



Virginia Commonwealth University
VCU Scholars Compass

Biology and Medicine Through Mathematics
Conference


A Mathematical Framework to Augment Metrics of Small Intestinal Health

Cara J. Sulyok
University of Tennessee, Knoxville, csulyok@vols.utk.edu

Judy Day
University of Tennessee, Knoxville

Suzanne Lenhart
University of Tennessee, Knoxville

Follow this and additional works at: <https://scholarscompass.vcu.edu/bamm>

 Part of the [Dynamic Systems Commons](#), [Life Sciences Commons](#), [Medicine and Health Sciences Commons](#), and the [Ordinary Differential Equations and Applied Dynamics Commons](#)

<https://scholarscompass.vcu.edu/bamm/2020/talk/11>

This Event is brought to you for free and open access by the Dept. of Mathematics and Applied Mathematics at VCU Scholars Compass. It has been accepted for inclusion in Biology and Medicine Through Mathematics Conference by an authorized administrator of VCU Scholars Compass. For more information, please contact libcompass@vcu.edu.

A Mathematical Framework to Augment Metrics of Small Intestinal Health

Cara J. Sulyok, Judy Day, and Suzanne Lenhart

University of Tennessee, Knoxville

csulyok@vols.utk.edu

Celiac disease is a hereditary autoimmune disease that affects approximately 1 in 133 Americans. After ingesting the protein gluten, a patient with celiac disease may experience a range of unpleasant symptoms while small intestinal villi, essential to nutrient absorption, are destroyed in an immune response. The only known treatment for this disease is a lifelong gluten-free diet and there is currently no drug treatment.

This preliminary work provides a mathematical framework to better understand the dynamics of cell populations in the small intestine after a single transient immune activation such as exposure to gluten in celiac disease. Using this construct, the modeled cell populations can be related to diagnostic methods for celiac disease. By investigating the timing of destruction and repair, the model will be able to analyze various theories behind the progression of this disease by capturing the dynamics of a healthy subject and a patient with celiac disease, including the effects of repeated immune activation. By doing so, we can suggest potential therapies to mitigate the negative effects of celiac disease without invasive procedures