CHAPTER 1

INTRODUCTION

Probiotics are live microorganisms which when administered in adequate amounts confer a health benefit on the host (FAO and WHO, 2002). The health benefits have been claimed for probiotic bacteria such as antimicrobial activity and gastrointestinal infections, improvement in lactose metabolism, antimutagenic properties, anticarcinogenic properties, reduction in serum cholesterol, anti-diarrhea properties, immune system stimulation, improvement in inflammatory bowel diseases and suppression of *Helicobacter pilori* infection (Shah, 2007).

Today, most probiotic strains are used in yogurts, fermentation milks, ice cream, bakery and pharmaceutical products for their anecdotal health effect. The research for development of food products with probiotics also continues to grow. For example, the possibility of adding probiotics to chocolate mousse, sushi, sandwich, cold smoothie, burger and condiments were studied (Casale and Rodgers, 2007).

High levels of viable microorganisms are recommended in probiotic foods for efficacy (Knorr, 1998). Technological challenges associated with the introduction and maintenance of high numbers of probiotic microorganisms in foods include the form of the probiotic inoculant, viability and maintenance of probiotic characteristics in the food product through to the time of consumption. The consumption of probiotics at a level of 10^8-10^9 cfu/g per day is a commonly quoted figure for adequate probiotic consumption, equating to 100 g of a food product with 10^6-10^7 cfu/g (Kebary, 1996; Lee and Salminen, 1996; Dave and Shah, 1997).

Spray drying has been used as a method of preservation of microbial cultures, including the probiotic *Lactobacillus paracasei* NFBC 338 (Gardiner *et al.*, 2000). The availability of spray-dried powders harboring high numbers of viable probiotic microorganisms is desirable for commercial applications, enabling convenient storage and transport of these cultures and their subsequent application in functional food development.

A higher survival rate of bacteria can be achieved when using a lower outlet temperature, such as at 60°C. Kim *et al.* (1990) had reported that if the outlet temperature of spray dryer during drying is less than 100°C, bacteria can have a chance to survive during a drying process. Beside that, the survival of a bacterium during a drying process is also affected by the type of food.

Because of the advantages of spray drying, the aim of the this study is to investigate spray drying as a method for pilot-scale production of dairy-based powders containing probiotic *Lactobacillus* cultures.

Objectives of this research

1. To study the optimal air outlet temperatures of spray drier that produces the highest survival rate of *L. casei* sub.sp. *paracasei* F-19, *Lactobacillus plantarum* V299 and *L. fermentum* 2311M in skim milk solution.
2. To study on survival rate and moisture content of *L. casei* sub.sp. *paracasei* F-19, *Lactobacillus plantarum* V299 and *L. fermentum* 2311M in skim milk solution for spray drying.
3. To study on survival rate and moisture content of *L. casei* sub.sp. *paracasei* F-19, *Lactobacillus plantarum* V299 and *L. fermentum* 2311M in whipping cream for spray drying.
4. To monitor packaging material to keep probiotic added skim milk and whipping cream powder during storage at different storage temperatures.