1086-92-2530 **Courtney L Davis*** (courtney.davis2@pepperdine.edu), **Rezwanul Wahid**, **Franklin R Toapanta**, **Marcelo B Sztein** and **Doron Levy**. *Applying Mathematical Tools to Accelerate Shigella Vaccine Development.*

We establish a mathematical framework for studying immune interactions with Shigella, a dysentery-causing bacteria that kills over one million people worldwide each year. The long-term goal of this approach is to inform Shigella vaccine design by elucidating which immune components and bacterial targets are crucial for establishing Shigella immunity. Our delay differential equation model focuses on antibody and B cell responses directed against antigens like LPS in Shigella's outer membrane. We find that antibody-based vaccines targeting only surface antigens cannot elicit sufficient immunity for protection. Additional boosting prior to infection would require a four-orders-of-magnitude increase in antibodies to sufficiently prevent epithelial invasion. However, boosting anti-LPS B memory can confer protection, which suggests these cells may correlate with immunity. An extension of the model reveals that targeting both LPS and epithelial entry proteins is a promising avenue to advance vaccine development. This work introduces mathematical models to the Shigella vaccine development effort and lays a foundation for joint theoretical/experimental/clinical approaches to Shigella vaccine design. (Received September 25, 2012)