Plan Overview

A Data Management Plan created using DMPTool

DMP ID: https://doi.org/10.48321/D1KK84

Title: Heterogeneity in function of parenchymal and airway neutrophils during pneumonia induced by S. pneumoniae

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Template: NIH-Default DMSP

Project abstract:

Bacterial pneumonias remain important clinical problems with major morbidity and mortality. S. pneumoniae is the most common cause of community-acquired pneumonias and an important cause of ARDS and post-viral bacterial pneumonias. The lung's immune response is critical to clearance of S. pneumoniae, repair of the lung tissue, and return to homeostasis. Neutrophils are the first immune cell to be recruited during bacterial infections. Their nature as a double-edged sword is well documented, and they are recognized as both beneficial cells required for effective host defense and destructive cells that induce parenchymal damage. They can secrete mediators that are also beneficial or destructive to the immune response. Our studies have addressed many aspects of neutrophil kinetics and function and document the numerous ways in which neutrophils vary and can be categorized, based on cytokine production, surface markers, transcriptomes, age, or many other criteria, each of which describes the range of functions that neutrophils can perform. Our scRNAseq/CITEseq studies have shown that parenchymal neutrophils in lung digests are transcribing numerous differentially expressed genes (DEGs) compared to airway neutrophils and in fact form discrete clusters identified by UMAP analysis. Furthermore, parenchymal neutrophils form two clusters, whereas airway neutrophils form nine clusters. In healthy lungs, the lungs contain almost no neutrophils. During infections, neutrophils migrate from the pulmonary capillaries into the lung parenchyma. Some then migrate into the airways. This proposal focuses on comparison of parenchymal and airway neutrophils to understand the progression of changes and the functional effects of these changes, testing the hypothesis that there is a progression of changes that underlie both the beneficial and damaging effects of neutrophils. Aim 1 will determine the transcriptomic and functional differences between parenchymal and airway neutrophils, testing hypotheses about the progression and plasticity of neutrophils as they enter and function in the airspace from the parenchyma. Aim 2 will determine the function of SiglecF+ neutrophils, testing the hypothesis that SiglecF+ neutrophils facilitate bacterial clearance and repair. Aim 3 will compare the transcriptomes of re-clusters of parenchymal and airspace neutrophils to test hypotheses that 1) transcriptomes predict the progression of neutrophils between re-clusters

and between microenvironments as they encounter and develop within the lung parenchyma; 2) that airway neutrophils differ in their function and show less plasticity as they become defined; and 3) that some have primarily beneficial functions in repair and resolution, whereas others show more functions that lead to poor repair. These studies will advance our knowledge of innate immune mechanisms and may help to clarify the responses and behaviors of neutrophils that are beneficial or destructive, the ultimate goal being to dampen therapeutically the damaging behaviors.

Start date: 07-01-2024

Last modified: 02-02-2024

Heterogeneity in function of parenchymal and airway neutrophils during pneumonia induced by S. pneumoniae

In this proposed project, data will be generated via the following methods: flow cytometry, sequencing, ELISAs, assays of cell function, spatial biology. The data will come primarily from in vivo studies using mice. The data will be primarily in a tabular format. The protocols vary with the experiment. We estimate that the total size of data collected will be 1000 GB.

In this proposed project, the cleaned, item-level spreadsheet data for all variables will be shared openly, along with example quantifications and transformations from initial raw data. Final files used to generate specific analyses to answer the Specific Aims and related results will also be shared. The rationale for sharing only cleaned data is to foster ease of data reuse.

To facilitate the interpretation and reuse of the data, a README file and data dictionary will be generated and deposited into a repository along with all shared datasets. The README file will include method description, instrument settings, RRIDs of resources such as antibodies, model organisms, and other tools. The data dictionary will define and describe all variables in the dataset.

No specialized tools, software, and/or code are needed to access or manipulate shared scientific data.

Formal standards have not yet been widely adopted. However, our data and other materials will be structured and described according to best practices.

Gene expression data will be stored at GEO. Any other data will be stored at UNC Odum Institute, UNC's institutional repository.

GEO and my institutional repository provide searchable study-level metadata for dataset discovery. Data will be discoverable online through standard web search of the study-level metadata as well as the persistent pointer from the DOI to the dataset or through contact with the investigator.

All scientific data generated from this project will be made available as soon as possible, and no later than the time of publication or the end of the funding period, whichever comes last. The duration of preservation and sharing of the data will be a minimum of 10 years after the funding period.

There are no anticipated factors or limitations that will affect the access, distribution or reuse of the scientific data generated by the proposal.

Controlled access will not be used. The data that are shared will be shared by unrestricted download.

Not applicable.

Lead PI Claire Doerschuk, ORCID: 0000-003-2638-3321, will be responsible for the day-to-day oversight of lab/team data management activities and data sharing. Broader issues of DMS Plan compliance oversight and reporting will be handled by the PI and research team as part of general campus stewardship, reporting, and compliance processes.

Planned Research Outputs

Data paper - "To be determined."

Planned research output details

Title	Type	Anticipated release date	Initial access level	Intended repository(ies)	Anticipated file size	License	Metadata standard(s)	May contain sensitive data?	May contain PII?
To be determined.	Data paper	Unspecified	Open	None specified		None specified	None specified	No	No