Modeling of Humoral Immune Response to Repeated Influenza A Virus Infections

Abbiana Arenas  
Nova Southeastern University, aa1318@nova.edu

Safiyah Muhammad  
Nova Southeastern University

Ly Nguyen  
Nova Southeastern University

Samita Andreansky  
University of Miami

Evan Haskell  
Nova Southeastern University, haskell@nova.edu

Follow this and additional works at: https://nsuworks.nova.edu/cnso_math_facpres

Part of the Mathematics Commons, and the Medicine and Health Sciences Commons

NSUWorks Citation
Arenas, Abbiana; Muhammad, Safiyah; Nguyen, Ly; Andreansky, Samita; and Haskell, Evan, "Modeling of Humoral Immune Response to Repeated Influenza A Virus Infections" (2015). Mathematics Faculty Proceedings, Presentations, Speeches, Lectures. 366. https://nsuworks.nova.edu/cnso_math_facpres/366
Modeling of Humoral Immune Response to Repeated Influenza A Virus Infections

Abbiana R. Arenas¹, Safiyah Muhammad¹, Ly Nguyen¹, Samita Andreansky², Evan C. Haskell¹

¹ Division of Math, Science, & Technology, Farquhar College of Arts and Sciences, Nova Southeastern University, haskell@nova.edu
² Department of Pediatrics, Microbiology, Immunology, and Medicine, Miller School of Medicine, University of Miami

Keywords: Humoral Immunity, Influenza A Virus, Mathematical Modeling. Seasonal infections by Influenza A virus (IAV) causes hundreds of thousands of deaths worldwide each year, with most individuals being infected multiple times throughout their lifetimes. The relative impact of the components of the host immune system in controlling the severity and duration of repeated challenges from an IAV infection remains unclear. In particular, the differential contribution of the humoral immune response in primary and secondary challenges from IAV are relatively little explored.

We develop a parsimonious mathematical model of the humoral immune response to IAV infection with biologically meaningful and identifiable parameters. We show the relative sensitivity of the viral load and antibody response to dynamics of B cell proliferation and antibody production. We relate immunoglobulin class switching to a CD4⁺ T-cell driven process for the formation of humoral memory. Results of this study help to illuminate the relative contribution of CD4⁺ T-cells, B-cells, and antibody in the control of IAV infection and formation of humoral memory.

Funding for this project provided through the Nova Southeastern University President’s Faculty Research and Development Grant No. 335321.

References
