The effect of the mobility of surface-grafted polymer on the interaction between nanoparticles and liver sinusoidal endothelial cells

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Abstract: Nanoparticle-based therapeutics and imaging agents are promising for many applications. However, their in vivo efficacy remains hampered by rapid systematic clearance, mainly in the liver. This challenge is persistent due to the poor knowledge in materials-cell interactions. To address this challenge, particles coated with polymer brush of different mobility were used to assess their interactions with liver sinusoidal endothelial cells (LSECs), which are recently identified as a major player in the clearance process. Polyethylene glycol (PEG) with various molecular weights was grafted onto the surface of polystyrene particles. The mobility of the PEG chains was measured by NMR relaxometry. Confocal microscopy and flow cytometry techniques were used to evaluate the in vitro uptake of PEG-coated polystyrene particles in different cell lines. The results show that high molecular weight PEG chains (20 kDa) demonstrating higher mobility on the surface of nanoparticles substantially attenuated uptake by SK-Hep-1, a cell line derived from LSEC. The nanoparticle biodistribution was also evaluated in zebrafish larvae.