Preparasi, Karakterisasi Superparamagnetic Iron Oxyde Nanoparticle-Poliamidoamin G4-Asam Hialuronat-Doksorubisin (SPION-PAMAM-HA-DOX) serta Uji Sitotoksisitas pada Sel HeLa = Preparation, Characterization of Superparamagnetic Iron Oxyde Nanoparticle-Polyamidoamine G4- Hyaluronic Acid-Doxorubicin (SPION-PAMAM-HA-DOX) and Cytotoxicity Study on HeLa Cell Line.

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Abstrak

Doksorubisin (DOX) merupakan agen kemoterapi antrasiklin yang bekerja dengan memperlambat atau menghentikan pertumbuhan sel kanker. Namun, penggunaan DOX memiliki efek toksik pada sel normal serta efek samping kardiotoksisitas. Penelitian ini bertujuan membuat sistem penghantaran DOX dengan SPION-PAMAM-HA, mengkarakterisasi, dan mengevaluasi konjugat superparamagnetic iron oxyde nanoparticle-poliamidoamin G4-asam hialuronat-doksorubisin (SPION-PAMAM-HA-DOX). Hasil karakterisasi SPION-TC menunjukkan kristal magnetit dengan ukuran 2,79 nm. Konjugat SPION-PAMAM-HA-DOX menunjukkan diameter rata-rata 292,57 ± 4,86 nm, indeks polidispersitas 0,216 ± 0,002 nm, dan nilai zeta potensial -53,37 ± 3,68 mV. Studi pelepasan pada 10 jam dapat terlihat bahwa sebanyak 99% doksorubisin dilepaskan di lingkungan pH 5, sementara kurang dari 10% doksorubisin dilepaskan di lingkungan pH 7,4. Uji sitoksisitas menunjukkan konjugat SPION-PAMAM-HA-DOX memiliki efek toksik pada sel HeLa dan sel Vero dengan IC50 2,54 ± 0,27 µM pada sel HeLa dan CC50 2,18 ± 0,019 µM pada sel Vero serta memiliki nilai SI SPION-PAMAM-HA-DOX lebih besar dibandingkan SI DOX yang menandakan bahwa konjugat SPION-PAMAM-HA-DOX masih aman digunakan dan masih memiliki efek anti kanker.

.....Doxorubicin (DOX) is an anthracycline chemotherapy agent that works by slowing or stopping the growth of cancer cells. However, DOX has a toxic effect on normal cells as well as a side effect of cardiotoxicity. This study aims to develop a DOX delivery system with SPION-PAMAM-HA, characterize, and evaluate of superparamagnetic iron oxide nanoparticle-polyamidoamine G4-hyaluronic acid doxorubicin (SPION-PAMAM-HA-DOX). Superparamagnetic iron oxide nanoparticle (SPION) could be used as diagnostic agent, polyamidoamine G4 (PAMAM) was used as carrier and hyaluronic acid (HA) was used as active targeting moiety. SPION were prepared by co-precipitation method, then SPION-PAMAM-HA-DOX were produced by conjugation of SPION with PAMAM-HA and DOX. SPION-PAMAM-HA-DOX were characterized by particle size analyzer (PSA), UV-Vis spectrophotometry, fourier transform infrared spectroscopy (FTIR), fluorescence spectrophotometry, and transmission electron microscopy (TEM). The release study was conducted by using pH 5 and pH 7.4. Cytotoxicity study was conducted on HeLa cells and Vero cells by using MTT [3-(4,5-Dimethylthiazole-2-yl)-2,5-diphenyltetrazolium bromide] assay. The characterization results of SPION-TC showed magnetite crystals with a size of 2.79 nm. The mean particle size, polydispersity index, and zeta potential of SPION-PAMAM-HA DOX were 57 ± 4.86 nm, 0.216 ± 0.002 nm, and -53.37 ± 3.68 mV. The release study at 10 hours showed that 99% of DOX was released in pH 5, while less than 10% DOX was released in pH 7.4. The cytotoxicity study showed that SPION-PAMAM-HA-DOX has toxicity effect on HeLa cells and Vero cells with IC50 2,54 ± 0,27 µM on HeLa

cells, CC50 2,18 ± 0,019 µM on Vero cells sel Vero, and SI value of SPION-PAMAM-HA-DOX greater than SI DOX which indicates that SPION-PAMAM-HA-DOX conjugate is still safe to use and has anti-cancer effects