

**Mahoney J, E Sako, K Seymour, C Marquardt, J Foker. A comparison of different carbohydrates as substrates for the isolated working heart. *J Surg Res* 1989;47:530-534.**

Ribose has been shown to greatly enhance ATP recovery in situations such as postischemia when total adenine nucleotides have been depleted by catabolism. In addition, metabolic studies have reported that both five carbon sugars and alcohols (ribose and xylitol) can support energy metabolism presumably after conversion to substrates for glycolysis. Because of the importance of these two aspects of energy metabolism to myocardial function, we compared the ability of ribose and xylitol with glucose and pyruvate as exclusive substrates for the isolated working rat heart. Our studies revealed, however, that the utilization of ribose or xylitol as substrates by the myocardium is not sufficiently rapid to rely on these as exclusive oxidizable substrates. In fact, ribose or xylitol are no more effective than substrate-free medium in this regard. Myocardial glycogen was depleted in these groups and after a lag period consumption of oxygen also decreased. In contrast to the postischemic situation the total adenine nucleotide levels were preserved during ribose, xylitol or substrate-free perfusion. Consequently, the energy charge in these hearts fell significantly. In hearts perfused with ribose, xylitol or no substrate, the rate pressure product and the stroke volume rapidly declined after an initial brief stable period corresponding to glycogen depletion. Glycogen levels were 6% of the average control value in ribose- and xylitol-perfused hearts and were undetectable in substrate-free perfused hearts. In contrast, either glucose or pyruvate supported steady levels of ATP and myocardial oxygen consumption; maintained the energy charge; and supported the stroke volume, rate pressure product, and cardiac work. In glucose-perfused hearts the glycogen was reduced to 21% of control values, while in pyruvate-perfused hearts the average glycogen levels were 76% of control. Thus, although the heart is able to metabolize ribose and xylitol through the hexose monophosphate pathway, the rate of utilization through glycolysis and presumably the TCA cycle is not sufficient for these compounds to serve as exclusive substrates for the isolated working heart.