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Impact of cigarette smoke exposure on cardiac function: Demonstration by animal models

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It is difficult to study the effect of cigarette smoke on humans in a systematic way; therefore, we studied the effect of cigarette smoke exposure on cardiac transplant survival and the development of myocardial infarction in rat models. In this experimental study, we investigated early consequences of tobacco smoke exposure in cardiac transplant donors and recipients with an emphasis on alloinflammatory mediators of graft outcome using heterotopic rat cardiac transplantation; we tested the effects of donor or recipient tobacco smoke exposure. Our experiments reveal that pre-transplantation tobacco exposure in donors and/or recipients results in heightened systemic inflammation and increased oxidative stress reduces post-transplantation cardiac allograft survival. Our studies with cigarettes without nicotine demonstrated significantly lesser detrimental effects on cardiac transplant survival.

The contribution of chronic tobacco exposure in determining post-myocardial infarction (MI) left ventricular (LV) remodeling and possible therapeutic strategies has not been investigated systematically. In this small animal investigation, we demonstrate that a significantly increased LV end-systolic diameter was observed in tobacco-exposed sham compared to tobacco-naïve sham, and tobacco-exposed MI compared to tobacco-naïve MI rats. The treatment of tobacco-exposed MI rats with NAC resulted in significantly increased levels expression of antioxidantsas well as circulating levels of glutathione, where the levels were almost identical to the tobacco-naïve sham rats. These findings identify a novel post-infarction therapy for amelioration of the adverse effects of tobacco exposure on the infracted myocardium and advocate the use of dietary supplement antioxidants for habitual smokers to prevent and reverse cardiovascular adverse effects in the absence of successful achievement of cessation of smoking.

Biography

Ashwani Khanna completed his Ph.D. degree with studies in Rheumatic Heart Disease at the age of 27 from Postgraduate Institute of Medical Education and Research, Chandigarh, India. His original studies have described the mechanism of immunosuppressive drugs clinically used to treat organ transplant recipients. He has developed therapeutic recombinant proteins, monoclonal antibodies and molecular diagnostic assays. He is author of 100 scientific publications and a patent. He is a regular member of NIH study section, reviewer for scientific journals and member of editorial board of a journal.

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