

The University of Colorado invites applications for a Postdoctoral Research Fellow position within the Cardiovascular and Pulmonary Research Program focusing on pioneering Pulmonary Hypertension (PH) research. This program focuses on uncovering novel pathogenetic processes linking pulmonary vascular inflammation, remodeling, and molecular underpinnings of pulmonary vascular lesions in PH. This position offers the opportunity to engage in groundbreaking research aimed at identifying new biomarkers and developing more effective, individualized treatments.

Project Overview:

The project is based on the hypothesis that activation of the complement system—a critical component of the innate immune response—plays a pivotal role in the initiation and progression of PH. This systemic activation results in local inflammation and vascular remodeling, characteristics that are central to the pathogenesis of PH. The research aims to dissect the molecular mechanisms by which the complement system influences these pathological changes and to explore targeted therapeutic strategies that could mitigate these effects. The work utilizes many mouse, rat, and large animal models to investigate various etiologies of PH.

Specific Research Objectives:

1. Complement Activation and Pulmonary Vascular Remodeling:

- Investigate how complement activation contributes to vascular inflammation and remodeling in PH. This includes studying the activation patterns of complement in animal models and human tissue samples to understand its role at different stages of the disease. This involves using advanced techniques such as spatial transcriptomics, single cell sequencing.
- Utilize genetically modified animal models to delineate the role of specific complement components in the development of PH.

2. Biomarker Identification:

- Develop methodologies to identify biomarkers of complement activation in blood and lung tissues. These biomarkers will help in diagnosing PH at an early stage and in monitoring disease progression or response to therapy.

3. Translational Applications:

- Translate findings from animal models to human PH by examining complement activation in explanted human lungs and peripheral blood samples. This will help in validating potential therapeutic targets and biomarkers in a clinical setting.
- Evaluate novel therapeutic approaches targeting complement activation, such as site-specific complement inhibitors, which could provide more effective treatment options with fewer side effects than current systemic therapies.

4. Innovative Methodologies:

- Employ advanced technologies such as single-cell RNA sequencing (scRNA-Seq) and mass cytometry (CyTOF) to analyze immune cell populations and their functional states in the context of complement activation.
- Use proteomic and transcriptomic analysis to understand the changes induced by complement activation in the pulmonary vascular environment.

Collaborative Environment:

The postdoc will work within a multidisciplinary team comprising experts in pulmonary vascular biology, complement biology, immunology, and proteomics. This collaborative setting is designed to foster innovative approaches and rapid translation of research findings from bench to bedside.

Expected Outcomes:

- Detailed characterization of the role of the complement system in various forms of PH.
- Identification of novel biomarkers for early detection and progression monitoring of PH.
- Development and pre-clinical testing of targeted therapies that could revolutionize the treatment landscape for patients with PH.

This position represents a unique opportunity for a postdoctoral researcher to engage in high-impact research that bridges fundamental immunology and clinical application, potentially leading to significant advancements in the treatment and understanding of pulmonary hypertension.