

ABSTRACT

**Effect of dietary energy source on in vitro substrate utilization and insulin sensitivity of muscle and adipose tissues of Angus and Wagyu steers**

*R D Rhoades<sup>1</sup>, J E Sawyer, K Y Chung, M L Schell, D K Lunt, S B Smith*

<sup>1</sup>Department of Animal Science, Texas Agricultural Experiment Station, Texas A&M University, College Station, TX 77843, USA.

Angus (n = 8; 210 kg of BW) and 7/8 Wagyu (n = 8; 174 kg of BW) steers were used to evaluate the effects of dietary energy source on muscle and adipose tissue metabolism and insulin sensitivity. Steers were assigned to either a grain-based (corn) or hay-based (hay) diet and fed to similar final BW. At slaughter, LM and s.c. and i.m. adipose tissue samples were collected. Portions of the LM and adipose tissues were placed immediately in liquid N for later measurement of glycolytic intermediates. Fresh LM and s.c. and i.m. adipose tissues were incubated with [U-(14)C]glucose to assess glucose metabolism in vitro. All in vitro measures were in the presence of 0 or 500 ng/mL of insulin. Also, s.c. and i.m. adipose tissues were incubated with [1-(14)C]acetate to quantify lipid synthesis in vitro. Glucose-6-phosphate and fructose-6-phosphate concentrations were 12.6- and 2.4-fold greater in muscle than in s.c. and i.m. adipose tissues, respectively. Diet did not affect acetate incorporation into fatty acids (P = 0.86). Insulin did not increase conversion of glucose to CO<sub>2</sub>, lactate, or total lipid in steers fed hay but caused an increase (per cell) of 97 to 110% in glucose conversion to CO<sub>2</sub>, 46 to 54% in glucose conversion to lactate, and 65 to 160% in glucose conversion to total lipid content in adipose tissue from steers fed corn. On a per-cell basis, s.c. adipose tissue had 37% greater glucose oxidation than i.m. adipose (P = 0.04) and 290% greater acetate incorporation into fatty acids than i.m. adipose (P = 0.04). Insulin addition to s.c. adipose tissue from corn-fed steers failed to stimulate glucose incorporation into fatty acids, but exposing i.m. adipose tissue from corn-fed steers to insulin resulted in a 165% increase in glucose incorporation into fatty acids. These results suggest that feeding hay limited both glucose supply and tissue capacity to increase glucose utilization in response to insulin without altering acetate conversion to fatty acids. Because s.c. adipose tissue consistently utilized more acetate and oxidized more glucose than did i.m. adipose, these results suggest that hay-based diets may alter i.m. adipose tissue metabolism with less effect on s.c. adipose tissue.