### Overview

#### Introduction:

The Immunology Database and Analysis Portal (ImmPort) ( <https://www.immport.org/home>) repository aims to be a trustworthy data resources as an essential component of the research enterprise focusing on immunological research.  ImmPort offers support to the community by providing resources including secure, reliable, and scalable computing systems and infrastructure to operate the data repository; long term archival and data preservation; integration and curation of disparate data sets and data types in specific domains and across clinical, laboratory and computational areas; data sharing, data management, and dissemination following the FAIR Data Principles - Findability, Accessibility, Interoperability and Reusability; development of and adherence to standards and best practices for data collection, presentation and exchange; and training in deposition and use of data and tools. To achieve its mandate of FAIR data sharing, ImmPort transforms the shared data into a more user-friendly resource to enable reuse of the data to gain new insights and findings to advance immunology research. To date, ImmPort has shared 482 studies encompassing various data types and organisms. Further, ImmPort repository has participant level data from 145 clinical trials that are openly available for reuse (<https://immport.org/shared/search?filters=clinical_trial:Y>).

#### Clinical trial datasets for use:

* Use case 1: Dataset with clinical data elements:
  + [SDY1544](https://www.dev.immport.org/shared/study/SDY1544) - LEA29Y (Belatacept) Emory Edmonton Protocol (LEEP) (CIT-04) and Extended Follow Up after Islet Transplantation in Type 1 Diabetes (CIT-08)
  + There is no associated publication
  + Dataset has demographic and clinical information.
* Use case 2: Dataset with clinical and mechanistic data elements:
  + [SDY998](https://www.immport.org/shared/study/SDY998) - AMP Rheumatoid Arthritis Phase 1
  + Dataset has demographic and clinical information along with mechanistic study files.
  + Associated publications:
    1. Methods for high-dimensional analysis of cells dissociated from cryopreserved synovial tissue, Arthritis research & therapy, 2018, 20(1), 139, PMID: [29996944](http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=29996944)
    2. Defining inflammatory cell states in rheumatoid arthritis joint synovial tissues by integrating single-cell transcriptomics and mass cytometry, Nature Immunology, 2019, 20(7), 928-942, PMID: [31061532](http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=31061532)
    3. HBEGF+ macrophages in rheumatoid arthritis induce fibroblast invasiveness, Science translational medicine, 2019, 11, 491, [31068444](http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=31068444)
    4. PD-1hiCXCR5- T peripheral helper cells promote B cell responses in lupus via MAF and IL-21, JCI insight, 2019, 4, 20, [31536480](http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=31536480)

Machine readable data is available via ImmPort API: <https://docs.immport.org/#API/DataQueryAPI/dataqueryapi/>

#### Scenario:

* Retrieve study metadata and associated data via API or from website
* All Immport studies are searchable using study metadata API
* Assess FAIRness of the metadata/data using the RDA FAIR data maturity Indicators
* Convert metadata/data into FHIR standard
* Assess FAIRness of the metadata/data again using the RDA FAIR data maturity Indicators
* Analyze changes to FAIRness (if any)

### Initial Assessment of FAIRness using the RDA FAIR Maturity Indicators

To understand the FAIRness of this resource prior to the implementation of FHIR, we mapped the RDA FAIR indicators to the ImmPort resource at the study level using two datasets defined above.

Dataset SDY1544 is a clinical trial study with no associated study files and no mechanistic data, and dataset SDY998 is a clinical research study with associated study files and mechanistic data such as RNAseq, CyTOF (mass cytometry) and flow cytometry.  In summary, ImmPort as a resource is relatively FAIR and, as such, satisfied most of the indicators for the findability (7/7) and accessibility (11/11).  For interoperability and reusability, the studies satisfied 7/12 and 7/10 indicators, respectively.

| Dataset | Findable | Accessible | Interoperable | Reusable | Comments |
| --- | --- | --- | --- | --- | --- |
| SDY1544 | 7/7 | 11/11 | 11/12 | 7/10 |  |
| SDY998 | 7/7 | 11/11 | 11/12 | 7/10 |  |

### Mapping of ImmPort metadata into FHIR resources

In an effort outside of this implementation guide, ImmPort has planned to improve its interoperability by mapping the FHIR resources to the ImmPort data model.  In addition, ImmPort clinical data will also be transformed and disseminated in the FHIR format.  After the FHIR implementation and data transformation, it is expected that ImmPort will see an improvement in the interoperability and reusability category, which is consistent to the assessments from other scenarios in this implementation guide.

### References

FAIR Data Maturity Model Working Group (2020). FAIR Data Maturity Model: specification and guidelines. Research Data Alliance. DOI: 10.15497/RDA00050