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Elite Status and Centre of Excellence–Govt. of Maharashtra

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CITATION

The work by Prof. Padma V. Devarajan on *Nanoparticle Shape A New Design Parameter for Splenic Targetting* is based on a serendipitous finding of unusually high accumulation, of a specific composition of nanoparticles in the spleen. Spleen targeted delivery can have important implications in improved therapy of spleen resident infections like leishmaniasis, trypanosomiasis, splenic TB, AIDS, malaria and a range of veterinary spleen resident intractable infections. The study was initiated to develop nanoparticles of an antibiotic drug Doxycycline hydrochloride, for targetting intracellular infections. Right from conceptualization of an innovative lipid polymer hybrid nanoparticle composition (Lipomer), to achieve high drug loading and desired targetting to the Reticulo-endothelial system(RES) the study is very innovative. The results of the biodistribution study in the rat model by gamma scintigraphy brought in the exciting turn, when it was seen that a particular Lipomer composition exhibited high splenic accumulation, indicative of spleen targetting. This was a surprising and unexpected finding, especially since the spleen is reported to receive barely 15% of an intravenously injected dose of nanocarriers. Rapid clearance of nanocarriers from the blood stream by the Kupffer cells of the liver further limits spleen concentration. Prof. Padma's research group took this challenge head-on and systematically elucidated the science behind this serendipitous finding, by undertaking a series of well-planned biodistribution studies in rats, mice, rabbits and dogs by gamma scintigraphy. By capturing live videos and monitoring drug concentration in the spleen and other organs, they came up with confirmatory evidence that asymmetric/irregular nanoparticles of >200nm size could be trapped in the spleen, thereby being the first to establish the role of nanoparticle shape on spleen targetting. A scientifically valid hypothesis for spleen targetting is proposed. An explanation, on why some Lipomers were spherical and others asymmetric/irregular is arrived at through systematic experimentation. A product based on asymmetric solid lipid nanoparticles of Buparvaquone, has been successfully transferred to industry. It has application in the therapy of theileriosis, an intracellular infection in cattle, that seriously affects milk productivity. The research on nanoparticle shape has seamlessly integrated science with technology to provide a product of high societal relevance.

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