

Cardioprotection against ischaemia/reperfusion by vitamins C and E plus n-3 fatty acids: Molecular mechanisms and potential clinic applications

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The role of oxidative stress in ischaemic heart disease has been thoroughly investigated in humans. Increased levels of ROS (reactive oxygen species) and RNS (reactive nitrogen species) have been demonstrated during ischaemia and post-ischaemic reperfusion in humans. Depending on their concentrations, these reactive species can act either as benevolent molecules that promote cell survival (at low-to-moderate concentrations) or can induce irreversible cellular damage and death (at high concentrations). Although high ROS levels can induce NF- κ B (nuclear factor κ B) activation, inflammation, apoptosis or necrosis, low-to-moderate levels can enhance the antioxidant response, via Nrf2 (nuclear factor-erythroid 2-related factor 2) activation. However, a clear definition of these concentration thresholds remains to be established. Although a number of experimental studies have demonstrated that oxidative stress plays a major role in heart ischaemia/reperfusion pathophysiology, controlled clini