TPGS/Poloxamer 407 Nano-Micelle Enhanced the Cytotoxicity of Luteolin on Breast Cancer Cell Line

Muhammad Redza Fahmi Mod Razif[1,*], Kai Bin Liew[1], Shairyzah Ahmad Hisham[1], Shamima Abdul Rahman[1], Siok Yee Chan[2], Riyanto Teguh Widodo[3], Yik Ling Chew[4], and Masriana Hassan[5]
[1]*University of Cyberjaya, 63000 Cyberjaya, Selangor, Malaysia*
[2]*Universiti Sains Malaysia, 11800 Gelugor, Penang, Malaysia*
[3]*University Malaya, 50603 Kuala Lumpur, Malaysia*
[4]*UCSI University, 56000 Cheras, Kuala Lumpur, Malaysia*
[5]*Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia*
**Presenter email: redza.razif@gmail.com*

Abstract. Luteolin (Lut) is a flavonoid compound that has been studied widely for its various anti-cancer properties and sensitization of MDR cells. However, Lut limited solubility and bioavailability has rendered its potential and clinical use. The combination of this compound with vitamin E TPGS (TPGS) and poloxamer 407 (Pol) can produce a synergistic effect to enhance tumor apoptosis and P-glycoprotein inhibition. This study serves to develop an optimized micelle and investigate the efficacy of luteolin encapsulated in TPGS/Pol micelle in killing breast cancer cell lines. The micelle was prepared by using film hydration method and the micellar solution was lyophilized and the cake formed was analyzed. The encapsulation efficiency was measured by using UV-spectrophotometer and the micellar size was measured using dynamic light scattering technique. The cytotoxicity of the micellar powder and free luteolin was measured by using 3-(4,5-Dimethylthiazol-2-yl)-2,5-Diphenyltetrazolium Bromide (MTT) assay and breast cancer cell lines MCF_{-7} and $MDA\text{-}MB_{-231}$ were used. The optimized micelle was identified to have more than 90% EE with particle size less than 40nm, in which it came from 10% concentration of surfactants with the ratio of TPGS/Pol: 3:1. Cytotoxic assay showed enhanced killing of luteolin when encapsulated with TPGS/Pol micelle on both MCF_{-7} and $MDA\text{-}MB_{-231}$, compared to free luteolin and blank micelle. This study has proved that encapsulating hydrophobic drugs with micelle not only increased the solubility but also increased efficacy in killing breast cancer cells.

Keywords: Breast cancer, Cytotoxic study, Luteolin, Micelle, Poloxamer 407, Vitamin E TPGS.