CHAPTER 3

RESEARCH BRIEFING

This research is divided into two main parts.

Part 1: Chemical Transesterification of Tuna Oil

In this part, the fatty acid composition of tuna oil was chemically transesterification to enrich n-3 fatty acid, primarily EPA and DHA, using sodium methoxide ($NaOCH_3$) as catalyst. The effect of reaction time and temperature, catalyst concentration and reactants mole ratio on transesterification were studied by monitoring of lipid and fatty acid composition of tuna oil. The production of enriched n-3 fatty acid tuna oil was done only in laboratory scale (Chapter 4).

Part 2: Production of Microencapsulated Tuna Oil

The production of microencapsulated oil, by spray-drying, needs to have a large amount of oil. Therefore, the preparation of tuna oil enriched n-3 fatty acid need to be scaled up to obtain sufficient amount to produce the microencapsulated enriched tuna oil. Due to the limitation of time and lack of raw material (tuna oil and n-3 FAME), the experiment was carried out using only degummed, bleached and deodorized tuna oil instead of enriched tuna oil.

2.1 Study of Physicochemical and Oxidative Stability of Tuna Oil-in-Water Emulsion

For production of microencapsulated tuna oil by spray-drying, tuna oil is usually homogenized to form oil-in-water emulsion and the liquid emulsions are then dried. Because a stable liquid emulsions is critical for microencapsulation of oil. Therefore, the effect of environmental stresses such as pH, ionic strength, thermal treatment, freeze-thaw cycling and freeze drying on stability of tuna oil emulsions were examined (Chapter 5). Due to long-

chain fatty acids in tuna oil are highly susceptible to oxidation. Thus, the storage time and temperature and the ability of antioxidants on oxidative stability of liquid tuna oil emulsion were also studied by measuring of lipid hydroperoxides and TBARS (Chapter 6).

2.2 Production and Study of Storage Stability of Spray Dried Tuna Oil Emulsion

Spray drying is the most popular technique to prepare microcapsulted oils. However, the drying rate and drying temperature might be affected the properties of microcapsule powders. So, the impact of spray drying of tuna oil emulsion on the structure and quality of microencapsulated tuna oil was examined (Chapter 7). The physical and chemical properties of food powders, e.g. caking, stickiness, dispersibility, solubility and formation of maillard reaction products, can dramatically change upon storage and influence quality depending on temperature and moisture. Therefore, the effect of storage environments on dispesibility, color changing and oxidative stability of spray dried microencapsulated tuna oil was studied (Chapter 8).