

Haas G, L DeBoer, E O'Keefe, R Bodenhamer, G Geffin, L Drop, R Teplick, W Daggett. Reduction of postischemic myocardial dysfunction by substrate repletion during reperfusion. *Circ* 1984;70:165-174.

We studied the effect of selected metabolic substrates on recovery of myocardial function and ATP concentration when added to the reperfusate after normothermic ischemia. The hearts of 30 anesthetized, open-chest mongrel dogs were subjected to 45 min of global ischemia at 37 degrees C followed by 90 min of reperfusion. Left ventricular function curves were generated on right heart bypass before and at 30 min intervals after the ischemic period. ATP concentration was measured before, at the end of, and 90 min after the ischemic period. Experiments were randomized into five groups distinguished by the content of the myocardial reperfusate during the first 10 min of the reperfusion period. Hearts received either unmodified oxygenated pump blood (control; group I), normothermic oxygenated 28 mmol/liter potassium-blood cardioplegic solution (KBC; group II), 25 mmol/liter glutamate in KBC (group III), 250 μ mol/liter adenosine with 1 mg erythro-9-(2-hydroxy-3-nonyl) adenine hydrochloride (EHNA) and glutamate in KBC (group IV), or 2 mmol/liter ribose and glutamate (group V) in KBC. Hearts reperfused with KBC showed improvement early (group II vs group I; p less than .02) but not late recovery of left ventricular function over control. Glutamate, which replenishes Krebs cycle intermediates lost during ischemia, increased functional recovery (group III vs group II; p less than .002). Ribose, which is important in purine salvage and resynthesis, added to glutamate-KBC further improved functional recovery (group V vs group III; p less than .01). Adenosine, a precursor of ATP, with EHNA, an inhibitor of rapid adenosine catabolism, added to glutamate-KBC depressed early recovery (group IV vs group III; p less than .01); however, recovery improved with time. Both glutamate and ribose with glutamate in KBC improved ATP recovery (groups III and V vs group II; p less than .002). Thus selective substrate repletion during initial reperfusion after severe normothermic ischemia can improve recovery of myocardial function and ATP concentration.