# Synergistic stabilisation of emulsions by blends of dairy and plant proteins: Contribution of the interfacial composition

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In the food industry, dairy proteins are often used to formulate emulsions. These animal-derived proteins have a high environmental impact and therefore there is a drive to replace them by plant proteins. It is challenging to fully replace dairy proteins by plant proteins in food emulsions, as this will affect the physicochemical stability of the emulsions and the final product quality (e.g., nutritional value and taste). Alternatively, a blend of dairy and plant proteins can be used to improve sustainability, while not compromising on functionality and product quality.

In the present project, the use of blends of pea protein isolate (PPI) with whey protein isolate (WPI) or sodium caseinate (SC) to physically stabilise emulsions has been investigated. Emulsion stability, surface load and interfacial compositions were determined and compared to those of individual protein-stabilised emulsions. The $d_{3,2}$ and surface load measured over a concentration range (0.2-1.6 wt.% protein) were the lowest for SC- and WPI-stabilised emulsions, and the highest for PPI-stabilised emulsions, whereas emulsions stabilised by the blends (1:1 ratio) had intermediate $d_{3,2}$ values and surface loads. Although individual PPI and SC-stabilised emulsions showed some physical destabilisation over 14 days of storage, the WPI-PPI or SC-PPI blends formed stable emulsion systems, suggesting synergistic effects. In the case of the blends, both dairy proteins and plant protein adsorbed at the oil-water interface, but compositional rearrangements at the interface were noticed over three days. More specifically, whey proteins were able to displace pea proteins from the interface, which were themselves able to displace SC. However, such a displacement was possible only when the displacing protein was present in sufficient amount in the system. These effects are important to understand the stabilisation mechanisms of protein blend-stabilised emulsions, and to propose design rules for related applications.

Keywords: Interfacial displacement, protein mixtures, dairy protein, plant protein, emulsion stability, SDS-PAGE

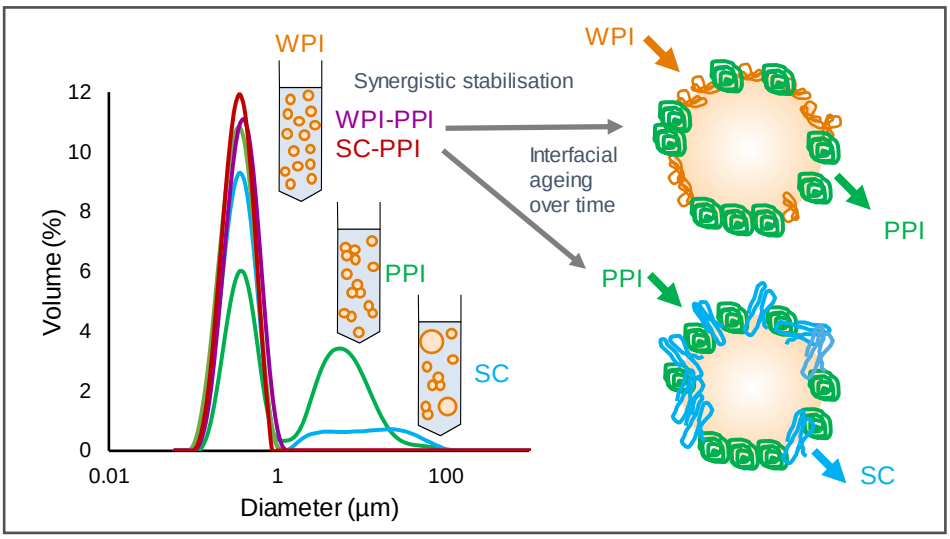


***Figure X: Graphical abstract***