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The effect of butyric acid on insulin signaling genes in Preadipocytes and hepatocytes

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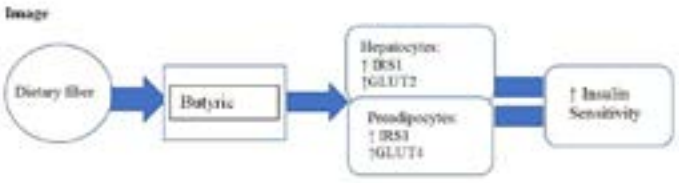
Type 2 diabetes mellitus (T2DM) affects millions globally and costs billions of dollars annually. A greater understanding of dietary components that prevent or ease the symptoms of the disease would help the growing number of people who suffer its effects. Butyric acid is a fatty acid that can be fermented from fiber by encouraging the growth of beneficial intestinal bacteria. In mice and intestinal cell culture studies, butyric acid has been shown to increase insulin sensitivity at the level of gene expression. Since little or no work has been done to show the effects of butyric acid on gene expression in human cells, our lab determined the effects on hepatocytes or preadipocytes in vitro. Using quantitative PCR, we determined the changes in expression of insulin receptor substrate-1 (IRS1) and glucose transporter 2 (GLUT2) on insulin-shocked THLE-2 human liver cells exposed in vitro to 0.05, 0.1, and 1.0 mg/ml butyric acid. We also determined the effects of this fatty acid on IRS1 and GLUT4 in human preadipocytes at the same concentrations. In human hepatocytes, IRS1 and GLUT2 were increased in expression by levels of butyric acid similar levels found to be nontoxic in humans while IRS1 and GLUT4 were both upregulated in preadipocytes. Results suggest that altering the human diet to encourage the fermentation of butyric acid could increase insulin sensitivity in those with T2DM or aid in the prevention of the disease.



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Biography

Lisa Maness is an Assistant Professor at Winston-Salem State University in the Clinical Laboratory Science Department in NC, USA. In addition to teaching Microbiology, Biochemistry, and other clinical laboratory classes, she mentors students in researching the molecular mechanisms of T2DM, focusing on the influence of fatty acids on this pathway. She also serves the community of Winston-Salem, NC, along with colleagues and students, in hopes of decreasing the widespread effects of this disease. In addition, she has performed studies with patient volunteers to determine how patients with T2DM can benefit from personalized medicine using information about single nucleotide polymorphisms, lab parameters, and family history.

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