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Studying the effect of Western diet on atherosclerosis risk factors

Eric L. Scott

Virginia Commonwealth University, scotte4@vcu.edu

Rebecca Segal

Virginia Commonwealth University, rasedal@vcu.edu

Angela M. Reynolds

Virginia Commonwealth University, areynolds2@vcu.edu

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Studying the effect of Western diet on atherosclerosis risk factors
Eric Scott
Abstract

Atherosclerosis is a disease characterized by the buildup of cholesterol plaque in blood vessels, leading to increased risk of cardiac events as blood flow is restricted. Lipopolysaccharides (LPS), while found naturally in the gut, can stimulate an inflammatory response when moved into general circulation which can exacerbate the risk factors of atherosclerosis. Under normal conditions, intestinal alkaline phosphatase (IAP) detoxifies LPS, preventing it from entering circulation. A high-fat diet such as the Western Diet can introduce high levels of LPS which overwhelm this interaction.

We use ordinary differential equation (ODE) modeling to study the effect of the Western Diet on the systemic factors that contribute to atherosclerosis. This model includes dynamics in the Gut involving IAP and LPS with and without the effects of Western Diet. It also accounts for changes in gut permeability, which affect levels of circulating LPS when on a Western Diet. The model is fit to available experimental data for pre-and post-diet Wild Type (WT) mice, IAP Transgenic (IAPTg) mice and IAP Knockout (IAPKO) mice, which express normal levels of IAP, high levels of IAP, or no IAP, respectively. We then use the model to evaluate the effect of modulating IAP on circulating LPS.