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# **Data Storage, Collaboration, and HPC Resources at reNEW, UCPH**

## **Introduction**

Biomedical research at **reNEW – The Novo Nordisk Foundation Center for Stem Cell Medicine, UCPH,** is data-intensive, often involving large imaging datasets, sensitive patient information, and complex analyses. Effective **Research Data Management (RDM)** ensures data security, meets legal and ethical obligations (including GDPR compliance), and supports high-quality, reproducible science.

A critical component of RDM is **data storage management** throughout the **Research Data Lifecycle**. Each stage—from planning to archiving—requires careful consideration of storage infrastructure, data privacy, security protocols, and collaboration needs, especially in projects that involve personal data or multi-institutional teams.

This guide provides an overview of best practices and the University of Copenhagen (UCPH) facilities supporting data storage, sharing, and high-performance computing (HPC) tailored to the needs of biomedical researchers at reNEW.

## **The Research Data Lifecycle and Storage Management**

At reNEW, researchers must ensure that **storage planning and security measures** are integrated at every stage of the data lifecycle:

### **1. Plan & Design Stage**

Develop a **Data Storage Plan** outlining:

* Storage options
* Backup strategies
* Access controls
* Data classification and risk assessment (mandatory before data collection)  
   This ensures that legal, ethical, and security requirements are addressed immediately.

### **2. Collect & Create Stage**

As you acquire or generate data (e.g., imaging, genomic, patient-derived data), consider:

* Secure data transfer and ingestion
* Protection of sensitive information
* Version control and documentation
* Compliance with **UCPH Information Security Policy** and GDPR

### **3. Analyze & Process Stage**

Data analysis can require:

* Updated storage and backup strategies
* High-performance or specialized storage for large-scale analyses
* Security controls to prevent unauthorized access
* Traceable workflows for reproducibility

### **4. Evaluate & Archive Stage**

At project completion:

* Choose suitable repositories (e.g., Zenodo, Dataverse) for sharing
* Plan long-term preservation to ensure access and transparency.
* Consider confidentiality and ethical sharing of sensitive dat.a

## **Information Security and GDPR Compliance**

Handling **personal or sensitive data** is common in biomedical research. Researchers at reNEW must:

* Comply with the [**General Data Protection Regulation (GDPR)**](https://kunet.ku.dk/work-areas/research/data/personal-data/Pages/default.aspx)
* Adhere to UCPH’s [**Information Security Policy for Researchers**](https://informationssikkerhed.ku.dk/english/is-policy/)
* Apply appropriate access controls, encryption, and secure transmission protocols.
* Conduct [**data classification**](https://kunet.ku.dk/work-areas/research/data/information-security-for-researchers/Pages/default.aspx#collapseMSOZoneCell_WebPartWPQ6) **and** [**risk assessments**](https://kunet.ku.dk/work-areas/research/data/personal-data/impact-assessment/Pages/default.aspx) before data collection.
* Use only approved UCPH infrastructure for sensitive data.

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## **UCPH Data Storage and Collaboration Solutions**

Below is a summary of UCPH facilities suited to various data types and collaboration needs:

### **Personal Drive**

* For individual use ([Windows](https://kunet.ku.dk/work-areas/research/data/facilities-for-data-storage-and-sharing-in-active-projects/Pages/default.aspx#collapseMSOZoneCell_WebPartWPQ8)/[Linux](https://kunet.ku.dk/work-areas/research/data/facilities-for-data-storage-and-sharing-in-active-projects/Pages/default.aspx#collapseMSOZoneCell_WebPartWPQ14))
* Suitable for small amounts of non-sensitive research data
* Not designed for sharing with collaborators

### **Shared Network Drive -** [**Windows**](https://kunet.ku.dk/employee-guide/Pages/IT/Network-drives.aspx?searchHitHighlight=network%20drives) **/** [**Linux**](https://kunet.ku.dk/work-areas/research/data/facilities-for-data-storage-and-sharing-in-active-projects/Pages/default.aspx#collapseMSOZoneCell_WebPartWPQ14)

* For collaboration among UCPH employees
* Ideal for research groups needing shared access
* Not suitable for storing sensitive or personal data

### **S-Drive (**[**Shared Drive for Sensitive Data**](https://kunet.ku.dk/employee-guide/Pages/IT/S-drive.aspx)**)**

* Designed for sharing sensitive data among designated UCPH users
* Complies with GDPR
* Suitable for storing and sharing confidential or personal data internally

### **Microsoft** [**OneDrive**](https://kunet.ku.dk/work-areas/research/data/facilities-for-data-storage-and-sharing-in-active-projects/Pages/default.aspx#collapseMSOZoneCell_WebPartWPQ7) **for Business**

* Cloud storage meeting UCPH security standards for **non-sensitive data**
* Up to 5TB for sharing with colleagues and external partners
* Covered by a data processing agreement with Microsoft
* Recommended cloud solution (note: Dropbox and other providers do *not* have such agreements with UCPH)

### [**ERDA**](https://www.erda.dk/) **(Electronic Research Data Archive)**

* Managed by the HPC Center, Faculty of Science
* Centralized storage, archiving, and synchronization service
* Ideal for non-sensitive research data

### **Sensitive Information Facility (**[**SIF**](https://sif.ku.dk/)**)**

* For storing and sharing **sensitive information**, including personal data
* Enables secure sharing with UCPH and external partners
* Requires GDPR compliance and pre-approval
* Currently provided by the SCIENCE HPC Center; expansion to all UCPH researchers under consideration.

### [**DATA DOI**](https://kunet.ku.dk/work-areas/research/data/data-sharing/data-doi) **Service**

* Built on ERDA
* Open to all UCPH employees for data sharing.
* Facilitates assigning DOIs to datasets for findable, citable research outputs

## **UCPH Policy for Research Data Management**

Section 2.5.3 of the [**UCPH Policy for Research Data Management**](https://kunet.ku.dk/work-areas/research/data/Documents/UCPHPolicyforResearchDataManagement2022-EN.pdf) emphasizes:

* Choosing an appropriate, secure infrastructure
* Supporting collaboration while ensuring compliance with information security policies and legal requirements
* Protecting personal data in line with GDPR

Researchers at **reNEW** must carefully select solutions that meet their data sensitivity and collaboration needs while upholding UCPH policies.

## **High-Performance Computing (HPC) for Biomedical Research**

Biomedical research at reNEW often involves large-scale imaging analyses, computational modeling, and multi-omics integration that require **HPC resources**. UCPH offers access to both local and national HPC systems tailored to diverse research needs:

### **Key National HPC Systems Available to UCPH Researchers**

#### **Type 1 – Interactive HPC**

* Focus on interactivity and easy user access
* Includes **YouGene Cluster** hosted at UCPH (via UCloud)
* Supports iterative data exploration and analysis

#### **Type 2 – Throughput HPC**

* Optimized for high-volume data processing
* Systems include **Computerome 2.0**, **GenomeDK**, and **Sophia.**
* Suitable for large-scale, batch analyses

#### **Type 3 – Large Memory HPC**

* Designed for workloads needing large, globally addressable memory
* Hosted at UCPH
* Ideal for complex, memory-intensive biomedical simulations

#### **Type 5 – LUMI Capability HPC**

* Pan-European pre-exascale system
* Located in Finland (EuroHPC initiative)
* Suitable for cutting-edge, large-scale computational needs

### **Special Note: DanGPU HPC at reNEW**

* Owned by DanStem/reNEW, SUND, and KU
* Specialized GPU server for **image data analysis**
* Connects large datasets stored on KU-IT storage for advanced computation

## **Access and Support**

* **UCloud** provides a user-friendly interface for accessing many of these HPC resources, with guidance and application processes streamlined for researchers.
* Support is available via UCPH IT and the Faculty of Science HPC Center.