

# HELENA RODRIGUES



→ **Helena Rodrigues** is a PhD student at ESB-UCP and i3S-UP in the Biotechnology doctoral program, working in the food and health fields. She has a MSc in Applied Biochemistry-Biotechnology and a BSc in Biochemistry, both from the University of Minho. She has been involved in different projects including SerpaFlora, Mobfood and NEWFOOD and she has won a prize in the FoodValorization contest.

## A New Valorisation Approach of Porcine Blood Based on Enzymatic Hydrolysis and Membrane Technology: The Biological Potential of Resultant Hydrolysate as a Food Ingredient

Helena Araújo-Rodrigues<sup>a,\*</sup>, Miguel Pereira<sup>a</sup>, Carlos D. Pereira<sup>b</sup>, Manuela Pintado<sup>a,\*</sup>

<sup>a</sup>Centro de Biotecnologia e Química Fina -Laboratório Associado, Escola Superior de Biotecnologia, Universidade Católica Portuguesa/Porto, Rua Diogo Botelho, 1327, 4169-005 Porto, Portugal.

<sup>b</sup>Departamento de Ciência e Tecnologia Alimentar, Instituto Politécnico de Coimbra, Escola Superior Agrária, 3045-601 Coimbra, Portugal.

\*Corresponding author: ORCID iD - 0000-0001-8916-0956; e-mail - hrodrigues@porto.ucp.pt.

Blood is one of the main meat industry by-products, which possess an interesting nutritional value and components with potential as a functional ingredient<sup>1</sup>. In this study, a new valorisation approach based on enzymatic hydrolysis and membrane technology was developed. Swine blood was cooked and enzymatically hydrolysed with *Cynara cardunculus* L. After hydrolysis, the product was filtered and the liquid fraction was then submitted to microfiltration (MF), using a 0.2 µm pore size membrane. MF retentate (MFR) was subject to reverse osmosis (RO) and freeze-dried. Subsequently, MF filtrate (MFF) was submitted to a

nanofiltration (NF) 3 kDa cut-off membrane. Nanofiltration retentate fraction (NFR) was subjected to RO and freeze-dried. NF filtrate was resubmitted to a sequential step of NF (120 g mol<sup>-1</sup> cut-off membrane). The resultant retentate, NF filtrate (NFF) was also submitted to RO and lyophilized. The biological activities of MFR, NFR and NFF were investigated. The results suggested that MFR and NFR had approximately 90% of total protein, while NFF about 65% on a dry basis. Regarding the protein and peptide profile, all hydrolysates showed the peaks between 1200 and 14000 Da but NFF had a higher content of lower molecular size peptides. Additionally, the antioxidant capacity was evaluated by 2,2'-azino-bis(3-ethylbenzothiazoline-6-sulfonic acid) (ABTS) and oxygen-radical absorbance-capacity (ORAC) assays. NFF showed higher antioxidant activity, which was aligned with its peptide profile. The anti-hypertensive activity was also tested, and the results indicated that NFF showed a very good anti-hypertensive potential. Due to its biological properties, the NFF potential as a food functional ingredient was raised. NFF antimicrobial potential was also investigated however, no antimicrobial effect was registered for the pathogenic strains tested. Regarding the free amino acids and mineral profile, a high content of glutamic acid, leucine, alanine, phenylalanine and aspartic acid as well as phosphorus, magnesium, calcium, sodium and potassium was registered.

**Keywords:** Blood by-products; enzymatic hydrolysis; bioactive peptides; antioxidant and anti-hypertensive potential; food ingredient.