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Kinetic models for the release of the anticancer drug doxorubicinfrom biodegradable polylactide/metal oxide-based hybrids

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Abstract

For decades, studies on drug-release kinetics have been an important topic in the field of drug delivery because they provide important insights into the mechanism of drug release from carriers. In this work, polylactide (PLA), doxorubicin (DOX), and metal oxide (MO) (titanium dioxide, magnetic iron oxide, and zinc oxide) spheres were synthesised using the solvent-evaporation technique and were tested for sustained drug release. The efficacy of a dosage system is determined by its ability to deliver the drug at a sustained rate, afford an increased plasma half-life, a minimum exposure of toxic drugs to healthy cells and a high drug pay load. Mathematical models were used to elucidate the release mechanism of the drug from the spheres. The release fitted a zero-order model with a correlation coefficient in the range of 0.9878–0.9891 and the release mechanism followed an anomalous release, meaning drug release was afforded through both diffusion and the dissolution of PLA. Therefore, PLA/DOX/MO released the same amount of drug per unit time. Consequently, the potential for PLA use as a carrier was ascertained.