アデニンヌクレオタイド代謝物は低酸素後の心収縮力回復に有益である

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Adenine Nucleotide Metabolites are Beneficial for Recovery of Cardiac Contractile Force after Hypoxia

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ABSTRACT In a previous study,we demonstrated a significant release of adenosine, inosine and hypoxanthine during hypoxia and subsequent reoxygenation [30]. The present study was designed to determine whether or not exogenous adenosine, inosine and hypoxanthine are beneficial for the recovery of hypoxia-induced loss of cardiac contractile force. Hearts were perfused for 20 min under hypoxic conditions, followed by 45 min-perfusion under reoxygenated conditions, and changes in contractile force, resting tension and metabolic parameters of the perfused heart were examined. When either adenosine, inosine or hypoxnathine were exogenously infused during hypoxia at the rate of 3 μmol/min, remarkable recovery (61 to 68%) of cardiac contractile force was observed upon reoxygenation. The recovery was accompanied by a significant restoration of myocardial ATP (90 to 100%) and CP contents(80 to 86%), suggesting that exogenous metabolites are utilized for the restoration of myocardial ATP during reoxygenation, which may lead to a beneficial recovery of hypoxiainduced loss of cardiac contractile force upon reoxygenation. Infusion of exogenous metabolites also resulted in an almost complete inhibition of hypoxia- and reoxygenation-induced release of creatine phosphokinase from the perfused heart as well as a significant depression of hypoxia-induced calcium accumulation in the cardiactissue. Since these phenomena are considered to represent increases in cell membrane permeability, protectopn of the myocardium against hypoxia- and reoxygenation-induced changes in cell membrane permeability may be an alternative mechanism for the beneficial effect of adenosine, inosine and hypoxanthine on the hypoxic myocardium.

抄録　本研究はアデニンヌクレオタイド代謝物が低酸素負荷後の心収縮力回復に有益か否かを検討した。3 μmol/min のアデノシン，イノシン，あるいはヒポキサンチンを低酸素負荷時に投与された心臓は，その後の再酸素化時に有意に心収縮力や心筋内高エネルギーリン酸化合物を回復させた。以前，我々はこのアデニンヌクレオタイド代謝物が低酸素化した心臓から多量に遊離することを認めている。今回の研究はこの遊離を代償する代謝物を投与することが低酸素後の心収縮力回復に有益なることを示した。