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THE EFFECT OF SURFACTANT HLB ON THE SELF-EMULSIFYING EFFICIENCY OF NON-IONIC SURFACTANT-VEGETABLE OIL MIXTURES

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Self-emulsifying drug delivery systems (SEDDSs) formulated in soft gelatin capsules are potentially useful for the administration of lipophilic drugs by the oral route (Pouton, 1985).

This work describes the effect of temperature, surfactant concentration and ethoxy content on the efficiency of self-emulsification for mixtures of a medium chain triglyceride oil, (Miglyol 812) and ethoxylated glyceryl trioleate. Four surfactants with mean contents of 20, 22, 25 and 27 ethoxy groups per molecule (GT-20E, GT-22E, GT-25E and GT-27E) were used as supplied by Th. Goldschmidt AG. Standard conditions of self-emulsification at constant temperature involved adding 10ul of SEDDS to 25ml of water in a 40ml glass vessel, rocked through 2.5cm at 40 oscillations per minute, for 10 minutes. The resultant emulsions were examined using a photon correlation spectrometer (Coulter N4 sub-micron particle size analyser). Figure 1 shows data for systems containing 30% surfactant self-emulsified at 35°C. In this case the minimum mean emulsion droplet diameter (MEDD) was obtained using GT-22E. For the temperature range 20°C to 50°C and surfactant concentrations from 25 to 70% w/w GT-22E or GT-25E (HLB 10.5 and 11.0 respectively) formed the most efficient SEDDSs. MEDD - surfactant concentration profiles exhibited minima (Figure 2). The surfactant concentration at which this minimum occured was lower for GT-25E (59.3±3.0nm) than GT-22E (159.6±8.1nm). The surfactant concentration at which this minimum occurred was lower for the more hydrophobic surfactant. This suggests GT-25E in combination with Miglyol 812 exhibits the optimum self-emulsifying behaviour. Our studies have shown that slight changes in the ethoxy content of these surfactants can have profound effects on the efficiency of self-emulsification. We believe that the explanation for this sensitivity lies in the ability of each system to form a specific lamellar liquid crystalline dispersion phase on exposure to water. Equilibrium phase studies have shown the formation of such liquid crystals to be highly dependent on temperature, surfactant HLB and concentration (Shinoda & Friberg 1978).

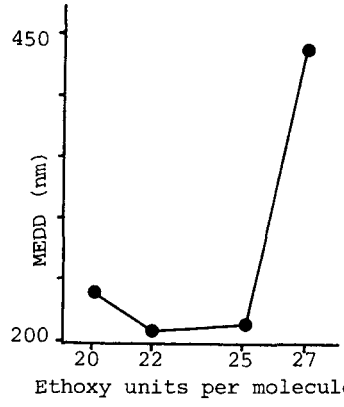

Fig.1. Effect of nominal ethoxy content of surfactant on mean emulsion droplet diameter (MEDD)

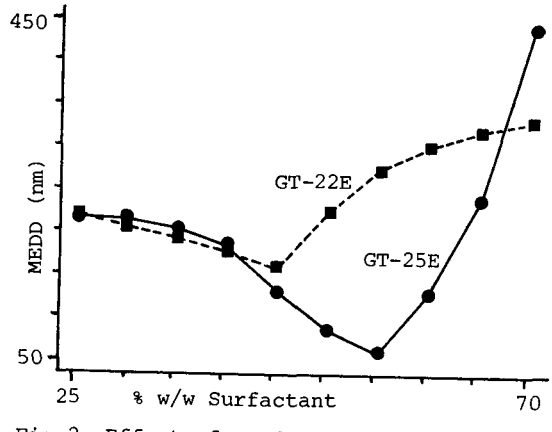

Fig.2. Effect of surfactant concentration on mean emulsion droplet diameter (MEDD) for surfactants GT-22E and GT-25E.

Pouton, C.W. (1985) Int.J.Pharmaceutics 27: 335-348
Shinoda, K., Friberg, S. (1975) Adv.Colloid Interface Sci. 4: 281-300