SUMMARY

Cervical cancer is the fourth most common cancer among women worldwide, with an estimated 604.000 new cases and 342.000 deaths in 2020. The highest incidence and mortality rates of cervical cancer occur in low- and middle-income nations. Cervical cancer is caused by persistent infection with the human papillomavirus (HPV). Treatment to handle cervical cancer cases is by using chemotherapy. Chemotherapy using herbal compounds is a method that is intensively explored today, one of them that can be used is andrographolide. Andrographolide has strong anticancer activity, thus showing promising potential. However, andrographolides have non polar properties and poor solubility in water, thus reducing their teraupetic effect. To overcome these challenges, this study aims to develop and optimize andrographolide liposome formulation and surface modification with gum arabic, determine the efficiency of andrographolide encapsulation with coconut liposome, determine the effect of IC_{50} value of andrographolide encapsulation-coconut liposome bioactivity against cancer cells, and determine the molecular interactions between phospholipids, andrographolide, and cholesterol with proteins in HeLa cells computationally by molecular dynamics and molecular docking methods using YASARA software. The methods used in this study include isolation and encapsulation process with characterization using Spectrophotometer UV-Vis, FTIR, LC-HRMS, PSA, TEM, cytotoxic test with MTT assay and in silico with molecular docking and molecular dynamics methods. The results showed that the two optimum formulations obtained were liposomes with 20% cholesterol (CLAND) and a modified formulation with the addition of 5% gom arabic (CLANDGA). The optimum formulations showed EE values of (87.7% for CLAND and 92.9% for CLANDGA), approriate PS (66.2 nm for CLAND and 92.6 nm for CLANDGA). The ζ-potential values indicated good stability following the addition of GA. The liposomes exhibited controlled DR (~37% over 72h) and spherical morphology. Encapsulation of andrographolide in liposomes and modification of gum arabic affected the IC_{50} values in cervical cancer cells (HeLa), breast cancer cells (MCF-7), liver cancer cells (HepG2) and normal cells (Vero) as comparison. In silico studies showed that andrographolide is able to interact with cervical cancer protein receptors. This suggests that andrografolide has potential as an inhibitor for HeLa cells.

Keywords: *andrographolide, liposome, drug delivery system, anticancer, gom arabic*