Biological Fate of Nanocarries and In vivo Protein Corona studies

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Nanoformulations offer multiple advantages over conventional drug delivery, enhancing solubility, biocompatibility, and bioavailability of drugs.[1] Following systemic delivery nanocarriers must deliver encapsulated drugs, usually through nanocarrier degradation. A premature degradation or the loss of the nanocarrier coating may prevent the delivery of drugs to the targeted tissue. Despite their importance, stability and degradation of nanocarriers in biological environments are seldom studied in literature. Understanding fate and how nanomaterials change in biological matrixes is also fundamental for their toxicological evaluation as changes in nanoparticles surface or release of ions or molecules can induce toxicological endpoints. In biological fluids the presence of proteins from the media leads to the formation of a protein coating around nanoparticles, the protein corona. This corona gives a different biological entity to the nanocarrier surface and may alter toxicological endpoints. One of the main areas of research in our group in the last years has been the study of the fate of nanomaterials, aiming to understand how their properties change in biological environments-.In this presentation issues related to the biological fate and stability of nanocarriers in biological matrixes will be discussed: the interaction of the nanocarriers with proteins, the biodistribution of the nanocarriers, their biological fate, the kinetics of drug release in vivo and the stability of the core and surface coating of the nanocarriers as well as the formation of protein corona in vivo. Different types of nanomaterials will be discussed: poly lactic co glycolic nanoparticles[2], polymersomes[3], polyplexes for siRNA delivery[4], and mesoporous silica nanoparticles[5]. We will make use of Positron Emission Tomography and Single Photon Emission Tomography to study the biodistribution of nanocarriers, the stability of surface coatings and nanocarrier dissolution, and stability of hard and soft protein coronas[6], making use of advanced radiolabeling strategies.

References

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