The oxidation of proteins, fat, carbohydrates (CHO), plasma and exogenous glucose, glucose released by the liver, and muscle glycogen was measured in five healthy male subjects (36.0 $\pm$ 4.7 yo; 182 $\pm$ 6.0 cm; 87.3 $\pm$ 12.5 kg; mean $\pm$ SE) during a 120-min period of tethered treadmill walking (3.5 kg) with ski poles (3.7 km/h, 0 % slope: VO2 = 1.17 $\pm$ 0.08 L/min; heart rate 85-95 bpm) following a 500-kcal breakfast and with ingestion of 1.5 g/kg of 13C-glucose during the exercise. Measurements were made before and after a 20-day 415-km ski trek (energy expenditure [EE] about 5000 kcal/day) using a tracer technique combined with indirect respiratory calorimetry, from urea excretion in urine, gas exchanges at the mouth, and 13C/12C in expired CO2 and in plasma glucose. Before the ski trek, over the last 90 min of exercise, protein oxidation (9.5 $\pm$ 0.3 g) contributed 8.3 % to the EE, while fat and CHO oxidation (105.7 $\pm$ 7.5 and 9.1 $\pm$ 2.3 g) provided 75.6 and 15.9 %, respectively. Plasma glucose was the main source of CHO oxidized (75.8 $\pm$ 7.2 g, providing 55.1 % of EE), and the oxidation of exogenous glucose (39.0 $\pm$ 3.0 g and 28.2 % of EE), glucose released from the liver (36.8 $\pm$ 7.4 g and 26.9 % of EE) and muscle glycogen (36.6 $\pm$ 4.9 g and 25.2 % of EE) were similar. Following the ski trek the contributions of protein, fat and CHO oxidation were not significantly modified (9.2 $\pm$ 1.0, 7.9 $\pm$ 1.8 and 96.5 $\pm$ 4.4 g and 8.7, 15.5 and 75.7 % of EE). Exogenous glucose oxidation was also similar (37.3 $\pm$ 2.7 g and 29.3 % of EE). However, a reduction in the oxidation of plasma glucose (53.5 $\pm$ 2.6 g and 42.1 % of EE), due to a marked reduction in the oxidation of glucose released from the liver (16.2 $\pm$ 2.1 g and 12.8 % of EE), was observed, while the oxidation of muscle glycogen increased (43.0 $\pm$ 3.5 g and 33.6 % of EE). Both before and after the ski trek, in response to glucose ingestion plasma glucose concentration increased (final value: 6.8 $\pm$ 0.3 and 6.6 $\pm$ 0.4 mmol/L), while plasma FFA and glycerol concentrations decreased. The response of plasma insulin concentration to the glucose load was blunted after the ski trek. These results show 1) that fuel selection during prolonged exercise at low workload performed in fed subjects with ingestion of glucose during the exercise period is markedly different from that observed in the fasted state (Romijn et al. Am J Physiol 265:E380,1993) with a major contribution of CHO oxidation both from exogenous and endogenous origin; and 2) that in this situation following a 3-week period of prolonged low intensity exercise, fuel oxidation is slightly modified with an increase in muscle glycogen oxidation (possibly because of higher muscle glycogen stores) and a reduction in the oxidation of glucose released from the liver (possibly because of an inhibition of liver glycogenolysis due to an increased insulin sensitivity).