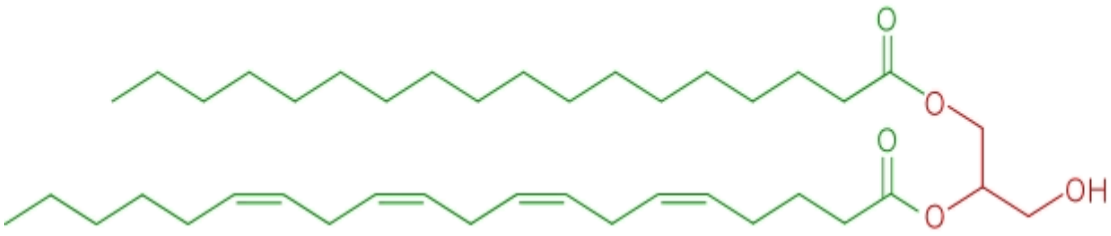
Generally, the nanoparticles adopt irregular shapes within the dispersion phase that may cause an increment in its aggregation diameters. Thus, SCOS combination has been added in order to achieve more symmetrical shape for the insulin-loaded chitosan nanoparticles, to decrease the particle size of the microspheres and to improve the bioavailability by various mechanisms including improved drug dissolution, increased intestinal epithelial permeability (Elsayed et al., 2011; DeRosa et al., 2000).

In spite of numerous advantages of microemulsion, a high content of surfactant that can lead to interfacial tension; the co-surfactant is used to lower the interfacial tension because a low interfacial tension is essential for producing microemulsions (Lovelyn & Attama, 2011). Labrasol® as a surfactant and Plurol® Oleique as a cosurfactant were proposed to be used in the formulation of oily-based system for oral delivery of insulin in this study.

Based on previous researches, diacylglycerol (DAG) is defined as is a simple lipid consisting of a glycerol molecule linked through ester bonds to two fatty acids (Figure 1.6) (Carrasco & Mérida, 2007).



(Figure 1.6): Chemical structure of DAG.