# Immune System Innovation: Ushering in a New Era of Immunology Research by Characterizing Cell Populations Most Impacted by Normal Microbial Exposure for Preclinical Research and Healthcare Treatment Development Success

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Mus musculus (mice) are often used to model the human immune system and to develop healthcare treatments because mouse immunology accurately recapitulates many aspects of the human immune system. However, differences between the immune systems of lab mice and the true human immune system may decrease the predictive power of treatments developed in mice. One limitation of using mouse models to study human immune conditions is the relative immune immaturity of laboratory mice. Immune maturity is a key component in any organism's ability to resist disease and infection. This project aims to redefine treatments geared towards infant human immune systems by showing that normal microbial exposure (NME) mice, which have undergone microbial exposure from conception, have an accelerated immune development relative to their specific pathogen free (SPF) counterparts and thus more accurately model human immune development. For this work, tissue samples from 120 mice were characterized. The hypothesis was supported, indicating that the use of SPF conditions for laboratory mice in preclinical and research studies leaves the immune systems of infant mice underdeveloped and far different from those found in human infants. The data presented herein further demonstrated that infant NME mice develop elevated profiles of numerous immune components during different stages in development and better reflect human infant immunity. Applying Listeria monocytogenes challenges or sepsis challenges to NME mice in the future will demonstrate the physiological changes associated with the changed immune composition. This work is critical in advancing immunology research and accurately developing preclinical healthcare treatments.

**Awards Won:**
Third Award of $1,000