Abstract #66 | Poster

NFDI4Immuno: A shared database for immunology research data

A. Kadam[1], B. Budeus[1]

[1] *Uniklinikum Essen, Institute of Cell Biology, Essen, Germany*

Background:

Rapidly increasing data volumes inspire a need to handle data reliably. With that, strategies to support data scaling, transformation for downstream analysis, secure storage with efficient retrieval, and institutional cross-compatibility are direly needed. The Nationale Forschungsdateninfrastruktur for Immunology (NFDI4Immuno) is a federal consortium established in 2023 that aims to build a single, interconnected data infrastructure for immunological data in Germany. It is funded by the German federal and state governments and encompasses a total of 10 institutions.

Objectives: Building a FAIR compliant National Immunological Data Infrastructure

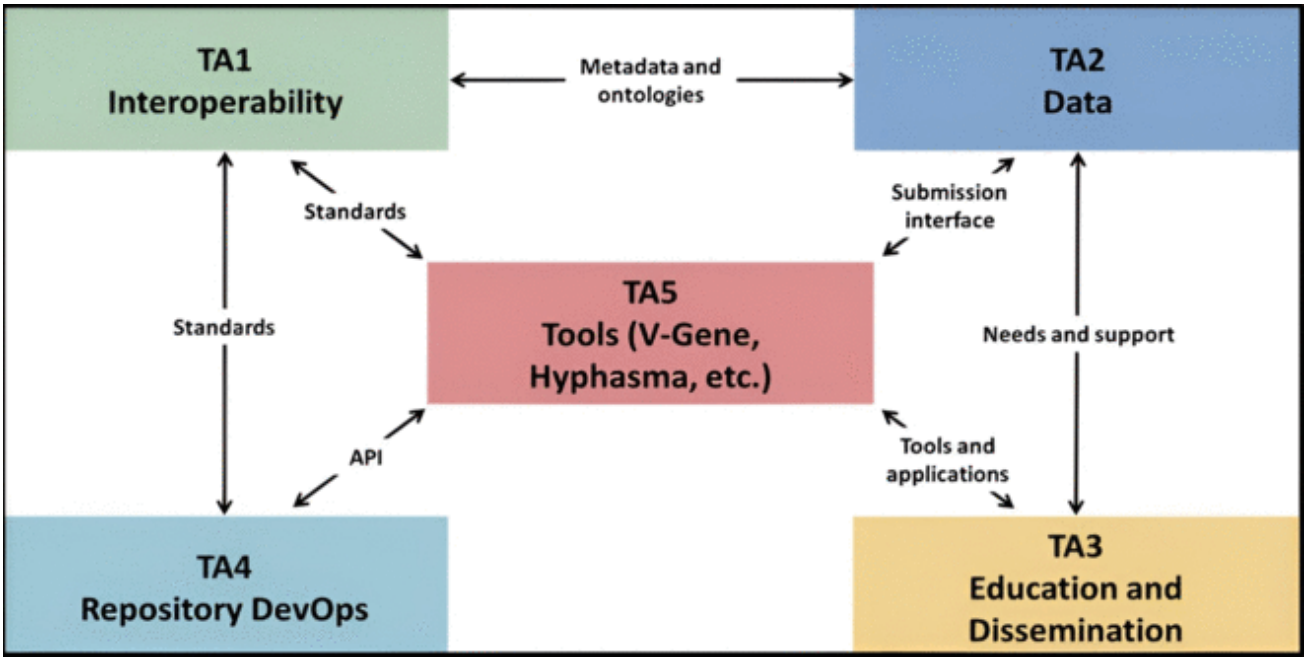
The consortium builds robust metadata models and automated data pipelines to support Adaptive Immune Receptor Repertoire sequencing (AIRR-seq) data and plans to further expand into other data types. All datasets adhere to FAIR principles, i.e., research data should be Findable, Accessible, Interoperable and Reuseable, fostering open science and immunological data sharing within the German community and abroad. These goals are realized by i) providing high-quality annotated datasets which follow community standards for metadata and data representation (Task Areas 1 & 2); ii) operating reliable repositories and services to support an evolving landscape of standards (Task Areas 3 and 4); iii) enabling the community to utilize these resources for their own research by providing tools, iv) documentation, and training (Task Areas 3 & 5).

Implementation: V-Gene for B-Cell Receptor analysis

One of the key software products developed within the consortium is V-Gene, a first-of-its-kind tool for analyzing bulk targeted DNA sequencing data of B-cell receptors (BCR) generated from the Invivoscribe *IGH* kit. While most existing tools focus on RNA-based analysis, V-gene performs end-to-end DNA-based BCR analysis comprising quality control, V(D)J assignment, clonal group inference, and lineage reconstruction.

Conclusion:

By standardizing metadata models, deploying automated pipelines such as V-Gene, and using community-oriented solutions, the NFDI consortium not only establishes a sustainable foundation for immunological data management and analysis, but also accelerates discovery by enabling collaborative, data-driven research that transcends institutional and national boundaries.



NFDI4Immuno consortium structure