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pH-responsive Doxorubicin-loaded cockle shell-derived nanoparticles: Release kinetics and pharmacokinetics in canine

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Nanoparticles with stimuli-responsive release mechanism have received great interest in nanomedicine. Doxorubicin-loaded pH-responsive nanocarriers could enable selectivity and specificity by reducing premature drug release in the plasma following an intravenous administration. Doxorubicin-load cockleshell-derived nanoparticle (CSNP-DOX) was prepared via ball-milling method. Apart from the analysis of CSNP drug release kinetics at pH 4.8 and 7.4, a high-performance liquid chromatography (HPLC) bioanalytical method was developed for the detection of Doxorubicin. For the pharmacokinetics of CSNP-DOX, animal ethics approval was sought. Six canines were divided into two groups to receive intravenous CSNP-DOX and free Doxorubicin at 30 mg/m2, respectively. At predetermined time interval, blood was sampled and processed before analyzed by HPLC. The pharmacokinetic parameters were determined based on the plasma Doxorubicin concentration in the canines. An excellent bioanalytical method with high acceptable extraction yield and linearity of 89.87% and 0.997 within the range limit of 0.25-4 µg/mL was revealed from the method developed. At pH 7.4, 13.7% of DOX was released from CSNP-DOX after 96 hours while 52.6% of Doxorubicin was recorded in the free Doxorubicin alone. However, the amount of Doxorubicin released from the nanocarriers doubled in acidic condition. CSNP-DOX increases the t1/2, Tmax and AUC0-t of Doxorubicin. The plasma concentration of Doxorubicin rapidly becomes lower versus time when compared to the plasma concentration of CSNP-DOX. CSNP-DOX exhibited pH-triggered and sustained-drug release properties. The pharmacokinetic parameters confirmed that CSNP has the ability to regulate and delay the release of doxorubicin in blood circulation.

Biography

Danmaigoro Abubakar is currently a PhD student at Universiti Putra Malaysia. He is also a Lecturer at the Usmanu Danfodiyo University, Nigeria in the Department of Veterinary Anatomy.

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