

# **Crystallization Inhibitory Effect for Crystallization of Phytosterol in O/W Emulsion Droplets**

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## **Experiment background and purpose**

Functional lipids, such as carotenoids, lipid soluble vitamins, phytosterols, and numerous other substances, are widely used as active ingredients in various food products. However, because of the low solubility of functional lipids against water and oil, they could not be absorbed well in body .Functional lipids are absorbed through a small intestine. First, they are taken into bile acid micelle, and then they are absorbed inside of the body through a small intestinal epithelial cell. However, if functional lipids are transferred to a small intestine as crystals, they could neither be dissolved into bile acid micelle, nor be absorbed in body. Therefore, we attempt to improve bioabsorbable property, by dissolving functional lipids in the oil droplet of o/w emulsions, and controlling crystallization. In this study, we studied the effect of the types of emulsifier and emulsion droplet diameter on the crystallization of  $\beta$ -sitosterol in oil droplet of o/w emulsion.

## **Experimental method**

$\beta$ -sitosterol was dissolved in medium chain triacylglycerol oil phase of O/W emulsion. The emulsifiers we applied which consisted of polyglyceryl or Polyoxyethylene sorbitan fatty acid ester as a hydrophilic group, and of lauric acid, stearic acid or oleic acid as hydrophobic group (10G1L, 10G1S, 10G1O, Tween20, Tween60, Tween80).Emulsion droplets having the diameter of 3  $\mu$ m and 500 nm were prepared by homogenizer and high-pressure emulsifiers , then stored at 5°C. We examined whether crystallization occurred or not by using synchrotron X-ray diffractometer.

## **Experimental result**

The crystallization inhibitory effect for particle diameter 500 nm is higher than the case of 3  $\mu$ m. The small particle diameter made decrease the number of impurities contained in one oil droplet, and then crystallization was inhibited. The difference of crystallization inhibitory effect also depended on the type of emulsifiers. The crystallization inhibitory effect was higher in order of 10G1L > Tween60 > 10G1O, 10G1S, Teen20 > Tween80. This result implies that the size of hydrophilic group, unsaturated fatty acid, fatty acid chain length of the hydrophobic group related to the order of easy to crystallization.