VISUALIZING IMMUNE SYSTEM DATA TO DEVELOP NEW TREATMENTS AND VACCINES

Viruses and bacteria that infect the respiratory tract are a leading cause of death worldwide, despite advances in antibiotics and vaccines. At the University of Rochester, our history of vaccine development is responsible for saving hundreds of thousands of lives each year around the world. Today, we are using data science innovation to gain new insights into how the immune system works to reduce the global burden of respiratory pathogens and develop more effective treatments and vaccines.

Two studies in the laboratory of David J. Topham, PhD are focusing on respiratory infections in those who are most vulnerable—our children. Respiratory syncytial virus (RSV) is a common and contagious respiratory infection and the world's second largest cause of death in children under one year of age. This is because the immune system of infants is still developing. Our studies have revealed novel mechanisms that protect infants from the burden of RSV and respiratory disease. These outcomes are made possible by scientists working across the University with the Health Sciences Center for Computational Innovation (HSCCI) and VISTA Collaboratory. Powerful computational and data visualization tools of the HSCCI allow Topham and his team to process and visualize complex data—on 8' x 20' computer screens—and determine the factors that put some infants at risk for severe respiratory infection and hospitalization. Their findings will help pediatricians triage high-risk babies to prevent the life-threatening development of severe disease caused by respiratory infections.

Microscopic imaging and data science have also helped research teams understand how flu evades our current vaccines and how immune cells move in the body to combat the infection. We are turning this data into 3D models to better understand how flu changes and escapes the immune system. As director of the New York Influenza Center of Excellence—one of only five National Institutes of Health funded flu centers—Topham is also trying to make flu vaccines more efficient by investigating why they fail. This knowledge will be key to developing a universal flu vaccine to diminish the major public health threat of flu epidemics.

With your philanthropic support, we will improve our knowledge of the basis of infection and immunity and develop new treatments and preventions that will have a global impact on health.

> " It has been said that the immune system is both the cause of and the solution to all disease. We are working with scientists from many disciplines to combine biology with imaging and computational tools, analyze high volumes of data, and make discoveries about how and why the immune system works the way that is does to reduce the impact of disease and infection around the world. "

DAVID J. TOPHAM, PHD
Vice Provost and Executive Director of Health Sciences Center for Computational Innovation
Marie Curran Wilson and Joseph Chamberlain Wilson Professor of Microbiology and Immunology

MAKE A DIFFERENCE

There are a number of ways in which you can make an impact. You can invest in people—talented computer science and data science students and fellows who are helping us develop powerful tools to better understand data—or in pilot projects which can be leveraged many times over to merit additional external funding. **To learn more, please contact Dianne Moll at 585-273-5506 or diane.moll@rochester.edu.**

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