTERNATIONAL SYMPOSIUM FOOD TECHNOLOGY

MURCIA Food 25

# Development of functional meat products with byproducts from artichoke industry

Pablo Ayuso, Jhazmin Quizhpe, María de los Ángeles Rosell, Pascual García-Pérez, Rocío Peñalver, Gaspar Ros and Gema Nieto

Department of Food Technology, Food Science and Nutrition, Faculty of Veterinary Sciences, Regional Campus of International Excellence "Campus Mare Nostrum", University of Murcia, Murcia, Spain; pablo.ayuson@um.es; jhazminedith.quizhper@um.es; mariaangeles.rosellp@um.es; pascual.garcia@um.es; rocio.penalver@um.es; gros@um.es; gnieto@um.es.

## BACKGROUND

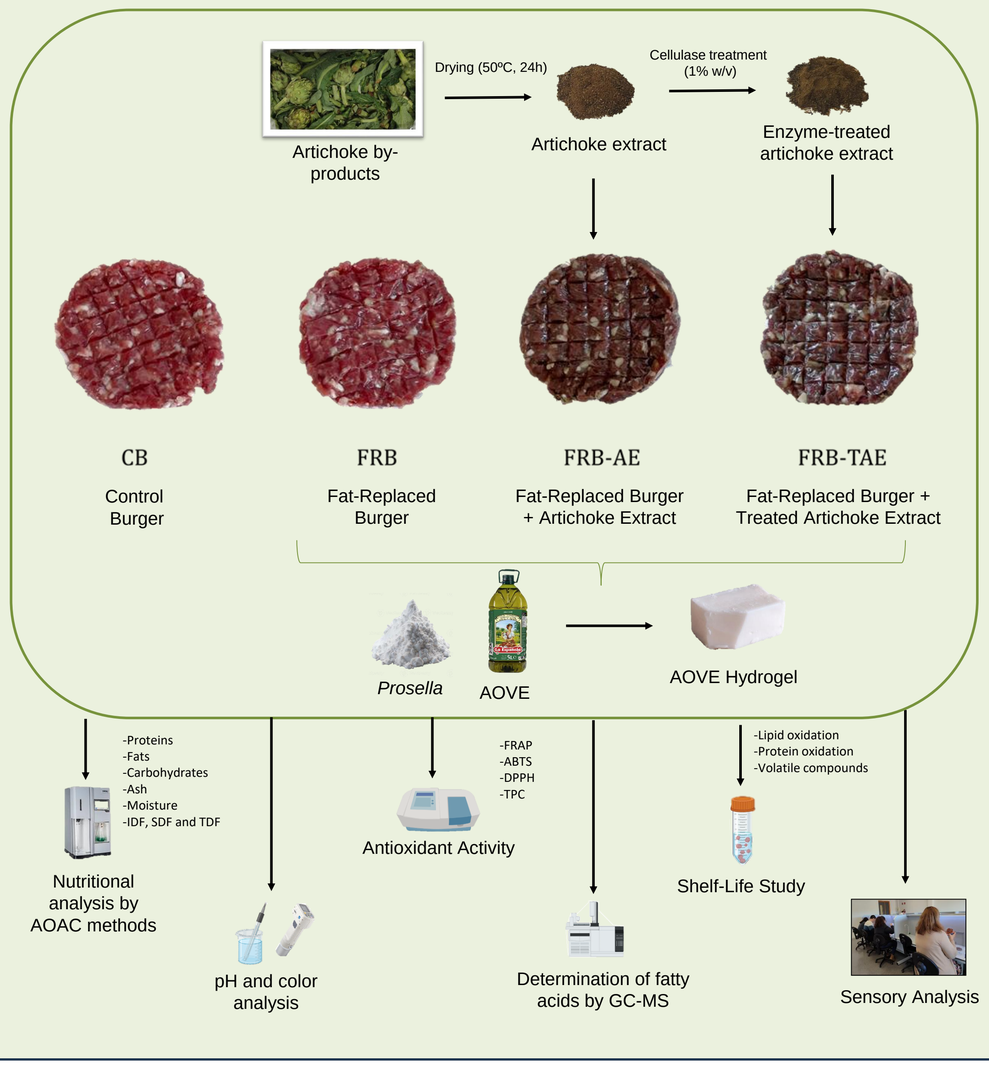
Beef burgers are widely consumed for their convenience and appealing sensory properties. However, their high fat content, rich in saturated fatty acids (SFA) has raised nutritional concerns, as it contributes to increased LDL cholesterol and the risk of cardiovascular diseases [1]. Additionally, beef exhibits an unbalanced n-6/n-3 polyunsaturated fatty acid (PUFA) ratio, which may promote inflammation and the development of chronic diseases. In response, consumers are increasingly demanding healthier alternatives that retain the desirable qualities of traditional meat products. One innovative approach is the replacement of animal fat with oil-in-water hydrogel emulsions using vegetable oils [2] such as extra-virgin olive oil (EVOO), which is rich in monounsaturated fatty acids (MUFA), particularly oleic acid, and bioactive compounds like hydroxytyrosol and vitamin E.

In addition to healthy lipids, incorporating functional ingredients such as artichoke (*Cynara scolymus* L.) by-products has emerged as a promising strategy. These by-products, obtained from industrial processing, are rich in dietary fiber, especially inulin and pectins, and antioxidant compounds including phenolic acids and flavonoids [3]. While most of this fiber is insoluble, enzymatic treatments can increase its solubility, enhancing its health benefits and technological applications. Despite their potential, the use of artichoke by-products in meat products remains limited. Their high content of fiber and antioxidants makes them valuable ingredients for improving the nutritional and functional quality of reformulated meat products like beef burgers.

## OBJECTIVES

- Evaluate the effects of enzymatically treated and non-treated artichoke by-product extracts on beef burgers.
- Assess the impact of replacing 50% of animal fat with an extra-virgin olive oil (EVOO) emulsion.
- Analyze physicochemical, sensory properties, and oxidation stability during 3 days of refrigerated storage at 4 °C.

## MATERIALS & METHODS




## RESULTS

**Table 1.** Beef Burgers proximate composition (g/100g)

| | Burgers | | | |
|---|---|---|---|---|
| | CB | FRB | FRB-AE | FRB-TAE |
| Energy | 198.73 ± 6.72[a] | 169.07 ± 12.21[a] | 183.93 ± 5.01[a] | 165.72 ± 17.05[a] |
| Moisture | 62.46 ± 0.08 [a] | 66.43 ± 1.50 [a] | 63.84 ± 0.99 [a] | 65.13 ± 1.95 [a] |
| Ash | 2.46 ± 0.02 [b] | 2.70 ± 0.05 [ab] | 2.80 ± 0.05 [ab] | 2.90 ± 0.07 [a] |
| Fat | 12.16 ± 1.25 [a] | 9.59 ± 1.29 [ab] | 10.57 ± 0.25 [ab] | 7.99 ± 1.81 [b] |
| Protein | 19.14 ± 0.79 [a] | 18.50 ± 0.36 [ab] | 18.92 ± 0.24 [ab] | 17.54 ± 0.06 [b] |
| Carbohydrates | 2.98 ± 0.31 [a] | 1.32 ± 0.04 [a] | 1.91 ± 1.12 [a] | 4.52 ± 0.49 [a] |
| IDF | 0.74 ± 0.06 [a] | 1.39 ± 0.15 [a] | 1.85 ± 0.48 [a] | 1.77 ± 0.40 [a] |
| SDF | 0.08 ± 0.11 [a] | 0.07 ± 0.00 [a] | 0.16 ± 0.23 [a] | 0.23 ± 0.29 [a] |
| TDF | 0.81 ± 0.05 [b] | 1.46 ± 0.15 [a] | 1.87 ± 0.66 [a] | 1.93 ± 0.63 [a] |

a-b: Different letters within the same row indicate significant differences between samples ($p < 0.05$). CB: control patty; FRB: fat-substituted patty; FRB-AE: fat-substituted patty and artichoke extract; FRB-TAE: fat-substituted patty and treated artichoke extract; IDF: insoluble dietary fiber; SDF: soluble dietary fiber; TDF: total dietary fiber.

### Fat reduction and TDF improvement

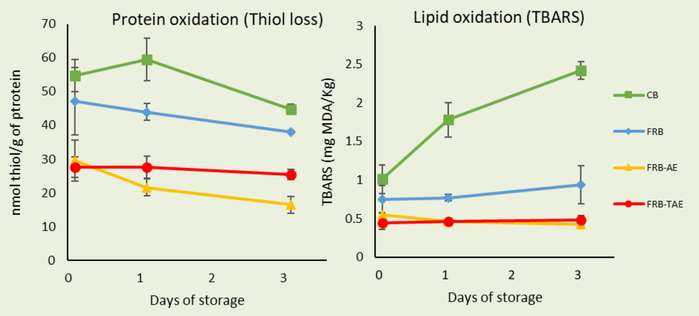



**Figure** 1. Protein and Lipid oxidation of beef burgers. CB: control burger; FRB: fat-replaced burger; FRB-AE: fat-replaced burger with artichoke extract; FRB-TAE: fat-replaced burger with treated artichoke extract.

### Inhibition of proteic and lipid oxidation

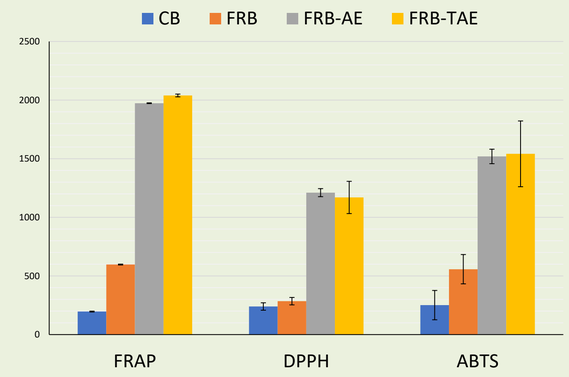



**Figure 2.** Antioxidant activity of beef burgers. CB: control burger; FRB: fat-replaced burger; FRB-AE: fat-replaced burger with artichoke extract; FRB-TAE: fat-replaced burger with treated artichoke extract.

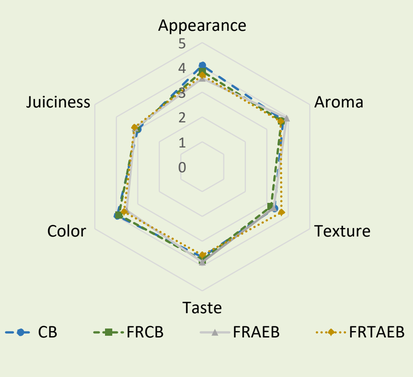



**Figure 3.** Sensory analysis of beef burgers. CB: control burger; FRB: fat-replaced burger; FRB-AE: fat-replaced burger with artichoke extract; FRB-TAE: fat-replaced burger with treated artichoke extract.

### Enhancement of antioxidant capacity and Good sensory Acceptability

## CONCLUSIONS

The findings highlighted the positive impact of incorporating artichoke by-products and partially substituting animal fat with an EVOO hydrogel. This approach led to enhanced nutritional value, extended shelf life, and improved antioxidant properties of beef burgers, all while preserving their sensory quality. These outcomes suggest that artichoke by-products could be effectively revalorized, offering promising potential as high-value functional ingredients within the meat industry.

## REFERENCES

[1] Bell, A.E.; Culp, P.A. Reduction in Saturated Fat Intake for Cardiovascular Disease. Am Fam Physician **2022**, 105, 19A-19C.
[2] Heck, R.T.; Saldaña, E.; Lorenzo, J.M.; Correa, L.P.; Fagundes, M.B.; Cichoski, A.J.; de Menezes, C.R.; Wagner, R.; Campagnol, P.C.B. Hydrogelled Emulsion from Chia and Linseed Oils: A Promising Strategy to Produce Low-Fat Burgers with a Healthier Lipid Profile. Meat Sci **2019**, 156, 174–182.
[3] Ayuso, P.; Quizhpe, J.; Rosell, M.d.l.Á.; Peñalver, R.; Nieto, G. Bioactive Compounds, Health Benefits and Food Applications of Artichoke (*Cynara scolymus* L.) and Artichoke By-Products: A Review. *Appl. Sci.* **2024**, *14*, 4940.

**Acknowledgements:** Artichoke by-products have been provided by Cricket Campo de Lorca S.C.L..
**Funding:** This study is part of the Agroalnext programme and has been supported by the MCIU with funding from the European Union Next Generation EU (PRTR-C17.I1) and by the Autonomous Community of the Region of Murcia-Fundación Seneca.