MYOCARDIAL SUBSTRATE REQUIREMENTS. M.L. Wahlqvist, Department of Medicine, Monash University, Prince Henry's Hospital, St. Kilda Road, Melbourne 3004, Australia.

The relative contributions of different substrates to myocardial energy metabolism have been expressed traditionally as oxygen extraction ratios (OERS). The amount of oxygen required to oxidise a substrate, S, extracted from blood (C_A-C_S S_xEqO_2) is expressed as a fraction of the oxygen extracted (C_A-C_S O_2). In this expression the effect of coronary blood flow is eliminated. Measurements of arterial (C_A) and coronary sinus (C_{CS}) substrate and oxygen concentrations are required. For resting fasting man, the OER for fatty acids (FFA) is 49%, triglycerides 15%, ketones about 5%, glucose 25%, lactate 8% and pyruvate <1%. In steady state conditions, it would be expected that intramyocardial energy stores of glycogen and triglyceride would not undergo net change, althougn turnover of these stores may take place. During short term exercise, at 10mins, the extraction of lactate increases about 6-fold. In duration exercise of 1-2 hours, the relative contribution of substrates to energy metabolism is similar to rest, although the absolute utilization of each substrate will have increased. Since the myocardial RQ is also not significantly different with duration exercise (0.81) by comparison with that at rest (0.76), the myocardium, unlike skeletal muscle, would not appear dependent on endogenous energy stores in prolonged exercise. In the fed state, chylomicron triglyceride can contribute up to 50% to myocardial energy metabolism, but the relative contribution of FFA is decreased. Alcohol increases the OERS of lactate and acetate and decreases that of FFA. Reports vary with regard to the effect of ischaemia on the OER for glucose. The availability of glucose during ischaemia, whether from blood or glycogenolysis is one of the most important metabolic considerations for myocardial preservation in ischaemia. This is because it is the only fuel able to generate ATP anaerobically. Furthermore, the P/O ratio for glucose at 3.15 is theoretically higher than for any other substrate (e.g. FFA 2.83).