CHAPTER I

INTRODUCTION

For several years, many evidences have shown that the level of *trans* fatty acids (TFA) intake was directly associated with increased risk of cardiovascular disease (Tavella et al., 2000). Therefore, many countries have mandated the declaration of the *TFA* content on the nutrition labels for all conventional foods and supplements. In addition, some countries have regulated the sale of foods containing TFA.

Trans fatty acids are unsaturated fatty acids containing at least one double bond in the *trans* configuration; carbon chains on the opposite side of a double-bond. The double bond has straight chain that was similar to the structure of saturated fatty acid. These fatty acids are found in two major sources, natural and industrial sources. In natural source, *trans* fats originate from milk fat and tissue fat of ruminants such as cows, goat and sheep. Bacteria in their stomach can be producing TFA by biological hydrogenation process. Industrial TFA are mainly generated from vegetable oil polyunsaturated fatty acids, either during partial hydrogenation or during refining (Pfeuffer and Schrezenmeir, 2006).

Trans fatty acids are found in various animal products and in partially hydrogenated oils and foods made with such partially hydrogenated oils, therefore people may take the risk of cardiovascular disease. Consumption of these fats results in increasing the level of serum low density lipoprotein cholesterol and triglyceride and decreasing the level of high density lipoprotein cholesterol (Mozaffarian et al., 2006; Lichtenstein et al., 2001 ; Dyerberg et al., 2006). In addition, TFA also promote systemic inflammatory responses in healthy persons (Mozaffarian et al., 2004). Moreover, TFA may affect human fetal growth and infant development (Larque´ et al., 2001 ; Kummerow et al., 2004 ; Decsi et al., 2001).

Since *trans* fats consumption produces specific health problems especially in elevating risk of coronary heart disease. So, this consumption of such TFA in population was considered by dietitians. Many kind of foods were collected to determine the level of TFA content in some countries such as Argentina, USA, Costa Rica, Austria, New Zealand, etc (Tavella et al., 2000; Albers et al., 2008; Baylin et al.,

2007; Wagner et al., 2008; Saunders et al., 2008). The two common identification methods for total TFA detection in food are based on gas chromatography (GC) and infrared spectroscopy (IR) (AOAC, 2000).

During gas chromatographic (GC) analysis fatty acid in samples need to be converted into its corresponding volatile methyl esters prior to separation in a very long capillary columns (100 m) which coated with highly polar stationary phases. However GC analysis time can take up to 1.5 hours injection. Another major drawback of the GC analysis is the overlapping of sample peaks, such problem can be solved by prior fractionation of sample of *cis* and *trans* isomers with silver-ion thin layer chromatography (Ag-TLC), silver-ion solid phase extraction (Ag-SPE) or reversed phase high performance liquid chromatography (HPLC). In addition, lack of standards chemical of all *trans* fatty acid isomers is also problematic to GC analysis, while the excessive processing during partial hydrogenation, heating and oxidation may leads to the formation of many *trans* containing fatty acid isomers (Milosevic et al., 2004; Destaillats et al., 2007). Therefore, GC method may not be the most appropriate choice for routine determination of TFA in labeling purposes.

Another alternative method, infrared spectroscopy (IR) is specific and rapid analytical method for the determination of total TFA. The quantitative of total TFA by IR method is base on the C-H out-of-plane deformation band observed at wave number 966 cm^{-1}, which is uniquely characteristic of isolated *trans* double bonds, regardless of the chain length or the position of the isolated *trans* double bond (Mossoba et al., 2007).

The purpose of this study was to determine the TFA content in various kinds of bakery products and partially hydrogenated vegetable oils which produced and distributed in Thailand during September 2007 and February 2008. The results can be applied to decide the measure or regulate for controlling the amounts of TFA in these kinds of foods in Thailand. Additionally, for labeling purposes, the study intends to propose the IR method as fast in routine TFA determination instead of slow the GC technique which currently use in Thailand.