

Plan Overview

A Data Management Plan created using HKUL DMPTool

Title: Development of mRNA-based Vaccines Against *Pseudomonas aeruginosa* and *Bordetella pertussis*

Creator: Anqi Xu

Affiliation: The University of Hong Kong

Principal Investigator: Anqi Xu

Data Manager: Anqi Xu

Template: HKU Template

Project abstract:

This project investigated the application of mRNA-based vaccine platforms against two clinically important bacterial pathogens, *Pseudomonas aeruginosa* and *Bordetella pertussis*. Conventional vaccine strategies for these pathogens face challenges such as antigenic variability, weak cellular immunity, and poor mucosal protection. The study focused on the rational design and evaluation of mRNA constructs encoding engineered bacterial antigens, aiming to induce functional and broadly protective immune responses. Research activities included computational antigen design and structural prediction, in vitro transcription and expression validation in mammalian cells, lipid nanoparticle formulation, and immunogenicity and protective efficacy testing in mouse models. The dataset comprises protein and nucleotide sequence files, structural prediction models, agarose gel and western blot images, ELISA antibody titre data, opsonophagocytic killing assay results, toxin neutralisation assay data, ELISPOT counts, flow cytometry data, bacterial burden measurements, body weight records, and survival curves. These data provide a resource for the development of next-generation antibacterial mRNA vaccines and for antigen engineering and delivery strategies targeting respiratory bacterial pathogens.

Start date: 11-28-2024

End date: 08-31-2026

Last modified: 08-19-2026

Copyright information:

The above plan creator(s) have agreed that others may use as much of the text of this plan as they would like in their own plans, and customize it as necessary. You do not need to credit the creator(s) as the source of the language used, but using any of the plan's text does not imply that the creator(s) endorse, or have any relationship to, your project or proposal

Development of mRNA-based Vaccines Against *Pseudomonas aeruginosa* and *Bordetella pertussis*

Data Collection

What data will you collect or create?

This project will generate the following types of data: (i) nucleic acid and protein sequences downloaded from public databases (NCBI, UniProt) and synthetic constructs designed in-house; (ii) in vitro experimental data such as agarose gel images, Western blot images, fluorescence microscopy images, ELISA absorbance readings, and cell culture records; (iii) in vivo immunological data including serum antibody titres, opsonophagocytic killing percentages, pertussis toxin neutralisation titres, IFN- γ ELISPOT counts, flow cytometry data, bacterial burden counts (CFU), body weight measurements, and survival curves; (iv) statistical analysis scripts and derived numerical results.

How will the data be collected or created?

Data will be generated through standard laboratory procedures described in the thesis. Computational data will be produced using online platforms (AlphaFold, codon optimization tools) and saved as digital files. Experimental data will be recorded from instruments (e.g., plate readers, flow cytometers, gel imagers) as raw files and organized into datasheets.

Documentation and Metadata

What documentation and metadata will accompany the data?

Dataset will be accompanied by a README file describing the experimental context, sample identifiers, reagents, animal ethics approval number, instrument settings, and file naming conventions. Laboratory notebooks will provide detailed protocols. Analysis scripts will be documented with comments. Key metadata (e.g., antibody clones, dilution factors, challenge strains) will be recorded alongside raw data to enable future reuse.

Ethics and Legal Compliance

How will you manage any ethical issues?

No human subjects or human personal data are involved. All animal experiments were approved by

the Committee on the Use of Live Animals in Teaching and Research (CULATR), The University of Hong Kong (Approval No. 5918-21), and conducted in accordance with institutional and international animal welfare guidelines. Any cell lines used (HEK 293T, CHO-K1, HL-60) are commercially obtained and used for research purposes only.

How will you manage copyright and Intellectual Property Rights (IP/IPR) issues?

All original data generated in this project are owned by The University of Hong Kong according to institutional IP policy. Sequences downloaded from public databases (NCBI, UniProt) are used under their respective access conditions and will be cited appropriately. If data are deposited in public repositories, a Creative Commons Attribution (CC BY) license will be applied unless a patent filing or commercial collaboration requires a more restrictive license.

Storage and Backup

How will the data be stored and backed up during the research? i. e. until stored in the final location (e.g. on your password protected laptop)?

All research data will be stored on the researcher's personal laptop computer. Data will be organised in a dedicated project folder structure with consistent file naming conventions. To protect against data loss, a portable external hard drive will be used for routine backups. The external hard drive will be stored separately from the laptop when not in use to reduce the risk of simultaneous loss due to theft, fire, or hardware failure.

How will you manage access and security?

The laptop computer and external hard drive are protected by a strong password. Access to the research data is restricted solely to the researcher. Antivirus software will be kept up to date, and operating system security updates will be applied regularly. No unpublished or sensitive data will be transferred to third parties without prior approval from the supervisor.

Selection and Preservation

Which data are of long-term value and should be retained, shared, and/or preserved?

The following data have long-term scientific value and will be retained: (i) final optimized sequences and structural models of vaccine constructs; (ii) all processed data underlying figures and tables in the thesis and publications; (iii) representative original images (Western blots, gels, microscopy); (iv) statistical analysis scripts; and (v) the thesis itself. Data that are purely preliminary

or have no further analytical value, such as failed experiments without scientific insight, may be discarded after discussion with the supervisor.

What is the long-term preservation plan for the dataset?

Key datasets will be deposited in HKU DataHub after publication. Raw data files will be converted to open, non-proprietary formats. The repository will assign a persistent identifier (DOI).

Data Sharing

How will you share the data?

Processed data supporting publications will be made openly available as supplementary material or via a public repository at the time of publication. The repository deposit will include a README file and metadata to facilitate reuse. Data underlying the thesis will be shared through the HKU DataHub after thesis submission. The corresponding author will handle requests for additional data.

Are any restrictions on data sharing? If yes, Why?

Raw data related to unpublished or patentable findings may be subject to an embargo period to allow for patent filing or further analysis. Data from animal experiments will be shared in accordance with ethical guidelines and institutional policy. Any third-party proprietary materials will not be shared without permission.

Responsibilities and Resources

Who will be responsible for data management?

The researcher is primarily responsible for day-to-day data management, including data entry, backup, and organization. The supervisor will oversee data management practices and ensure compliance with HKU policies. The HKU Libraries will provide guidance on data deposition and preservation.

What resources will you require to deliver your plan?

The following resources are required: (i) sufficient storage space in the HKU DataHub repository for long-term preservation and sharing of the final dataset (estimated data volume <50 GB), which will be provided by the HKU Libraries; (ii) an encrypted external hard drive for routine local backups during active research (already available).

