Contribution ID: **18** Type: **Invited Talk**

Stem cells loaded with near-infrared nanoparticles for dynamic imaging of cancer, metastasis and inflammatory focuses

Friday, November 8, 2024 1:40 PM (20 minutes)

Different types of nanoparticles are widely used because they have unique properties which make them suitable for the diagnostics and therapy (theranostics). They can improve detection selectivity and sensitivity, as imaging agents, delivery systems for encapsulated drugs, proteins and nucleic acids. Nanoparticles show high loading capacity, stability, high drug bioavailability and biocompatibility. However, nanoparticles face different biological barriers while entering the body, which limit their successful biodistribution for diseases theranostics. These biological barriers include immune clearance in the liver and spleen, permeation across the endothelium into target tissues, penetration through the tissue interstitium, endocytosis in target cells, diffusion through cytoplasm, and eventually entry into the nucleus. Additionally, there is another important biological barrier in the brain which is called blood brain barrier. To solve the problem of overcoming biological barriers, mesenchymal stem cells (MSCs) have recently become widespread. MSCs exhibit tropism for sites of tissue damage, inflammatory focuses, tumor microenvironment, and have thus gained more attention as vehicles for targeted therapy. One of novel approaches is to create an efficient multifunctional platform using MSCs as a carrier of core-shell polymeric nanoparticles loaded with near-infrared fluorescent dye for dynamic deep-tissue optical monitoring of targeted focuses in mouse body. As a result, the main amount of MSC carrying nanoparticles is accumulated in the inflammatory, cancer and metastasis areas. Hence, a potentially useful MSC-platform that combines their inflammatory/cancer tropism and nanoparticle optical imaging of migration and biodistribution is proposed pursuing MSC-mediated theranostics.

Type of presence

Presence online

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Session Classification: Biomedical Imaging and Nanotechnology