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Each year, millions of infants and young children experience disproportionate morbidity and mortality from seasonal respiratory viruses, such as influenza and respiratory syncytial virus (RSV), as compared to older children and adults. At present, there are no specific therapeutic or immunization strategies to improve the poor outcome to respiratory infections seen in pediatric patients. Before we can improve on existing vaccinations and anti-viral medications used in children, we need a better fundamental understanding of how respiratory immunity develops in pediatric patients. The overall goal of this project is use a novel analysis of fluid from the upper respiratory tract of pediatric patients with respiratory viral infections complemented by infant mouse models of influenza infection to determine the mechanisms for impaired respiratory immune function in infants and young children. Information from these studies will allow for future development of new immunotherapeutic and vaccination strategies specifically targeting deficiencies in the function of pediatric immune cells.

Short term objectives (for this pilot study):
Aim 1: Use a novel sampling approach to assay for lung immune responses in infants with respiratory viral infection. We hypothesize that endotracheal fluid, routinely suctioned from mechanically ventilated patients, will provide a unique portal to the respiratory environment in critically ill pediatric patients and will therefore be enriched in T cells involved in anti-viral immune responses compared to peripheral blood during respiratory tract infection.

Aim 2: Evaluate how immune responses to respiratory viral infection are impaired in infant mice and approaches to augment these in situ. We hypothesize that lung-resident T cell responses in infant mice will be impaired in effector function compared to adults, and that specific boosting of the lung-resident response will improve the outcome of infant respiratory infections.

Long term objectives: Our ultimate goal for this project is to transform the knowledge gained from these pilot studies into pioneering treatment and prevention strategies that address the unique properties of infant respiratory immunity.