

In vitro pepsin digestion of protein-added yogurts and its relationship to their satiating ability



Morell, P^{a,b}; Llorca, E^a; Fiszman, S^b; Hernando, I^a

^a Food Microstructure and Chemistry Research Group, Universitat Politècnica de València, Camino de Vera, s/n, 46022, Valencia (Spain)

^b Instituto de Agroquímica y Tecnología de Alimentos (IATA-CSIC). C/ Agustín Escardino 7, 46980, Paterna, Valencia (Spain)

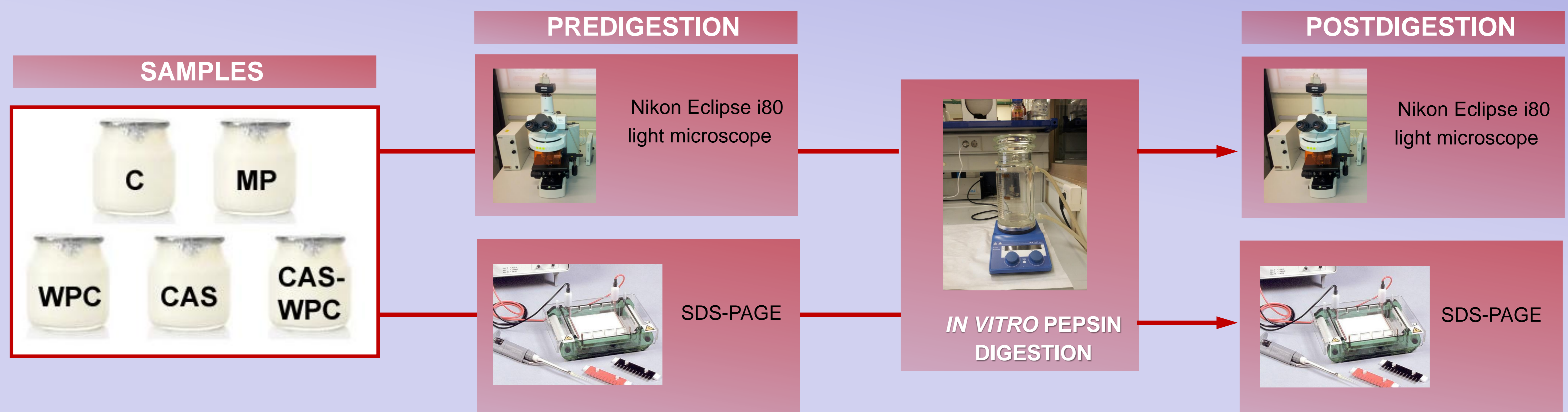


INTRODUCTION

Yogurt is one of the most popular dairy products; it contains high levels of protein, which is recognized as the macronutrient with the highest satiating capacity. In this context, yogurt can be an excellent basis for designing satiating food products. According to the speed at which amino acids are released to the bloodstream, whey protein is classified as a fast protein and casein as a slow one; this concept can be applied to distinguish foods with different effect on satiety or satiation.

MATERIAL AND METHODS

Five different set-type yogurts were formulated by adding: extra skimmed milk powder (MP), whey protein concentrate (WPC), calcium caseinate (CAS) or blend (50:50) of whey protein concentrate with calcium caseinate (CAS-WPC). A control yogurt was elaborated without addition of protein (C). To simulate gastric digestion, an adaptation of an *in vitro* pepsin digestion model was used. Electrophoresis (SDS-PAGE) and microstructure (light microscopy, LM) were analyzed before and after *in vitro* gastric digestion (0, 30, 60 and 120 min).



RESULTS AND DISCUSSION

Before *in vitro* digestion, LM images showed a network formed by milk proteins in all the samples (Fig.1). However, samples WPC and CAS-WPC showed a second thinner network corresponding to the added whey proteins. Sample CAS showed darker areas corresponding to caseinate network. After *in vitro* digestion, a slight protein aggregation was observed, and the network appearance was lost. The network composed by whey protein was digested faster than the caseinate one.

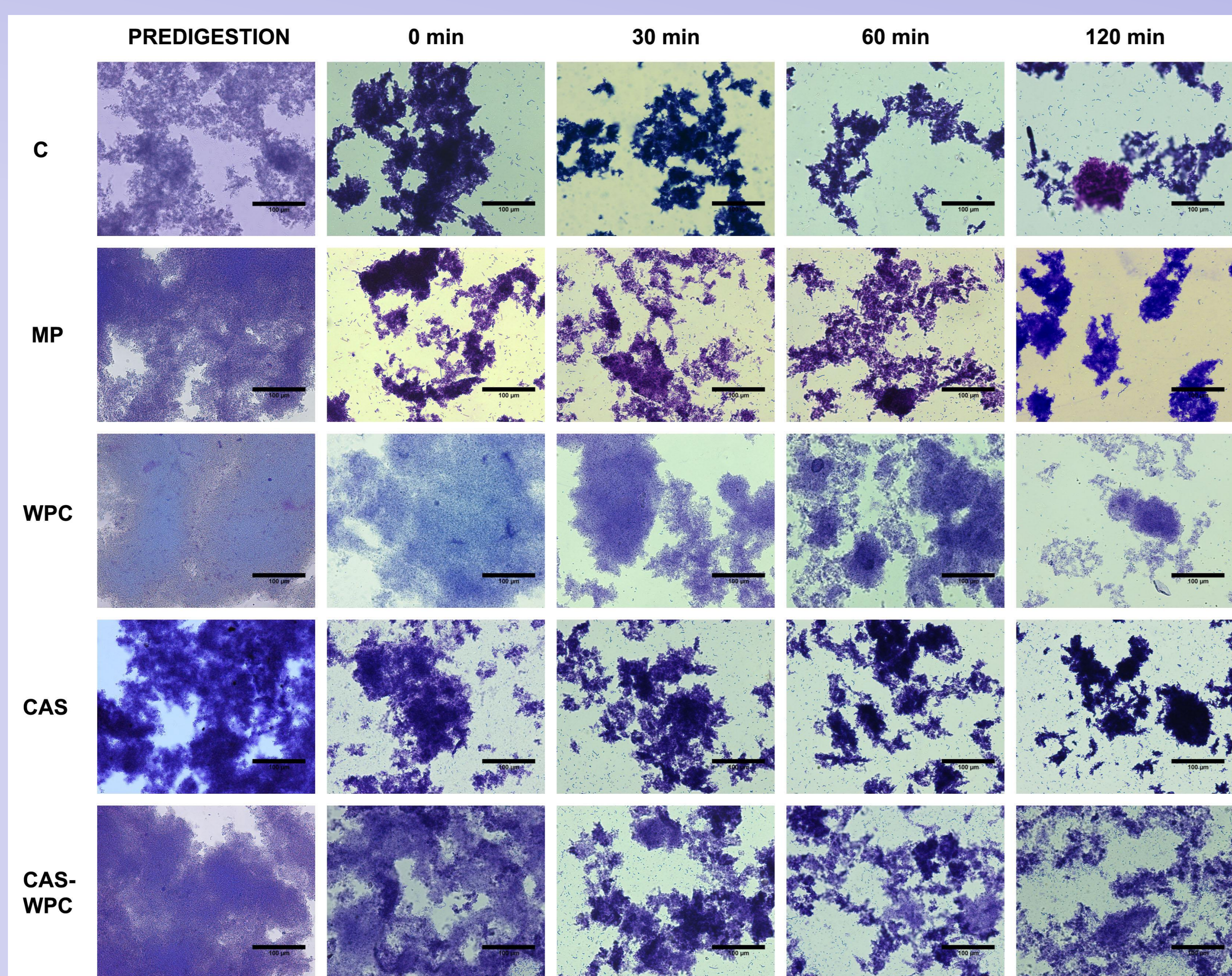


Figure 1. Light microscopy. Micrographs of the yogurts before and after *in vitro* pepsin digestion. Toluidine blue staining. Magnification: 10x.

Electrophoresis gel showed that sample WPC was digested after 60 min whereas CAS was digested after 120 min (Fig. 2). These results were correlated with microstructure and “fast and slow proteins” concept.

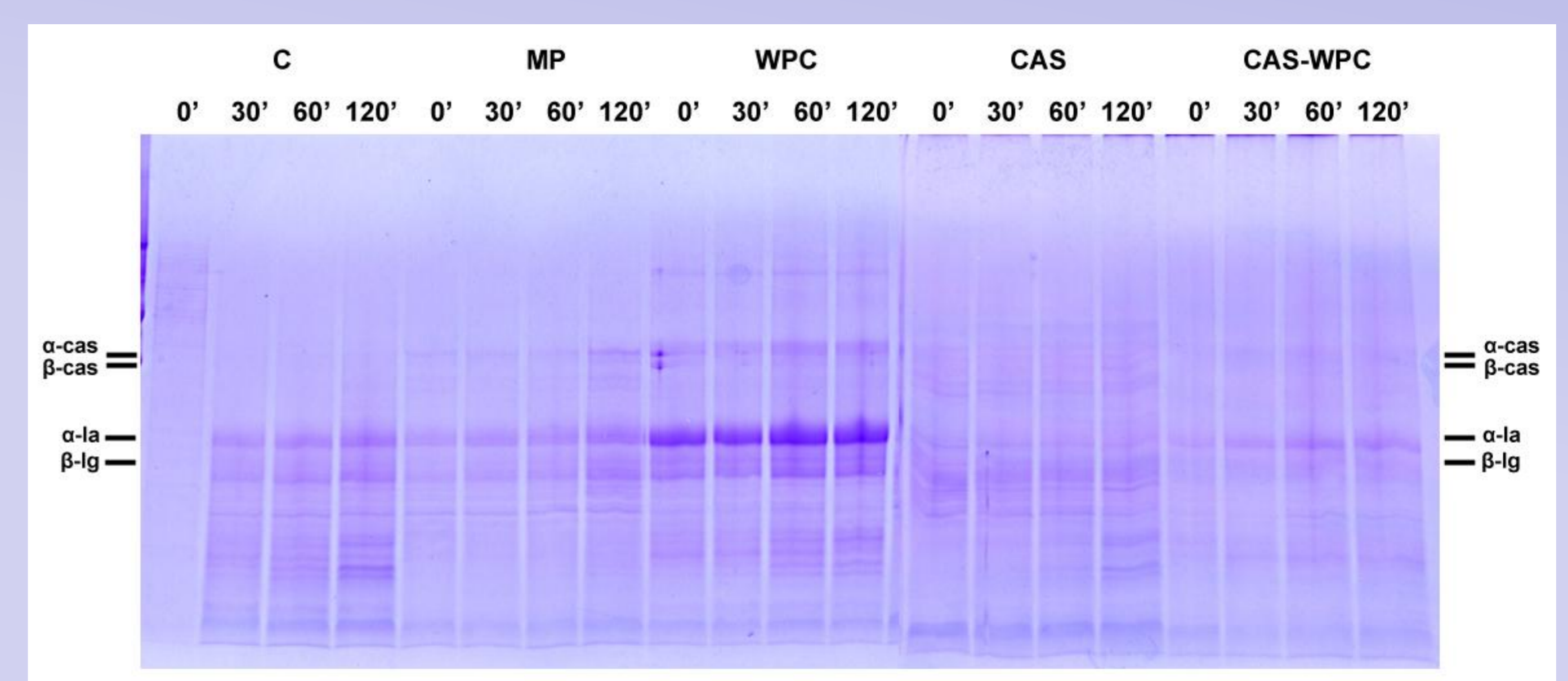


Figure 2. SDS-PAGE analysis of the yogurts during *in vitro* pepsin digestion.

CONCLUSION

This application of the digestion protein kinetics could open new pathways to design satiating products.

ACKNOWLEDGEMENTS

The authors wish to thank the financial support of Spanish Ministry of Economy and Competitiveness (AGL2012-36753-C02) and gratefully acknowledge the financial support of EU FEDER funds.