
Previous studies have demonstrated that the isolated epithelial cells (epi) from adult rats is appropriate for in vitro measurement of insulin-stimulated glucose transport. We tested the efficacy of longitudinally-splitting the epi muscle in 6 mo-old male Fisher 344 rats (body wt 335.5 g) to increase muscle sample number available for glucose transport determinations. We compared glucose transport rate utilizing 2-deoxyglucose (2-DG) of intact muscles (102.6 mg/g) to contralateral split strips (53.6 mg/g). Mean glucose transport (umol/g/15 min) was not significantly different for intact vs. split epi muscles, respectively: 0.116 vs. 0.110 (P = 0.383 vs. 0.316 [200]). Calculated ED50 for insulin was similar in intact and split epi. There was a strong correlation (r = 0.92, p < 0.027) between the treatment mean glucose transport of intact vs. split muscles. These data suggest that a longitudinally-split epi muscle from an adult rat is appropriate for in vitro measurement of insulin-stimulated glucose transport.


Chromium picolinate (CrP) may enhance insulin action in vivo. Biotin (B), an inducer of glutathione expression, has also been postulated to contribute to glucose metabolism. Human skeletal muscle culture (HSMC) was incubated with CrP, B, alone or in combination. 2-deoxyglucose uptake was assessed to evaluate the effects of these nutrients on carbohydrate metabolism. Specifically, incubations of HSMC with CrP (0.5 or 10 μM) and B (0, 10, or 50 μg/ml) were conducted for 24 h. Cells were then washed and stored at −70°C for 1 week. Assay was performed with 25 μM 2-DG in approximately 75% confluence and then both basal and insulin-stimulated glucose uptake studies were conducted. Results showed increasing in insulin-stimulated glucose uptake compared to control were shown in the table below:

| Treatment | Glucose Uptake (mg/g)
|-----------|------------------|
| B alone | 12 ± 2
| CrP 10 μM | 15 ± 2
| CrP + B | 18 ± 2
| CrP 10 μM + B | 19 ± 2


2-Deoxyglucose (2-DG) is a potent anti-metabolite, which has been shown to induce cell cycle arrest in normal hepatoma and epithelial to transformed malignant cells. It is believed that these effects are the result of inhibited glucose uptake and glycolysis by 2-DG. We present here evidence that 2-DG also affects pentose cycle metabolism. HepG2 cells were incubated with 5 mM (1.25 μM) glucose in the presence or absence of 1 mM 2-DG. Oxidation of [1-14C]glucose by G6PDH produces c-m isolated and the action of transketolase and transaldolase leads to the formation of ribose. The transketolase reaction is expressed (expressed in molar fractions) and forms (forms) the intermediate of glycogen glycogenesis. These data suggest that 2-DG inhibits cell proliferation through the inhibition of pentose cycle reactions, which contribute to ribose and the indirect pathway of glycogen synthesis. Supported by PO1 CA2701


AICAR (5-aminoimidazole-4-carboxamide 1-β-D-ribofuranoside) has been shown to stimulate AMP-activated protein kinase (AMPK) and increase glucose uptake in normal animals. To determine the effect of AICAR in animals with insulin resistance and diabetes, this study was conducted in high-fed insulin resistant (HF, on diet for 7 weeks) and streptozotocin-diabetic diabetic (STZ, 38 mg/kg) rats. In chronically cannulated rats whole body glucose uptake was assessed using glucose clamp techniques. Following an overnight fast the animals were infused with somatostatin (1.2 μg/kg), 1.8 μM glucose (in HF rats) and 3.5 μM glucose (STZ rats) to suppress the endogenous glucose production rate and basal rates of the hormones. Fifteen minutes after the onset of the hormone infusion, vehicle (sodium citrate) or AICAR (1.75 mg/kg) was infused for 75 min. Blood glucose concentrations were measured every 5 min and damped at euglycemic (60 mg/kg in HF rats) or hyperglycemic (270 mg/kg in STZ rats) levies via infusion of glucose solutions before and during the clamps were not different between the vehicle and AICAR groups (n=5/group). Glucose infusion rates during steady state (last 30 min) of the clamps were markedly greater in the AICAR groups (15±1.0 mg/kg/min in HF rats and 21±3.1 mg/kg/min in STZ rats), respectively. Blood lactate levels during the clamp were not different between the vehicle and AICAR groups. However, lactate levels during the steady state of the clamps were 3.7- and 3.9-fold higher (p<0.001) in AICAR-infused HF and STZ groups compared to their vehicle groups. In conclusion, infusion of AICAR significantly increased whole body glucose uptake and blood lactate in both resistant and diabetic rats, suggesting increased glucose transport and anaerobic glycolysis in these animals.


Studies in animal models suggest that ovarian hormone deficiency is associated with the development of insulin resistance. The effect of the menopause transition on insulin sensitivity in humans, however, is unclear. Thus, we measured insulin-stimulated glucose disposal in 43 middle-aged, premenopausal (mean age 49±7 years) and 40 early postmenopausal (51±4 years; time since menopause 21±13 months) to examine the effect of menopausal status on insulin sensitivity. Insulin-stimulated glucose disposal, a proxy measure of insulin sensitivity, was determined by euglycemic hyperinsulinemic clamp. Total and regional body composition by dual energy x-ray absorptiometry and abdominal fat distribution by computed tomography. No menopause-related differences in total or appendicular fat-free mass were found. Total body (P=0.01), subcutaneous abdominal (P=0.05) and intraperitoneal (P<0.01) adiposity were greater in postmenopausal compared to premenopausal women. No difference in insulin-stimulated glucose disposal was found between premenopausal and postmenopausal women on an absolute basis (pre: 435±130 vs. post: 448±120 mg/min) when expressed relative to fat-free mass (pre: 17.6±7.3 vs. post: 18.4±7.5 mg/kg FFM/min) or when statistically adjusted for fat-free mass (pre: 435±125 vs. post: 448±125 mg/min). We conclude from these results that menopausal status does not effect insulin sensitivity.

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