

NFDI4Microbiota – Letter of Intent for Renewal Proposal 2025

2025-06-18

1 Binding letter of intent as advance notification of a full renewal proposal

☒ Binding letter of intent (required as advance notification for renewal proposals in 2025)

2 Formal details

- Name of the consortium:

National Research Data Infrastructure for Microbiota Research

- Acronym of the consortium:

NFDI4Microbiota

- Applicant institution:

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Hannover Medical School, Institute for Medical Microbiology and Hospital Epidemiology	Hannover	00f2yqf98
Helmholtz Centre Potsdam - GFZ German Research Centre for Geosciences	Potsdam	04z8jg394
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University of Potsdam	Potsdam	03bnmw459
University of Regensburg	Regensburg	01eezs655
University of Tübingen	Tübingen	03a1kwz48

Network	Speaker	Location	GEPRIS
CRC 1182: Origin and Function of Metaorganisms	Prof. Dr. Hinrich Schulenburg	Kiel	261376515
CRC 1371: Microbiome Signatures - Functional Relevance in the Digestive Tract	Prof. Dr. Dirk Haller	Munich	395357507
CRC 1382: Gut-Liver Axis - Functional Circuits and Therapeutical Targets	Prof. Dr. Oliver Pabst	Aachen	403224013
CRC 1583: Decisions in Infectious Diseases (DECIDE)	Prof. Dr. Thomas Rudel	Würzburg	492620490
CRC 2330: New concepts in prokaryotic virus-host interactions - from single cells to microbial communities	Prof. Dr. Julia Frunzke	Jülich	441953848
EXC 2051: Balance of the Microverse	Prof. Dr. Kisten Küsel	Jena	390713860
EXC 2124: Controlling Microbes to Fight Infections (CMFI)	Prof. Dr. Andreas Peschel	Tübingen	390838134
EXC 2155: RESIST - Resolving Infection Susceptibility	Prof. Reinhold Förster	Hannover	390874280
SPP 2474: Illuminating gene functions of the human gut microbiome	Prof. Dr. Lisa Maier	Tübingen	TBA
Fraunhofer Cluster of Excellence Immune-Mediated Diseases (CIMD)	Prof. Dr. Dr. Gerd Geißlinger	Frankfurt am Main	-

Network	Speaker	Location	GEPRIS
Global Microbiome Conservancy	Prof. Dr. Mathieu Groussin	Kiel	-
Research Center One Health Ruhr	Prof. Dr. Alexander J. Probst	Duisburg, Essen	-
Microbial Community Database (MiCoDa)	Dr. Stephanie Jurburg	Leipzig	-

- Participant individual

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3 Objectives, work programme and research environment in the second funding period

Research area of the proposed consortium (according to the DFG classification system: www.dfg.de/subject-classification)

- 2.11-05 General Genetics and Functional Genome Biology
- 2.11-07 Bioinformatics and Theoretical Biology
- 2.12-03 Organismic Interactions, Chemical Ecology and Microbiomes of Plant Systems
- 2.13-03 Ecology and Biodiversity of Animals and Ecosystems, Organismic Interactions
- 2.21 Microbiology, Virology and Immunology
- 2.22-08 Pharmacy
- 2.22-31 Clinical Infectiology and Tropical Medicine

Concise summary of the consortium's main objectives and task areas

During the second funding phase, NFDI4Microbiota will continue its mission to make data, software, analytical workflows, and machine learning models FAIR (findable, accessible, interoperable, reusable) and open, thereby supporting microbiology researchers – including those working in bacteriology, virology, protistology, mycology, and parasitology – in translating their research data into a deeper understanding of microbial species. Contemporary microbiological research produces vast datasets, especially from high-throughput “omics” technologies, yet these data are often stored in unstructured formats or accompanied by minimal metadata, making them difficult to reuse. The consortium will address this challenge by mobilising, organising, and interlinking existing data to create a seamless, end-to-end data flow throughout the research process. In addition, it will provide data services, training and consultancy, drive the dissemination of standards, and foster a cultural shift toward robust research data management (RDM) practices in the microbiological research community. A key goal is to roll out the solutions developed during the initial funding phase across Germany's broader microbiology community. In parallel, the consortium will further develop its current services and introduce new ones based on community demand.

We will continue our work in the second funding phase with a similar but suitably adapted organisational structure consisting of the following task areas: **Task Area 1 - Community, Networking & Training** will focus on community engagement, networking, and training within microbiota research. It aims to build a supportive network and offer high-quality training for researchers at all career stages. A key approach in the second funding period is “NFDI Comes to You”, which will run tailored training events across Germany to enhance accessibility and identify specific community needs. Our helpdesk will play a crucial role in guiding researchers to make data FAIR. As well as professionalising support structures and implementing real-time support channels, we will continue to prioritise community engagement with outreach activities such as workshops and online

talks featuring microbiome experts. Collaboration with other NFDI consortia will be strengthened through joint projects and shared events. Internationally, strategic links with organisations such as the Genomic Standards Consortium (GSC) and EOSC will ensure alignment with global standards. Case studies will offer opportunities for community members to engage with NFDI4Microbiota's services through Community Incubators and Showcases, fostering collaboration and addressing RDM gaps. **Task Area 2 - From Bench to Repository: Data Standards & Integration** will continue to promote the adoption of RDM practices throughout the research cycle, providing comprehensive support to researchers and data producers within the microbiota community. This support includes making operating procedures available through a protocol market and developing tools for FAIR data sharing, such as a platform for standardised cultivation conditions. To enhance data interoperability and facilitate data sharing, a measure will be introduced to define, promote, and support community-driven standards for data, metadata, and analysis workflows in microbiological research. These standards will ensure full alignment with FAIR principles and technical interoperability across various disciplines and platforms. Implementing and continually updating best-practice recommendations for data processing is essential for enhancing the reproducibility and overall quality of research findings. This requires comprehensive assessment and benchmarking of computational methods against complex, realistic datasets. The transformation of data into AI-interpretable knowledge will be driven by ontologies and knowledge graphs, with the aim of enhancing data organisation and retrieval. To enable early, standards-compliant preservation and sharing of research data, this task area seeks to streamline data flow from generation facilities – such as sequencing and proteomics labs – to community-trusted repositories. Lastly, TA2 will address the increasing importance of legal and political frameworks affecting microbiological research. In **Task Area 3 - Services**, NFDI4Microbiota will provide the microbiology community with integrated services for data access and analysis, lowering technical barriers to standardised and reproducible research. Its Central Web Portal will serve as a single point of entry, offering microbiologists in Germany and beyond access to a diverse portfolio of resources. To meet evolving community needs, the consortium will continuously develop and maintain best-practice analytical workflows and services, further expanding its user-friendly suite of tools. It will strengthen the field's data foundations by creating new scientific databases, consolidating fragmented ones, and safeguarding at-risk resources, thereby improving and securing long-term access to microbial knowledge. NFDI4Microbiota will continue to work on the broad adoption of electronic lab notebooks (ELNs) and will champion open-source solutions. Furthermore, the consortium will aim to develop and implement an AI-driven metadata enrichment infrastructure for microbial omics entries, mining and structuring metadata from microbiological literature. As person-specific information becomes more prevalent in microbiome research, the consortium will devise solutions that ensure compliance with the GDPR and national regulations governing personal and sensitive data. **Task Area 4 - Technical Infrastructure** will establish the technical foundation for all NFDI4Microbiota services, supplying compute and storage resources to the other task areas and the community. Computational Infrastructure Operations and Software Components will manage and provide essential compute and storage capacities, including de.NBI cloud resources such as virtual machines, as well as trusted research environments and associated software. Furthermore, we aim to transform our data storage platform Aruna into a fully federated and distributed system, enabling distributed

data orchestration across multiple domains. Our Workflow Execution Platform (CloWM) addresses reproducibility, standardisation, and accessibility issues in life sciences data analysis and will be further developed to run best-practice workflows. The Base4NFDI and EOSC Service Integration measure will bolster federated research services by combining two key activities: integrating NFDI base services within the consortium and establishing a secure, interoperable infrastructure for federated services and cross-institutional collaboration. **Task Area 5 - Coordination & Communication** will maintain a functional governance structure for the consortium, establish its internal bodies, and integrate community input into its operations. This task area will encompass Project Governance, Project Financial Controlling & Reporting, as well as Dynamic Adaptation & Growth, including the continuation of our well-established FlexFund programme, which financially supports projects that contribute solutions aligned with NFDI4Microbiota's mission and promote long-term sustainability.

Brief description of the proposed use of existing infrastructures, tools and services that are essential in order to fulfil the planned consortium's objectives

NFDI4Microbiota is firmly rooted in the existing infrastructures, services, and tools developed by the applicants and the wider scientific community. These resources provide a solid basis for achieving the consortium's objectives of enabling FAIR, federated and reproducible microbiome research.

At the core of this infrastructure is the de.NBI Cloud, which operates mainly on large-scale, OpenStack-based infrastructures to provide scalable and secure computing and storage environments. As well as offering standard virtualised environments via OpenStack, these sites provide user-friendly access to SimpleVM and Kubernetes clusters, enabling flexible, container-based workflow execution across the federation.

The data infrastructure will be further strengthened by adapting and developing Aruna, a cloud-native data orchestration system that supports high-performance, versioned, metadata-driven storage and management of large-scale microbiome datasets. Aruna ensures that data remains findable, accessible, interoperable, and reusable (FAIR), while also supporting distributed access control and provenance tracking across institutional boundaries.

For workflow management and data analysis, the consortium will deploy the Cloud-based Workflow Manager (CloWM), a flexible and user-friendly platform for scalable workflow execution. CloWM enables researchers to design, share, and execute reproducible pipelines across different computing backends, thus supporting the scalable, standardised processing of microbiome data.

In addition to the infrastructure layer, NFDI4Microbiota will rely on a wide range of domain-specific services and databases. These include the DSMZ's Digital Diversity portfolio, encompassing essential microbial resources such as BacDive, LPSN, and SILVA – all recognised as Global Core Biodata Resources. Furthermore, services from EMBL and EMBL-EBI, including SPIRE, MGnify, and the European Nucleotide Archive (ENA) – Europe's largest sequencing data archive – are essential elements in ensuring integration with international standards and data exchange.

NFDI4Microbiota will also continue to promote the use of open-source electronic lab notebooks (ELNs), such as elabFTW and OpenBIS, within the microbiology community.

Interfaces to other NFDI consortia: brief description of existing agreements for collaboration and/or plans for future collaboration

NFDI4Microbiota is engaged in all NFDI sections and participates in most of their working groups and task forces, as well as in the communication and management circles. Inspired by the vision of "One NFDI", NFDI4Microbiota works closely with other consortia, primarily but not exclusively those in the life sciences. Together with NFDI4Biodiversity and DataPlant, NFDI4Microbiota founded the BioData Interest Group, which carries out coordinated activities in the areas of education and training, outreach and communication, user support, and the reuse and joint development of services, while also jointly addressing digital sequence information (DSI) activities at a policy level. In parallel, NFDI4Microbiota teamed up with GHGA, NFDI4BIOIMAGE and NFDI4Health to establish the BioMed Interest Group, an exchange platform that will continue to work synergistically on topics such as metadata standards and their implementation in the life sciences. In addition to these initiatives, DataPLANT, FAIRagro, GHGA, NFDI4Biodiversity, NFDI4BioImage, NFDI4Chem, NFDI4Earth, NFDI4Health, NFDI4Immuno, and NFDI4Microbiota work together in the Geo-Chem-Life Science Helpdesk Cluster, offering interdisciplinary consultancy for researchers whose projects span multiple scientific domains. Additionally, NFDI4Microbiota participates in multiple Base4NFDI projects, including KGI4NFDI, DMP4NFDI, PID4NFDI, MC4NFDI, and RDMTraining4NFDI, with members of the consortium frequently serving as the leading institutions.

4 International and national networking

Please describe your consortium's strategy for embedding its activities in the international and national context (e.g. the European Open Science Cloud). What forms of (inter)national cooperation does the consortium pursue?

NFDI4Microbiota cultivates and sustains collaborations at every level, from individual researchers to infrastructure providers and institutional stakeholders. During the first funding period, the consortium forged ties with key national and international life-science and data-infrastructure initiatives, with member researchers and institutions joining bodies such as the Genomic Standards Consortium, ELIXIR, and the Research Data Alliance (RDA). A connection to the European Open Science Cloud (EOSC) was established, and we contributed to discussions that paved the way for a German EOSC node. Productive collaborations and mutual feedback mechanisms for training programs and infrastructure services were developed with complementary projects such as the National Microbiome Data Collaborative (NMDC), the Next Generation Sequencing Competence Network, VIROINF, EVBC, The Carpentries, and other NFDI consorti. In addition, partnerships with de.NBI were established to expand technical infrastructure capacities, and collaborative exchanges were initiated with the Galaxy community. Since its inception, NFDI4Microbiota has been supported by five major microbiological societies: VAAM, GfV, DGHM, DGP, and DGfM. Representatives of NFDI4Microbiota regularly participate in their conferences and workshops to present solutions to the community and gather valuable feedback.

During the second funding period, NFDI4Microbiota will continue to deepen existing partnerships while pursuing additional strategic alliances. Key areas of collaboration include the co-development of international metadata standards (Schema.org/Bioschemas and GSC), continued involvement in the NFDI BioData and BioMed Interest Groups, and the consolidation of a core portfolio of services and training offerings that support the FAIRification of resources, analytical workflows, and training materials (CloWM, nf-core community, EOSC). We will also continue to work closely with research networks, including DFG-funded Collaborative Research Centres and Priority Programmes, while intensifying our engagement with scholarly societies. Additionally, we will seek and cultivate local and regional partnerships with German RDM initiatives, including state-level research data management initiatives.