Evaluation of albumin binding to Lapatinib by fluorescence spectroscopy

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*Abstract*: Breast cancer is the second most common cancer, occurring in approximately 75% of women with HER2 receptor-positive breast cancer [1]. Lapatinib is one of the effective drugs on cancerous masses that after oral administration will have side effects such as nausea, diarrhea and rash. As a result, Lapatinib should be used intravenously. Nanoparticles such as albumin, one of the most abundant proteins in plasma, should be used. Human Serum Albumin (HSA) has a half-life of about 19 days. The negative 24 charge in HSA leads to an increase in its solubility in water, which this negatively prevents the removal of nanoparticles from the kidney and leads to its transfer to the FCRn recycling pathway which prevents the destruction of lysosomes in endothelial cells (which absorb serum proteins) [2].

**First we have to bind Lapatinib to HSA. For this connection, HSA was buffered and Lapatinib was concentrated to DMSO with the desired concentration, and then the two solutions were mixed in a ratio of 1:1. The LAP\_HSA bond is formed as a hydrogen**

**bond at position III by the hydrogen atom Tyr161 albumin and the oxygen atom lapatinib, and at positions II and I ، 1 and 2 hydrogen bond will be established for bonding, respectively.[3]**

The loading of Lapatinib in HSA was determined by drawing a calibration sample and Uv-visible technique. To draw a calibration diagram, we prepared different concentrations of Lapatinib by UV-visible spectroscopy. We concluded that with increasing drug concentration, the absorption will also increase at the maximum wavelength [4]. HSA dissolved in saline buffer excited at 280 nm, and emitted at 343 nm .[3] HSA contains endogenous fluorophores, which include tyrosine and tryptophan [5]. To investigate the binding of HSA and Lapatinib, the fluorescence of HAS-Lapatinib at excitation 295 and emission 310-380 nm should be done. Comparing the emission of HSA solution alone and after binding, we found a decrease in emission, which indicates quenching in fluorescence samples and the connection of the two [3].

Keywords— human serum albumin, lapatinib, breast cancer, HER2 receptor-positive, drug delivery

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