PROTEIN CORONA: CHARACTERIZATION AND EFFECTS ON NANOPARTICLE FATE

SEMINARIO DOCTORAL IV

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ABSTRACT

The use of nanotechnology is being intensively applied in the biomedical field over the last years due to the fact that engineered nanoparticles cross biological barriers and permeate into organs and tissues, which is an advantage for applications in drug delivery, diagnostics, and imaging. Nevertheless, the knowledge about the biocompatibility and risks of exposure to nanomaterials is limited. In fact, there are inconsistencies between in vitro, in vivo and clinical trials, which restricts the application of nanocarrier systems for medical treatments (1,2).

Due to the above reasons, increasing number of studies remark the interactions between nanoparticles, biomolecules (proteins, lipids, DNA), cells and cell organelles, like a key parameter to understand the biodistribution and toxicity of the nanomaterials (2,3). These interactions depend on the biological fluid, that for the case of bloodstream is abundant in proteins, which will be adsorbed on nanoparticles (4). The adsorbed proteins on nanoparticle surface constitute what is called “protein corona”, which alters the physicochemical properties of the nanocarriers and gives them a biological identity that affects the biodistribution, cellular uptake, intracellular location and payload release kinetics of the nanoparticles (2,3,5,6). Several strategies have been used in order to determine the constituents of the protein corona on different nanocarriers and biological fluids, but their complexity makes this aim challenging (2,7). Therefore, it is important to understand the biological role of the protein corona and to undergo different analytical methods to evaluate its nature and composition and thus to make use of this information to predict the final fate of the nanocarrier and to enhance its biocompatibility (2,7–10).

A typical approach to enhance the biocompatibility has been the covalent attachment of poly(ethylene glycol) (PEG) on the surface of the nanocarriers to reduce non-specific cellular uptake, because it can decrease protein adsorption and thereby confer a stealth effect. Nevertheless, it is possible to select other proteins or molecules that increase the specific cellular uptake by the nanocarriers based on protein corona studies (2,6,7). Since protein corona formation is inevitable and even the stealth effect seems to be dependent on the adsorption of proteins, the concept of its exploitation for targeted delivery is emerging (2). This seminar will show different ways to study the composition of protein corona and its importance in nanocarriers design.
BIBLIOGRAFÍA


