Postdoctoral Position in System Immunology and Cell Engineering at the University of Pennsylvania

Location: University of Pennsylvania, Integrative Immunology and Cell Design Laboratory

The Integrative Immunology and Cell Design Laboratory at the University of Pennsylvania is recruiting postdoctoral fellows to join our growing and dynamic team. Our research integrates high-throughput T cell antigen discovery (TScan-I, TScan-II, TCR-MAP), single-cell genomics, and synthetic biology to unravel how T cells recognize and respond to self and foreign antigens in autoimmunity, cancer, and infectious diseases. We have pioneered genome-scale antigen discovery platforms (Cell 2019, Cell 2023, Nature Biotechnology 2024) that have illuminated key antigenic drivers of immune responses. Building on this foundation, we seek to expand these platforms and couple them with advanced immunogenomic and proteomic tools to comprehensively map the antigenic landscape of B and T cells. Our ultimate goal is to define the molecular determinants of immune recognition and tolerance, thereby identifying novel therapeutic targets for autoimmunity, cancer, and infectious diseases.

Research Areas

1. Autoimmunity & Tolerance

- Defining T-reg cell antigens to uncover mechanisms of immune tolerance
- Profiling tissue-infiltrating T cells in Type 1 Diabetes (T1D), immune-related adverse events (irAEs), Sjögren's disease (SjD), and other autoimmune conditions
- Investigating how checkpoint inhibitor therapy influences autoimmune manifestations

2. Cancer Immunotherapy

- Utilizing scRNA-seq and scTCR-seq to analyze tumor-infiltrating lymphocytes in pancreatic and other solid tumors

- Identifying neoantigens, self-antigens, viral epitopes, and non-canonical peptides that shape antitumor immunity
- Collaborating with clinical and industry partners to translate findings into adoptive T cell therapies and cancer vaccines

3. Tool & Platform Development

- Engineering platforms for the discovery of antigens recognized by pools of primary $CD4^+$ and $CD8^+$ T cells
- Expanding TScan libraries to include full-length human ORFeomes for post-translationally modified (and non-canonical epitope discovery
- Integrating machine learning to predict TCR specificity and cross-reactivity from large-scale mutagenesis datasets

Key Responsibilities

- Design and perform high-throughput T cell antigen discovery screens using TScan platforms and CRISPR-based approaches
- Conduct single-cell multi-omics (e.g., scRNA-seq, scTCR-seq) to elucidate T cell phenotypes and clonality
- Collaborate with bioinformatics and machine learning experts to analyze large-scale datasets
- Present research findings at lab meetings, conferences, and in peer-reviewed publications
- Mentor junior scientists and foster a collaborative, innovative lab environment

What the Lab Offers

- A rigorous, interdisciplinary environment at the intersection of immunology, genomics, proteomics, and computational sciences
- State-of-the-art facilities for high-throughput library construction, single-cell experimentation, and immunopeptidomics
- Access to collaborations with top-tier immunologists across the US, clinician-scientists, and computational experts for broad translational impact
- Opportunities to publish in high-impact journals, pursue independent research projects, and receive tailored mentorship for academic and/or industry career paths.
- Ph.D. (or near completion) in Immunology, Molecular Biology, Bioengineering, Computational Biology, or a related field
- Proven experience in T cell immunology, high-throughput screening, single-cell analytics, or similar domains

- Strong computational/bioinformatics skills (R, Python, machine learning) are highly desirable
- Demonstrated creativity, self-motivation, and effective collaboration skills supported by peer-reviewed publications or preprints

How to Apply:

Interested candidates should email the following to:

Mo Haj-Dezfulian, PhD, " Mohammad.Hajdezfulian@PennMedicine.upenn.edu

":

1. Cover Letter detailing research interests, relevant skills, and career objectives

2. CV

3. Contact information for three references (letters will be requested as needed, following applicant consent)

4. Summary of a significant publication or project that highlights your contributions and insights

Link: https://www.med.upenn.edu/i3h/faculty-profile/9852271