Investigating Mechanoenvironment Change in Tumor Growth using Multimodal Contrast Agents

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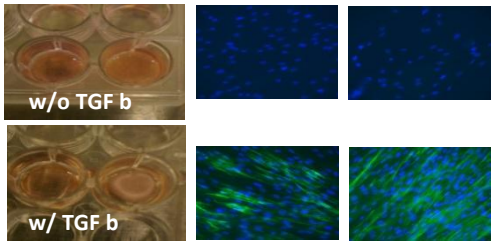
Objective

The tumor microenvironment is mechanically modified during cancer progression. Imaging of tumor mechanical environment will provide new information for early cancer diagnosis. The goal of this proposal is to more clearly understand the contrast mechanisms of elasticity images in terms of cellular activities that drive cancer. Two imaging modalities-ultrasound and OCT-are used with magnetic nanoparticles as contrast agents.

Research Highlights

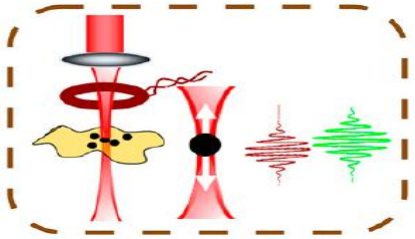
- Develop elasticity imaging techniques using magnetic nanoparticles and an magnetic source to measure local mechanical response
- 3-D cell co-culture system and animal model of breast cancer formation



3D cell co-cultures (left) and Immunofluorescence (IF) staining w/wo the exposure of cancer growth factor

Future Research

- Indentify the change in ECM when breast cancer develops; correlate the biological change with our elasticity imaging results; explore the contrast mechanisms in different scales using different imaging modalities
- Our research helps us understand the changes in mechanoenvironment caused by cancer. By understanding the contrast mechanisms physicians can more accurately evaluate cancer progression and treatment effectiveness through clinical elasticity images.



Magnetomotive displacements of magnetic nanoparticles inside a tissue sample