

# The stability and sensory characteristics of fish oil-milkfat solid lipid particles in yoghurt

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Blending fish oil, which has a high percentage of long chain poly-unsaturated fatty acids, with milkfat with a high percentage of saturated fatty acids, could result in a product with desirable characteristics from both components: increased omega-3 fatty acids and melting point, as well as improved taste and odour [1,2]. The resulted blend in the form of solid lipid particles (SLP) can then be incorporated to fortify dairy products such as yoghurt.

## Methods

To investigate this possibility, SLPs of fish oil and milk fat with the ratio of 50:50 were produced and added to plain Greek style yoghurt. The fatty acid distribution of the particles, as well as texture, viscosity, and sensory characteristics of the fortified yoghurt were analysed.

## Fatty acid distribution throughout SLP

Confocal Raman Spectroscopy of SLPs showed that the distribution of saturated and unsaturated fatty acids was not uniform. A 10 μm outermost layer of predominantly saturated fatty acids was identified, which was attributed to maintaining the intact shape of SLPs at 30°C (Figure 1).

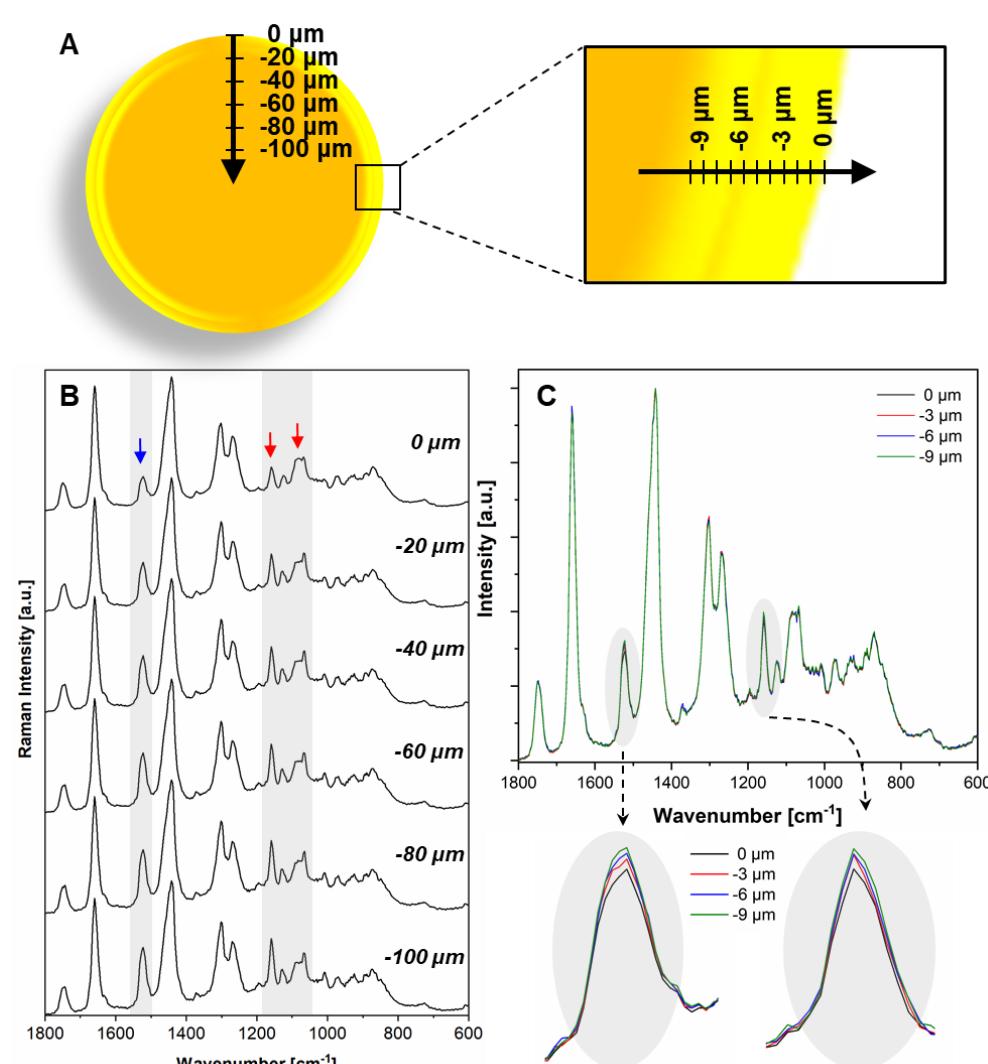


Figure 1: The schematic position of each layer in particles (A), the difference in Raman intensity at layers 0 to -100 μm of particle with milkfat: fish oil ratio of 50:50 (B), the Raman intensity at layers 0 to 9 μm of particle with milkfat: fish oil ratio of 50:50 (C).

## Sensory result of SLP

Sensory evaluation was conducted to investigate the effectiveness of milkfat to mask the fishy flavour and odour when added into plain Greek yoghurt. A summary of the scores obtained from sensory analyses are shown in Figure 2.

- With respect to smell and taste, the yoghurt sample blended directly with fish oil had the lowest score.
- Likewise, the taste score of Plain yoghurt was similar to that of yoghurt with SLP5:5, clearly demonstrating that the flavours of the fish oil could be effectively masked by SLP5:5, because of the presence of milkfat.

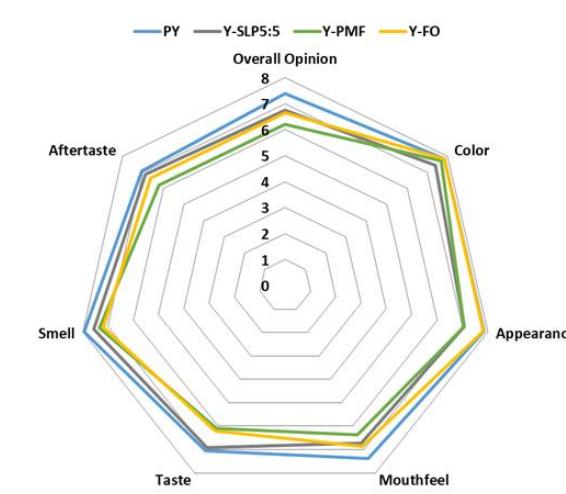


Figure 2: Sensory analysis scores for colour, appearance, mouthfeel, taste, smell, after taste and overall opinion of plain yoghurt (PY), yoghurt with particles of milkfat: fish oil ratio of 5:5 (Y-SLP5:5), yoghurt with particles of milkfat (Y-PMF) and yoghurt with fish oil (Y-FO).

## Texture and Viscosity analysis

The overall result of analyzing viscosity and texture of yoghurt containing SLP and fish oil indicated that adding SLPs did not significantly affect the viscosity and texture profile of the yoghurt matrix (Figure 3).

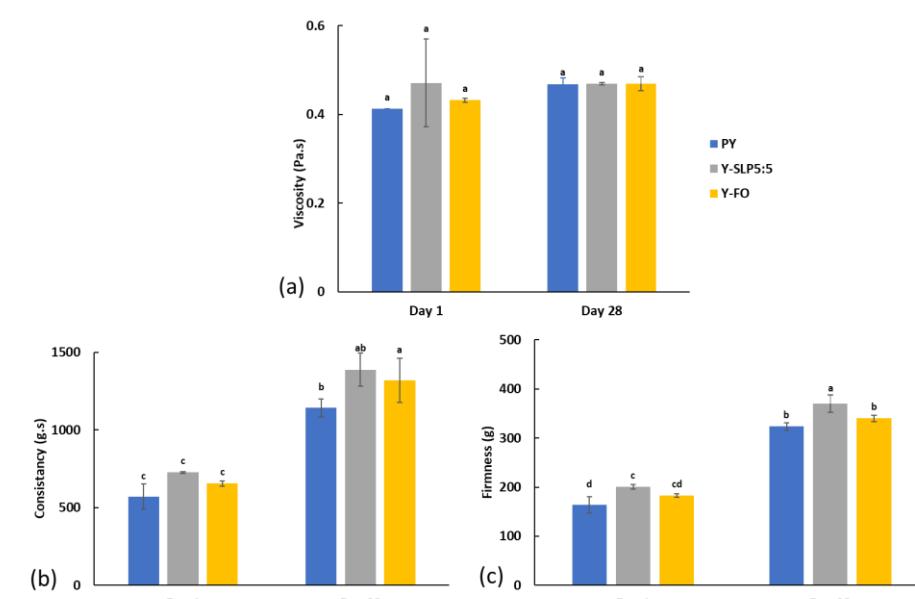


Figure 3: The viscosity (a), consistency (b) and firmness (c) in PY, Y-SLP5:5 and Y-FO, at day 1 and 28 of storage at 4°C. Means ± SD (standard deviation, shown by the error bars) with the same lowercase letters in each figure are not significantly different at p<0.05.

## Conclusion

The result showed saturated fatty acids of milkfat can entrap fish oil in the form of solid lipid particles. The addition of milkfat successfully reduced the fishy taste and smell when the SLPs were incorporated into yoghurt matrix without any detectable changes in viscosity, and texture.

The findings from this study could be used to direct a strategy to reduce undesirable characteristics of active ingredients using milkfat when added into a variety of dairy products.



## Reference:

1: Li, B.Z., Truong, T., & Bhandari, B. (2017). Crystallization and melting properties of mixtures of milk fat stearin and omega-3 rich oils. *Food Chemistry*, 218, 199-206.

2: Jamshidi, A., Shabani, B., Pourashouri, P., & Raeisi, M. (2018). Using WPC-inulin-fucoidan complexes for encapsulation of fish protein hydrolysate and fish oil in W1/O/W2 emulsion: Characterization and nutritional quality. *Food Research International*, 114, 240-250.

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