

In cardiology, there are different conditions associated with the release of free radicals in some forms of hypoxia, such as ventilatory hypoxia or reduced perfusion. The role of free radicals during hypoxia in cardiology is the key point of our interest. In presented thesis, we have focused on hypoxia-induced pulmonary vasoconstriction and acute myocardial ischemia.

Hypoxic pulmonary vasoconstriction (HPV), an important physiological mechanism, is regulated by changes in the production of and interactions among reactive oxygen species (ROS). There is controversy, however, over whether HPV is mediated by an increase or a decrease in ROS production. Also, the role of nitric oxide (NO) in HPV remains unclear. Our results indicate that inhibition of HPV by the superoxide dismutase mimetic tempol does not depend on either NO production or a decrease in basal vascular tone.

The effect of three-day fasting on cardiac ischemic tolerance was investigated in another experimental model. Short-term fasting conclusively decreases ROS production. Three-day fasting effectively protected rat hearts against major endpoints of acute ischemia-reperfusion injury. It prevented severe ventricular arrhythmias and reduced the extent of myocardial infarction. These beneficial effects can be linked to altered mitochondrial redox state resulting from increased ketogenesis and subsequent reduction of ROS production.