



Research: Impact of Aging on Innate and Adaptive Immune Responses to Primary Influenza Infection and Secondary Pneumococcal Pneumonia

Lead Scientist(s): Heather Stout-Delgado, Ph.D.

Disease/Condition: Influenza and Pneumonia in the Elderly

Influenza viral infections are responsible for annual epidemics that cause severe morbidity and mortality annually in approximately 5 million people worldwide. Although influenza infection alone may lead to pneumonia, secondary bacterial infections during and shortly after recovery from influenza infections are more common. Secondary bacterial pneumonia is a serious complication during and shortly after primary influenza infection, with higher incidences occurring in immune-compromised populations, such as the elderly. Severity of secondary bacterial pneumonia is characterized by a complex interaction between virus, bacteria, and host innate immune responses. With lethal pneumonia becoming an increasingly significant cause of morbidity and mortality in the aging population, there is an urgent need to improve our understanding of the complex interaction among virus, bacteria, and host immune mechanisms. As the innate immune response is the first line of defense against pathogens, it is imperative to elucidate how aging modifies innate immunity and contributes to viral persistence and increased susceptibility to secondary bacterial infections.

Researchers at LRRRI have been investigating the impact of aging on innate immune responses to influenza A and development of bacterial pneumonia. Using elderly animal models, our recent studies demonstrate that, similar to humans, elderly mice have increased weight loss and higher clinical scores during influenza A infection when compared to young adult mice. Further, when compared to young adult mice, elderly mice have decreased cellular infiltration of immune cells, increased viral load in the lung on days 2, 5, and 8, and increased incidence of pneumonia during influenza A infection. Additionally, elderly mice have increased morbidity as well as increased numbers of bacteria present in the lung during secondary bacterial infection with *Streptococcus pneumoniae* (ATCC 6303). This animal model will allow us to examine the mechanisms by which aging alters innate responses during respiratory infections and allow us to investigate new therapies to augment these responses in elderly hosts.