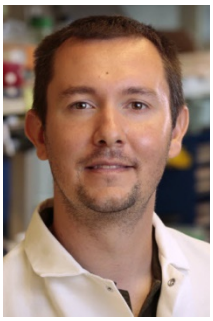
THE HARTWELL FOUNDATION

2015 Individual Biomedical Research Award

Justin J. Taylor, Ph.D.

Assistant Member
Vaccine and Infectious Disease Division

Fred Hutchinson Cancer Research Center



Providing Life-Long Protection Against Respiratory Syncytial Virus Infection without a Vaccine

Respiratory syncytial virus (RSV) is a leading cause of severe respiratory illness in young children, particularly infants with chronic lung disease, congenital heart disease or born prematurely. The U.S. Centers for Disease Control and Prevention reports that RSV infections cause 2 million medical visits each year, resulting in 60,000 hospitalizations and 200 deaths of children under the age of five. Nearly every U.S. child is infected with RSV before their 2nd birthday; but because the initial infection does not induce a fully protective immune response, children are also often reinfected with RSV year-after-year. Fortunately, the symptoms of RSV infection are reduced in older children and adults. However, the reduction in severity is not life-long. A medication called Synagis® that acts by neutralizing RSV is the only known way to protect against RSV. The active ingredient is an antibody called palivizumab, which is produced by recombinant DNA technology. To maintain protection against RSV the medication must be administered monthly. Unfortunately, an extremely high manufacturing cost combined with the short duration of effectiveness of the medicine has severely limited its use to those children with the highest risk for severe infection. An alternative approach would be to develop a vaccine, one that can induce a patient's immune system to produce a lifetime supply of antibodies that neutralize RSV; but all attempts to develop an effective vaccine against RSV have been unsuccessful. To address the unmet need for robust and long-lasting protection against RSV, Justin proposes a radically different strategy. Using cutting-edge genetic engineering, he aims to reprogram a small population of antibody producing B-cells to cease production of native DNA-encoded antibodies by inserting DNA that encodes the palivizumab antibody. He hypothesizes that the presence of palivizumab expressing B-cells would protect against RSV infection for life. His approach represents a significant departure from classic vaccine design because it doesn't rely on the chance production of a neutralizing antibody in the patient, but instead forces a small number of a patient's own B-cells to generate a precise antibody known to neutralize RSV. Once injected, the B-cell response should only take a few days, which efficiently surpasses months of booster injections necessary for a vaccine. Moreover, the strategy is not restricted to RSV. In theory, it is possible to express antibodies protective against virtually any pathogen with just a single blood draw and subsequent cell infusion a few days later. If successful, Justin's paradigm would eliminate the need to develop vaccination strategies for many life-threatening infections; an approach that should enable life-long protection against RSV for every child.