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Gelling properties of hake muscle with addition of freeze-thawed and freeze-dried soy phosphatidylcholine liposomes protected with trehalose

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PII: S0023-6438(18)30670-4

DOI: [10.1016/j.lwt.2018.08.018](https://doi.org/10.1016/j.lwt.2018.08.018)

Reference: YFSTL 7330

To appear in: *LWT - Food Science and Technology*

Received Date: 6 March 2018

Revised Date: 5 August 2018

Accepted Date: 8 August 2018

Please cite this article as: Marín-Peñalver, D., Alemán, A., Montero, P., Gómez-Guillén, M.C., Gelling properties of hake muscle with addition of freeze-thawed and freeze-dried soy phosphatidylcholine liposomes protected with trehalose, *LWT - Food Science and Technology* (2018), doi: 10.1016/j.lwt.2018.08.018.

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1       **Gelling properties of hake muscle with addition of freeze-thawed and freeze-dried soy**  
2                               **phosphatidylcholine liposomes protected with trehalose**

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8       ICTAN-CSIC has implemented and maintains a Quality Management System which fulfils the  
9       requirements of ISO standard 9001:2015.

10       **Abstract**

11       Soy phosphatidylcholine liposomes made with addition of trehalose as cryoprotectant were  
12       subjected to freeze-thawing and freeze-drying treatments, and subsequently incorporated in  
13       salt-ground hake (*M. merluccius*) muscle to study their effects on protein aggregation, water  
14       binding and thermal gelation. Both liposomal preparations presented similar particle size ( $\approx 215$   
15       nm, expressed as z-average) and strong electronegative zeta potential ( $-46$  mV). The addition  
16       of both types of liposomal preparations led to more water trapped within the myofibrillar  
17       protein in the salt-ground muscle, as observed by water holding capacity (WHC) and low field  
18       nuclear magnetic resonance (LF-NMR). However, the liposomes interfered strongly with the  
19       thermal gelation ability of the muscle protein. Differential scanning calorimetry (DSC) analysis  
20       of the salt-ground muscle showed that the liposomes caused an increase in the main transition  
21       temperature associated with the actin molecule, with a concomitant reduction in total  
22       enthalpy change. The hydration state of the trehalose-containing liposomes did not play a  
23       significant role in textural properties of the resulting gels. The detrimental role of liposomes in  
24       the texture of fish gels should be considered in the design of functional fish products.

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