

Biographical Sketch

Name: Stanca M. Ciupe	Title: Associate Professor
Email: stanca@vt.edu	Department: Mathematics

Education/Training:

Institution/Location	Degree/Postdoc	Year(s)	Field of Study
University of Michigan	Ph.D	2000-2005	Applied and Interdisciplinary Mathematics
Los Alamos National Labs	Postdoc	2005-2006	Theoretical Biology
Duke University Medical Center	Postdoc	2006-2009	Biostatistics

Personal Statement:

My research focuses on development, analysis and validation of mathematical models that describe immune system responses to viral diseases such as human immunodeficiency virus, hepatitis B virus, dengue virus and equine infectious anemia virus. Besides modeling virus-host interactions, I am investigating possible homeostatic mechanisms that regulate lymphocyte population size and T cell receptor diversity, the immune deficiencies that lead to diabetes, and the use of dynamical systems to model archeological data. The mathematical questions associated with my research range from the study of existence and positivity of solutions of systems of ordinary and delayed differential equations, to conducting local and global stability analysis of steady state solutions, to determining conditions for the emergence of bi-stable solutions, to optimization techniques involved in data fitting, to analysis of the sensitivity of models to changes in parameters and errors in data measurements, and finally, to questions regarding model validation. Biologically, I aim to determine the individual and combined contributions of cellular and antibody immune responses in protection against viral infections, the host-virus mechanisms responsible for transitions from acute to chronic disease, and the determination of the values of unknown parameters.

Selected Publications:

1. JE Forde, SM Ciupe, A Cintron-Arias, and S Lenhart. [Optimal control of drug therapy in a hepatitis B model.](#) *Applied Sciences*, 6:1–18, 2016.
2. A Leber, V Abedi, R Hontecillas, M Viladomiu, S Hoops, SM Ciupe, J Caughman, T Andrew, , and J Bassaganya-Riera. [Bistability analyses of CD4+ T follicular helper and regulatory cells during Helicobacter pylori infection.](#) *J Theor Biol*, 398:74–84, 2016.
3. R Nikin-Beers and SM Ciupe. [The role of antibody in enhancing Dengue Virus Infection.](#) *Math Biosci*, 263: 83-92, 2015.
4. SM Ciupe. [Mathematical model of multivalent virus-antibody complex formation in humans following acute and chronic HIV infections.](#) *J Math Biol*, 71: 513-532, 2015.
5. SM Ciupe, RM Ribeiro, and AS Perelson 2014, [Antibody responses during Hepatitis B viral infection.](#) *PLoS Comput Biol*, 10: e1003730, 2014.
6. SM Ciupe and E Schwartz 2014. [Understanding virus-host dynamics following EIAV infection in SCID horses.](#) *J Theor Biol*, 343:1–8, 2014.
7. SM Ciupe, BH Devlin, ML Markert, and TB Kepler. [Quantification of total T-cell receptor diversity by flow cytometry and spectratyping.](#) *BMC Immunol*, 14:1–12, 2013.
8. SM Ciupe and S Hews. [Mathematical models of e-antigen mediated immune tolerance and activation following prenatal HBV infection.](#) *PLoS One*, 7:e39591, 2012.

9. SM Ciupe, P De Leenheer, and TB Kepler 2011. [Paradoxical suppression of broadly neutralizing antibodies in the presence of strain specific antibodies during HIV infection](#). *J Theor Biol*, 277: 55–66, 2011.
10. SM Ciupe, RM Ribeiro, PW Nelson, G Dusheiko, and AS Perelson. [The role of cells refractory to productive infection in acute hepatitis B viral dynamics](#). *Proc Natl Acad Sci USA*, 104: 5050–5055, 2007.

Current and/or Recently Completed Research Grants: (as applicable)

Agency: Simons Foundation	Grant Number: 427115	PI: Stanca M. Ciupe	Dates: 09/16-08/21
Title: Modeling the immune responses to viral infections			
During the duration of this travel/collaboration grant we will develop, investigate, and validate against clinical data mathematical models of innate and adaptive immune responses to viral infections such as HIV/SIV, hepatitis B and dengue viral infections.			
Agency: NSF	NSF DMS-1214582	PI: Stanca M. Ciupe	Dates: 09/10-08/14
Title: Understanding the antibody responses following Human Immunodeficiency Virus infection			
The goal of the proposal was to develop, analyze and validate against human and animal data mathematical models of antibody responses to acute and chronic HIV infections. We have investigated (1) the role of competition between poly-specific and strain-specific neutralizing antibodies in viral escape; (2) the characteristics of virus-antibody immune complexes during early HIV infection; (3) the differences between cellular and humoral immunity during acute hepatitis B infection; (4) the possible protection due to antibody infusion in SCID horses infected with EIAV.			