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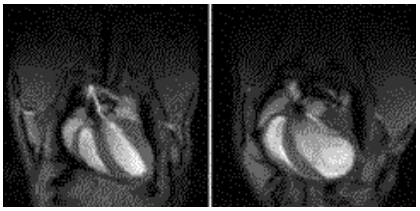
Research Interests

Interplay of Nitric Oxide with Superoxide in Health and Disease

The basic research focus of our laboratory is to determine the physiological significance of the balance that exists between nitric oxide and superoxide in the cardiovascular systems of higher mammals. Recent investigations indicate that this balance becomes critical in the setting of heart attack. Nitric oxide and superoxide are free radicals that react spontaneously to form peroxynitrite, a very destructive reactive oxygen species. Basic research efforts in the laboratory are focused on determining the roles played by nitric oxide, superoxide and peroxynitrite in both the acute and chronic settings of myocardial infarction.

Novel Therapies for Cardioprotection and Cardiopreservation



The applied research focus of the laboratory is to develop novel therapies to protect the intact mammalian heart against myocardial infarction and heart failure. An interdisciplinary approach is used to integrate recent advances in molecular biology with cutting-edge imaging techniques such as MRI and echocardiography to expedite research by accurately measuring the effect of novel therapies on cardiovascular disease. Accurate animal models of myocardial stunning, infarction and left ventricular remodeling after myocardial infarction have been implemented in rabbits, rats and mice. Using direct gene transfer techniques in these models, we have previously shown that either superoxide dismutase or nitric oxide synthase can provide the heart with substantial protection against myocardial infarction (i.e., reduce the extent of myocardial infarction by > 50%). Recently, the excess production of superoxide and nitric oxide have also been implicated in the progressive loss of cardiac function that characterizes heart failure after myocardial infarction. Thus we anticipate that gene therapy with superoxide dismutase may also prove beneficial in the setting of left ventricular remodeling after myocardial infarction by reducing the formation of peroxynitrite and thereby controlling oxidative damage in the heart and vasculature.

Recent Publications

Yang Z, Laubach VE, French BA, Kron IL
Acute hyperglycemia enhances oxidative stress and exacerbates myocardial infarction by activating nicotinamide adenine dinucleotide phosphate oxidase during reperfusion.

Yang Z, Linden J, Berr SS, Kron IL, Beller GA, French BA
Timing of adenosine 2A receptor stimulation relative to reperfusion has differential effects on infarct size and cardiac function as assessed in mice by MRI.

French BA, Kramer CM
Mechanisms of Post-Infarct Left Ventricular Remodeling.

Helm PA, Caravan P, French BA, Jacques V, Shen L, Xu Y, Beyers RJ, Roy RJ, Kramer CM, Epstein FH
Postinfarction myocardial scarring in mice: molecular MR imaging with use of a collagen-targeting contrast agent.

Li Y, Garson CD, Xu Y, French BA, Hossack JA
High frequency ultrasound imaging detects cardiac dyssynchrony in noninfarcted regions of the murine left ventricle late after reperfused myocardial infarction.

More Publications