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Enzyme location does not affect global glycolytic rate in resting smooth muscle cells

There is considerable evidence that the enzymes of glycolysis are organized within the cytoplasm of a variety of cells including vascular smooth muscle cells (VSMC). We have identified that caveolin-1 (cav-1) serves as a scaffold for localization of some glycolytic enzymes to the plasma membrane. We have previously reported that either decreasing cav-1 expression by siRNA resulted in displacement of phosphofructokinase (PFK) from the membrane to the cytoplasm (Biochemistry 43(51): 16224-32) and that overexpression of cav-1 with increased cav-1 localization to the plasma membrane resulted in increased localization of PFK and aldolase to the plasma membrane (J. Cellular Biochemistry 2006 in press). We have reported a compartmentation of glycolysis and a portion of gluconeogenesis in VSMC and that separate membrane domains were responsible for the compartmentation (AJP: Cell 47: C803-811). To determine whether the redistribution of glycolytic enzymes resulting from cav-1 overexpression resulted in alterations in glycolytic or gluconeogenic flux or an alteration of the compartmentation of the two pathways, we performed 13C-NMR on VSMC provided with 5 mM 2-13C-glucose and 5 mM 1-13C-fructose-1,6-bisphosphate. We found that the rate of lactate production from glucose (glycolysis) and the rate of glucose production from fructose-1,6-bisphosophate (gluconeogenesis) did not significantly change indicating that global rates of these pathways were unaltered and the compartmentation of the pathways was not disrupted despite significant changes in enzyme localization with cav-1 overexpression. We conclude that under resting conditions glycolytic enzyme localization does not alter global flux of glycolytic metabolism.