Polyketal Nanoparticles to Administer Pharmaceutical Products in Acidic Environments

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Technology description

Market Summary

A major challenge in drug therapy is the delivery of an exact therapeutic dose in a variety of microenvironments. The use of nanoparticles has circumvented some of these hurdles by precisely delivering therapeutics, thereby enhancing drug specificity and minimizing side effects. Polyester and polyanhydride particles are commonly used as drug delivery vehicles for sustained release due to superior bioavailability and slow hydrolysis rates. However, a number of therapeutics must be delivered to acidic environments found in lysosomes, inflammatory tissues, and tumors. The vast majority of ester-based microparticles cannot fulfill this requirement because they generate acids that destroy protein or nucleic acids and take a period of weeks to degrade. To efficiently deliver therapeutics to acidic environments, a pH-sensitive biodegradable polymer must be developed.

Technical Summary

This invention includes a versatile medium designed to deliver therapeutics. Polyketal particles (PKs) are small hydrophobic polymers which can be synthesized using a simple acetal exchange reaction. PKs contain ketal linkages in their backbone which allow flexibility in their size and shape. These particles degrade over a period of days by acid-catalyzed hydrolysis and breakdown into harmless compounds including water-soluble alcohols and ketones. Importantly, the polyketal nanoparticles do not generate acidic degradation products after hydrolysis, as with polyester-based particles. Upon internalization, these vehicles will breakdown, releasing their cargo. The ease of polyketal particle formation along with its pH-sensitive degradation into excretable compounds makes these polyketal particles an excellent drug delivery vehicle.

Application area

Acid-sensitive polyketal nanoparticles for biodegradable drug delivery.

Advantages

Can be engineered to a variety of sizes and shapes to facilitate the delivery of hydrophobic small molecules, proteins, or nucleic acids.
Provides a vehicle for delivering therapeutics to acidic environments found in tumors, inflammatory tissues, and phagosomes.

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