SUBSTRATE UTILIZATION AND GLUCOSE KINETICS DURING EXERCISE IN PATIENTS WITH NON-INSULIN-DEPENDENT DIABETES MELLITUS

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The present investigation was undertaken to examine substrate utilization and glucose kinetics during isocaloric exercise of varying intensities in patients with non-insulin-dependent diabetes mellitus (NIDDM). Six male NIDDM patients (N) and 6 male controls (C) of similar age, body weight, % body fat, and aerobic fitness were studied in two experimental sessions administered in a randomized counterbalanced order. During each session, the subjects cycled at a power output corresponding to 50% of VO\(_2\)peak or 70% of VO\(_2\)peak. Duration of exercise was adjusted so that energy expenditure was equal between the 50 and 70% trials. Isotope infusion technique and indirect calorimetry were used to assess substrate utilization and glucose turnover during exercise. Rates of carbohydrate and lipid oxidation increased (p<0.05) during both the 50 and 70% trials. Rates of carbohydrate oxidation were greater (p<0.05) during the 70 than 50% trial. However, rates of lipid oxidation were similarly between the two trials. No differences in rates of carbohydrate and lipid oxidation were observed between N and C. Rates of hepatic glucose production (R\(_a\)) and plasma glucose utilization (R\(_d\)) increased (p < 0.05) during exercise and the increases were similar between the 50 and 70% trials. R\(_a\) did not differ between N and C. However, R\(_d\) was greater (p < 0.05) in N than C. Plasma glucose concentration decreased (p<0.05) in N, with the decrease being similar between the 50 and 70% trials. In contrast, plasma glucose concentration remained unchanged during either the 50 or 70% trial in C. In conclusion, exercise results in a greater increase in plasma glucose utilization in patients with NIDDM compared to normal individuals and this increase mediates the decline in plasma glucose concentrations in patients with NIDDM. Under isocaloric condition, the changes in plasma glucose utilization and plasma glucose concentrations are similar during exercise of varying intensities. Despite greater glucose utilization, carbohydrate and fat oxidation are similar between the two groups and their relations to exercise intensity are not altered by NIDDM.