UNIVERSITI TEKNOLOGI MARA

DEVELOPMENT OF STABLE GAMMA LINOLENIC ACID (GLA) NANOEMULSIONS

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ABSTRACT

Gamma linolenic acid (GLA) is an essential polyunsaturated omega-6 fatty acid that can be found in certain plant oils such as evening primrose oils, black currant seed oils and borage oils. It is a poorly-water soluble drug that is effective in prevention and treatment of various health problems including for topical application onto the skin. The purpose of this study was to develop a stable GLA nanoemulsion with an acceptable particle size range as well as a good particle size distribution. In this study, several formulations of GLA nanoemulsion were prepared and analysed. GLA was used as the main active ingredient and also as the oil phase, Cremophor® EL and Tween 80 as the surfactant, ethanol as the co-surfactant and distilled water as the aqueous phase. Composition of nanoemulsion systems was optimised by using different types and concentrations of GLA and distilled water, and with or without the addition of co-surfactant. Eight nanoemulsion formulations were prepared, of which composed of GLA oil, Cremophor® EL, with or without addition of Tween 80 or ethanol, and distilled water were made up to 100 %. Particle sizes of the nanoemulsion and stability analysis were done to characterize the nanoemulsions. The result showed that three out of eight formulations developed good characteristics of nanoemulsions. These results indicated that incorporation of appropriate combination of types, quantity and concentrations of surfactant as well as co-surfactant can enhance the stability, particle size range and particle size distribution of GLA nanoemulsions.

CHAPTER 1

INTRODUCTION

1.1 Background of Study

Essential fatty acids (EFAs) refer to those polyunsaturated fatty acids that are needed by humans' bodies for proper health but unfortunately our bodies unable to manufacture or synthesize them. EFAs can be divided into two main families which are Omega-3 and Omega-6 fatty acids that are also known as linoleic acids (LA) and alpha linolenic acids (ALA) respectively.

Gamma linolenic acid (GLA, 18:3 n-6) is an essential polyunsaturated omega-6 fatty acid that can be found in certain plant oils such as evening primrose oils, black currant seed oils, and borage oils. It is converted from a starting material, the parent of essential omega-6 fatty acid which is linoleic acid (LA). This reaction is catalysed by an enzyme called delta-6-desaturase (D6D) (Q. Chen et al., 2011). GLA is also one of the EFA that is required for humans but the body is unable to synthesize it. Therefore, it must be ingested as part of everyday diets such as milk, meat and egg yolks. In addition, GLA can be converted to dihomo-gamma linolenic acid (DGLA),