FEATURES

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MsRs and AMI Stem Cell Protection

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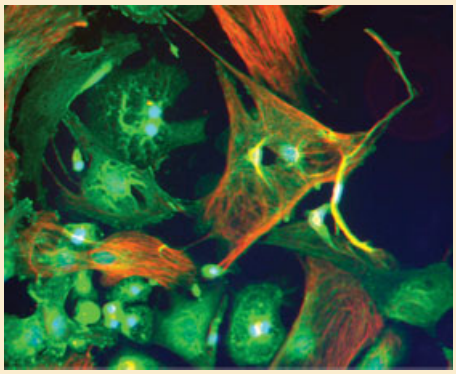

Acute myocardial infarction (AMI) leads to heart failure, the greatest cause of morbidity and mortality in western societies. AMI has become a prime target for stem cell therapy. During and after AMI endogenous stem cells are released from adjacent tissues and the bone marrow and home to the infarct where they limit damage, promote repair and initiate regeneration of the vasculature. Stem cell therapy involving direct injection of autologous cells is being developed as a way to augment the endogenous repair processes. However both the endogenous and exogenous therapy is limited because of the toxic environment of the infarct that includes hypoxia, acidosis and the oxidative stress of reperfusion. Because of this many of the cells die immediately after delivery. The methionine sulfoxide reductase (Msr) family of genes provide protection from oxidative damage by reducing the oxidized sulfide groups of methionine residues in proteins. This restores normal protein functions and neutralizes intracellular reactive oxygen species (ROS). Here, the authors provide evidence for an infarct-targeted regulation of all four Msr genes in mouse embryonic stem cells. Remarkably these genes responded individually and selectively to each component of infarct toxicity including hypoxia, acidosis and ROS. The results position msRs as environmentally responsive lifelines with the potential to protect conditionally against multiple stress stimuli.

AFM Supports Sonodynamic Therapy

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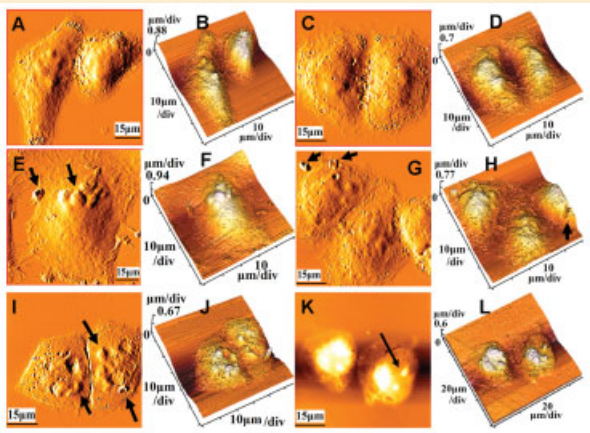

Ultrasound can penetrate deeply into tissues and reach a small region of tumors to activate the cytotoxicity of sonosensitizers. Therefore, sonodynamic therapy (SDT) has been arousing wide interest. However, the effects of SDT in combination with hematoporphyrin monomethyl ether (HMME) on tumor cells are still unclear. Jin. et al. investigated the in situ sonodynamic effects of HMME on CNE-2 cells using MTT assay, flow cytometry and AFM-based technology. MTT assay results showed that HMME alone had less cytotoxicity whereas HMME-SDT could suppress cell proliferation in a dose-dependent manner. Interestingly, the annexin V-based flow cytometric data indicated that upon SDT treatment different concentrations of HMME induced different types of cell death, apoptosis (low concentration of HMME) or necrosis (high concentration). To further confirm the results and determine the mechanism, changes in mitochondrial membrane potential (MMP), cytosolic free calcium level, organization of cytoskeleton, and nuclear morphology were explored. Simultaneously, AFM morphological and biomechanical data indicated that HMME-SDT induced changes in chemical composition of the cell membrane and in actin cytoskeleton reorganization. This paper implies that HMME can be utilized as an effective sound sensitizer for nasopharyngeal carcinoma treatment and that AFM ability to detect subtle changes at the nanometer scale in structural and biomechanical properties of cells can open up the exciting prospect of using a simple nanodevice as a sensitive tool.