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Can bioadhesive nanoparticles allow for more effective particle uptake from the small intestine?

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Abstract

There has been increasing interest in developing bioadhesive nanoparticles due to their great potential as carriers for therapeutics in oral drug delivery systems. Despite decades of research, such a system still has not been successfully implemented. This paper demonstrates the enormous potential of such engineered systems: the incorporation of a bioadhesive coating, poly(butadiene-maleic anhydride-co-L-DOPA) (PBMAD), to non-bioadhesive nanospheres resulted in an enhancement of particle uptake in the small intestine from $5.8 \pm 1.9\%$ to $66.9 \pm 12.9\%$. Direct correlation was obtained between bulk tensile strength, *in vitro* binding to everted intestinal sacs and quantitative *in vivo* uptake; this data suggests that bulk properties of polymers can be used to predict bioadhesive properties of nano- and microparticles. The differential distribution of the nanospheres to various tissues following uptake suggests surface chemistry plays a significant role in their localization within the body. The results of these studies provide strong support for the use of bioadhesive polymers to enhance nano and micro particle uptake from the small intestine for oral drug delivery.

Keywords

bioadhesion; nanoparticles; uptake; in-vitro in-vivo correlation

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