Particle interactions with proteins and phagocytic cells

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(1) **Protein behaviour on PLGA particle surfaces:** PLGA micro-particles are bio-degradable and bio-compatible carriers for drug delivery in vivo. When these particles come in contact with biological fluid, they rapidly get coated with proteins abundantly present in the serum such as albumin or immunoglobulins by physical adsorption. This protein corona sometimes leads to altered drug release kinetics and immune reactions like phagocytosis of the particles. It is hypothesized that chemical conjugation of proteins on the PLGA particles could lead to altered protein corona and reduced phagocytosis. The behaviour of proteins chemically conjugated on the surface of PLGA micro-particles was studied and compared with behaviour of physically adsorbed proteins. PLGA- micro-particles were synthesized by solvent emulsion evaporation technique and chemically conjugated with BSA-FITC. After incubation of BSA-FITC conjugated and adsorbed particles in (a) PBS, (b) 10% serum and (c) BSA-TRITC for different time intervals, flow cytometry was carried out to study their behaviours. No change was found in case of conjugated protein in PBS and serum, whereas in the case of adsorbed samples, some of the BSA-FITC was found to be removed. BSA-TRITC was added onto the surface in case of protein conjugated particles, whereas the adsorbed BSA-FITC was replaced by BSA-TRITC.

(2) **Effect of uptake of polystyrene micro-particles on immune cell fate:** The use of micro-particles in bio-medical applications has seen an exponential growth during the past decades. Immune reaction to these micro-particles has been widely studied. The points of interest of these studies have been to examine the fate of the particles after uptake, factors affecting the uptake, or surface modifications on the particle for efficient uptake. However, the fate of the phagocytic cell after particle uptake has not been studied. In this study, polystyrene micro-particles were incubated with RAW 264 murine macrophages and the cell fate was studied by monitoring changes in cell cycle, cell death (flow cytometry) and haemocytometer live cell counts over the course of three days. No significant changes in cell fate were observed from the experiments conducted.