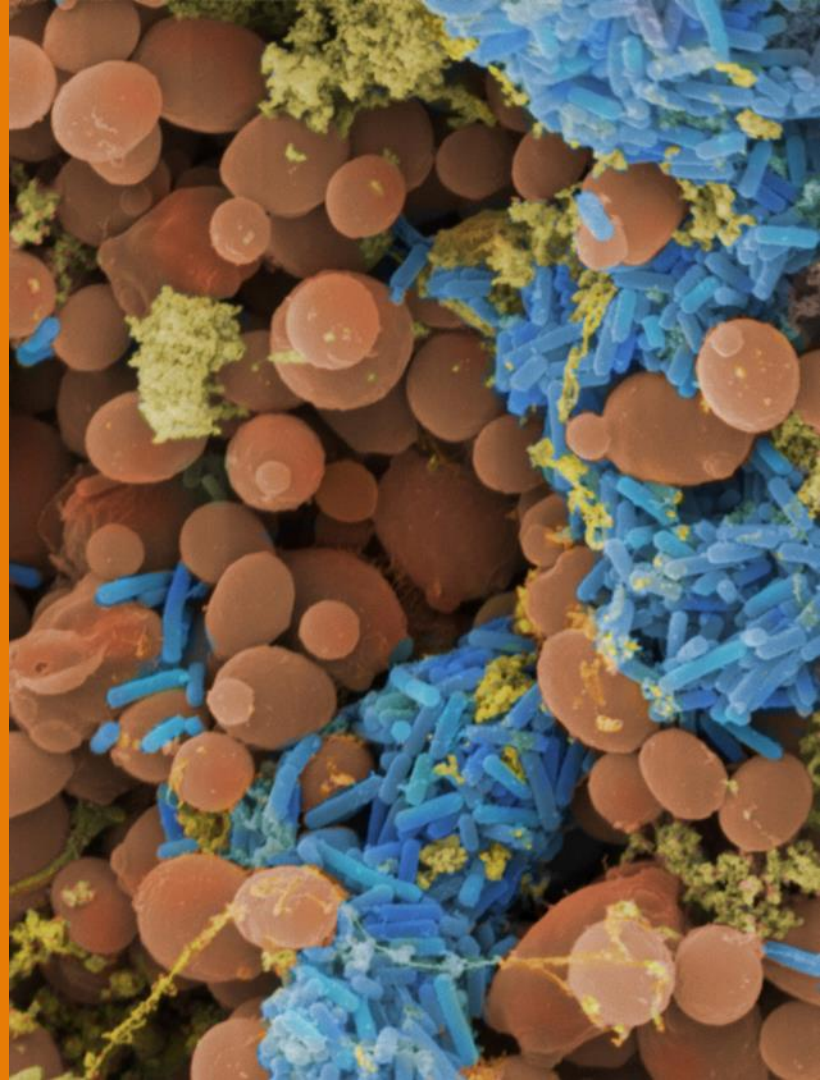
MIRRI
MICROBIAL RESOURCE RESEARCH INFRASTRUCTURE

A PAN-EUROPEAN RESEARCH INFRASTRUCTURE FOR MAKING MICROBIAL SCIENCE & INNOVATION HAPPEN

INSTITUTIONAL PRESENTATION | JUNE 2021



MIRRI: from microbial collections to real-life innovations

The Microbial Resource Research Infrastructure (MIRRI) is the pan-European distributed Research Infrastructure for the preservation, systematic investigation, provision and valorisation of microbial resources and biodiversity.

MIRRI serves the bioscience and the bioindustry communities by facilitating the access, through a single point, to the broadest range of high-quality microorganisms, their derivatives, associated data and services, with a special focus on the domains of Health & Food, Agro-Food, and Environment & Energy.

By serving its users, by collaborating with other research infrastructures and by working with public authorities and policy makers, MIRRI contributes to the advancement of research and innovation in life sciences and biotechnology, as well as for a sustainable, competitive and resilient bioeconomy.

In the European Strategy Forum on Research Infrastructures (ESFRI) Roadmap since 2010, now on its Health & Food domain, MIRRI is striving to soon establish the European Research Infrastructure Consortium (ERIC).

MIRRI offers a single point of access to 50+ microbial domain Biological Resource Centres (mBRCs), culture collections and research institutes from 11 countries

2,800+ combined years of experience. 300+ people working with MIRRI, with H-index up to 100+.

BELGIUM
- BCCM - Coordination cell - Belgian Science Policy
- BCCM/DCG - Diatoms Collection
- BCCM/GeneCorner - Plasmid Collection
- BCCM/IHEM - Fungi Collection: Human and Animal Health
- BCCM/ITM - Mycobacteria Collection
- BCCM/LMG - Bacteria Collection
- BCCM/MUCL - Agro-Food and Environmental Fungal Collection
- BCCM/ULC - Cyanobacteria Collection

FRANCE
- CIRM - CFBP Plant associated bacteria collection
- CIRM - BIA Food associated bacteria collection
- CIRM - BP Pathogenic bacteria collection
- CIRM - CF Filamentous fungi collection
- CIRM - Levures Yeasts collection
- CRBIP-CNCM National Collection of Cultures of Microorganisms
- CRBIP-CVIP Collection of Viruses of the Institut Pasteur
- CRBIP-CIP Collection of bacteria of the Institut Pasteur

GREECE
- CCUoA-NKUA - Culture collections of the National and Kapodistrian University of Athens
- ACA-DC - Agricultural College of Athens - Dairy Collection
- BPIC - Benaki Phytopathological Institute Collection

ITALY
- TUCC - Turin University Culture Collections
- DBVPG - Industrial Yeasts Collection
- UMCC - University of Modena and Reggio Emilia Microbial Culture Collection
- CNR-PLAVIT - National Research Council-Plant Viruses Italy
- CNR-ITEM - National Research Council-Agro-Food Microbial Culture Collection
- USMI - University Hospital (Ospedale Policlinico) San Martino

LATVIA
- MSCL - Microbial Strain Collection of Latvia

NETHERLANDS
- CBS - Collection of yeasts and filamentous fungi
- NCCB - Netherlands Culture Collection of Bacteria

POLAND
- IAFB - Collection of Industrial Microbial cultures of the Prof. Wacław Dąbrowski Institute of Agricultural and Food Biotechnology
- KPD - Collection of Plasmids and Microorganisms at the University of Gdansk
- PCM - Polish Collection of Microorganisms

PORTUGAL
- MUM - Micoteca da Universidade do Minho, CEB/Uminho
- PYCC - Portuguese Yeast Culture Collection, UCIBIO/UNLisboa
- ACOI - Algoteca de Coimbra, Ucoimbra
- LEGE-CC - Blue Biotechnology and Ecotoxicology Culture Collection, CIIMAR/Uporto
- UCCCB - University of Coimbra Bacteria Culture Collection
- CIMOCC - Mountain Research Centre Culture Collection, CIMO/IPBragança
- VFMCC-INIAV - Agronomic, Veterinary and Food Microbial Culture Collections
- Biotropical Resources - GHTM-IHMT/Global Health and Tropical Medicine, UNLisboa
- CDB - Coleção do Departamento de Biologia, CBMA/Uminho
- IVDP - Instituto dos Vinhos do Douro e Porto, I.P.
- LRV/DRAg - Laboratório Regional de Veterinária dos Açores, Direção Regional da Agricultura

RUSSIA
- VKM - All-Russian Collection of Microorganisms
- IEGM - Regional Specialised Collection of Alkanotrophic Microorganisms
- UNIQEM - The Collection of Unique and Extremophilic Microorganisms
- VKPM - Russian National Collection of Industrial Microorganisms

SPAIN
- CECT - Spanish Type Culture Collection
- BEA - Spanish Bank of Algae

ROMANIA *(Observer)*
- IBB - Institute of Biology Bucharest
- MCUB - Microbial Collection of the University of Bucarest
- CMII-ICCF - Culture Collection of Industrial Importance Microorganisms-National Institute for Chemical Pharmaceutical Research and Development
- MIUG-DJUG - Industrial Microorganisms Collection of "Dunărea de Jos" University of Galati, (DJUG)
- CNCBC-IC Cantacuzino National Medico-Military Institute for Research and Development

MIRRI is a first-choice partner for Research & Innovation in several key scientific and economic areas

Health & Food

- Research on pathogenic microorganisms and human / human-animal infectious diseases
- Research & Development of new (bio)pharmaceuticals / therapeutic solutions (including antimicrobials, vaccines, phage therapies and microbiome therapeutics – for human use)

Agro-Food

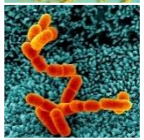
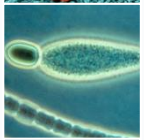
- Research & Development of new, safe, healthy and sustainable food and feed products
- Resources and methods for biological management of soils and crops

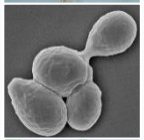
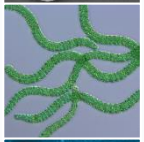
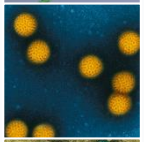
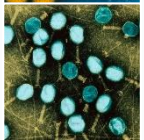
Environment & Energy

- Resources and methods for biomonitoring and/or bioremediation of microbial pathogens, persistent organic pollutants and plastics in soils and waters
- Research & Development of renewable biobased chemicals, materials and bioenergy sources
- Rescuing and preserving microbial biodiversity

Biodiversity
Biotechnology
Bioeconomy
Sustainability
One Health

Bioprospection | Preservation & Culturomics | Taxonomy
Digital services & FAIR data | Legal/Regulatory issues & Standards

MIRRI offers the broadest catalogue of microbial resources and data

Single point of access to 400,000+ high-quality microbial resources

– such as archaea, bacteria (and their cognate bacterio-phages), fungi (including yeasts), microalgae, eukaryotic viruses, and other microbiological material such as cell lines, natural or constructs carrying plasmids, DNA libraries, and genomic DNA –,

and associated data

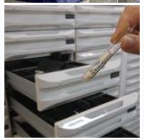
– e.g. taxonomy, ecology, pathogenicity, morphology, physiology, chemical characterization, DNA barcoding or genomics.

20,000+ strains identified/characterised /year

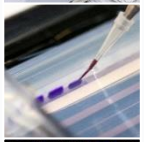
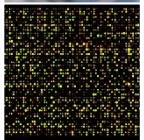
and

20,000+ samples supplied /year

Microbial Resources		Health & Food		Agro-Food	Environment & Energy		
		Strategic Area 1	Strategic Area 2	Strategic Area 3	Strategic Area 4	Strategic Area 5	Strategic Area 6
Archaea	Archaea for bioactive compounds		●	●			●
	Archaea for agro-environmental applications					●	●
	Archaea for biotech applications	●	●	●	●	●	●
Bacteria	Pathogenic bacteria (for humans, animals, plants and crops)	●	●	●	●	●	●
	Bacteria for bioactive compounds		●	●			●
	Foodborne bacteria		●	●			●
	Bacteria for agro-environmental applications (e.g. bioremediation, biofertilizers, biopesticides, etc.)				●	●	●
	Bacteria for biotech applications	●	●	●	●	●	●
	Bacteria as reference strains for bioassays' controls	●	●	●	●	●	●
Cyanobacteria	Toxic cyanobacteria (for humans and animals)	●	●	●		●	●
	Cyanobacteria for bioactive compounds		●	●			●
	Cyanobacteria for food (e.g. dietary supplements)			●			●
	Cyanobacteria for agro-environmental applications (e.g. biofertilizers)				●	●	●
	Cyanobacteria for biotech applications	●	●	●	●	●	●
Filamentous Fungi	Pathogenic fungi (for human, animal, plants and crops)	●	●	●	●		●
	Fungi for bioactive compounds		●	●			●
	Foodborne fungi		●	●			●
	Fungi for agro-environmental applications (e.g. bioremediation, biofertilizers, biopesticides, etc.)				●	●	●
	Fungi for biotech applications	●	●	●	●	●	●
	Fungi as reference strains for bioassays' controls	●	●	●	●	●	●
Yeasts	Pathogenic yeasts (for human, animal, plants and crops)	●	●	●			●
	Yeasts for bioactive compounds (e.g. mycocins)		●	●			●
	Yeasts for biotech applications	●	●	●	●	●	●
	Yeasts as reference strains for bioassays' controls	●	●	●			●
Microalgae	Microalgae for bioactive compounds		●	●			●
	Microalgae for food (e.g. dietary supplements, food additives, etc.)			●			●
	Microalgae for agro-environmental applications (e.g. bioremediation, biofertilizers, etc.)				●	●	●
	Microalgae for biotech applications	●	●	●	●	●	●
Viruses	Pathogenic viruses (for humans, animals, plants and crops)	●	●	●		●	●
	Viruses for therapies		●				●
	Viruses as vectors		●				
	Viruses for agro-environmental applications				●	●	●
	Viruses for biotech applications	●	●	●	●	●	●
	Viruses as reference strains for bioassays' controls	●	●	●		●	●
Cell Lines & Genetic Constructs	Human, animal and plant cell lines	●	●	●	●	●	●
	Plasmids	●	●	●	●	●	●
	Bacteriophage vectors	●	●	●	●	●	●
	Microbial DNA/RNA	●	●	●	●	●	●



MIRRI offers a comprehensive, diverse portfolio of 60+ types of high-quality services

DEPOSIT

- Public Deposit
- Patent Deposit
- Safe Deposit

MICROORGANISM ISOLATION, PRESERVATION AND CULTIVATION

- Isolation and purification of strains
- Freeze-drying
- Optimisation of preservation conditions (including consortia and microbiomes)
- Optimisation of cultivation/fermentation
- Microbial counting/titer (phages, viable cells, spores, MPN...)

MOLECULAR IDENTIFICATION

- Identification from pure cultures
- Virus diagnostics
- Cell line authentication

PHENOTYPIC CHARACTERISATION

- MALDI-TOF MS
- Image analysis (optical, fluorescent, CLSM, TEM and SEM microscopies)
- Biochemical tests (classical or miniaturised i.e. API, Biolog ...)
- Analysis of the cellular fatty acid composition
- Analysis of cell wall sugars
- Analysis of peptidoglycan structure
- Analysis of polysaccharide degrading enzymes
- Analysis of the cellular polar lipid composition
- Analysis of volatile metabolites
- Analysis of ligninolytic enzymes
- Analysis of mycolic acids
- Analysis of respiratory quinones
- Immunochemical analysis

MOLECULAR CHARACTERISATION, MOLECULAR TYPING AND PHYLOGENETIC ANALYSIS

- Gene sequencing and analysis (housekeeping/rRNA/ virulence/drug-resistance genes, MLSA/MLST...)
- PCR-typing (RAPD, DGGE, TTGE, AFLP, Microsatellites, rep-PCR, Inter-LTR)
- RFLP (genomic, mt-RFLP, ARDRA, ribotyping...)
- MALDI-TOF MS
- Karyotyping
- Determination of ploidy
- Plasmid profile analysis

HIGH-THROUGHPUT SEQUENCING RELATED SERVICES

- Draft/complete genome sequencing and analysis (assembly, annotation, G+C...)
- Overall genome relatedness index (ANI, DDH...)
- Metagenomic analysis

SCREENING, TESTS AND BIOASSAYS

- Growth promoting / antimicrobial bioassays
- Screening (targets depend on the provider mBRC)
- Characterisation of technology abilities
- Characterisation of bioproducts (analytical, pharmaceutical)
- Analysis of adhesive activity
- Analysis of biosurfactant-producing activity
- Analysis of hydrocarbon-oxidizing activity
- Quality control and sterility testing of raw materials and products
- Material resistance testing

MISCELLANEOUS

- Assessment of Virus presence within fungal cultures
- Cell sorting applications (Flow cytometry)
- Construction of interspecific hybrids
- Determination O_2 consumption / CO_2 production
- DNA extraction
- Down-streaming processing (metabolite purification)
- House fungi diagnostic (e.g. *Serpula*)
- Mycoplasma testing
- Mycotoxin analysis
- Plasmid copy number quantification (Droplet digital PCR)
- Preparation of competent cells
- Provision of inactivated strains
- Safety assessment of strains for food and feed
- Virus resistance assays

TAXONOMIC DATABASE TOOLS

- MycoBank
- YeastIP
- FungalDC
- Yeast-ID
- Phylosearch

CONSULTANCY, TRAINING AND CONTRACT RESEARCH

- Consultancy (taxonomy, handling and preservation of strains)
- Consultancy (topics related to the mBRC expertise, including legal and safety issues)
- Training courses (content depends on the provider mBRC)
- Contract Research (content depends on the provider mBRC)







MIRRI offers 30+ application-specific workflows of integrated, high-quality services

HEALTH & FOOD

Diagnostic

- Bacterial and fungal pathogens detection, isolation, characterisation and preservation under controlled conditions.
- Selection of reference pathogenic strains for bioassays and diagnostics.
- Bacterial genome scanning for investigation of virulence factors and antimicrobial resistance.

Biopharmaceuticals

- Identification of taxonomically related *Streptomyces* strains with antimicrobial activity using mass spectrometry profiles.
- Scanning of fungal genomes, identification of pathways for synthesis of biomolecules with pharmaceutical interest and heterologous expression of silent fungal gene clusters for bioactive compounds production.
- *In vitro* screening of anti-inflammatory and anti-infectious activities (antibacterial, antiviral, antifungal and antiparasitic) of newly isolated strains or strains preserved in mBRCs (including archaea, bacteria, cyanobacteria, yeasts and fungi isolated from untapped environments).
- Preparation of inactivated strains to be used for the development of vaccines.

Microbial based therapeutics and health promoting solutions

- *In vitro* screening of phages for phage therapy as alternative to antimicrobials.
- *In vitro* screening for health-promoting properties i.e. production of organic acids, vitamins, aminoacids, GABA.
- Isolation and/or selection of strains with probiotic activity, screening of probiotic potential and analysis of resistance to gastrointestinal conditions.

AGRO-FOOD

Food production processes

- Food microbiome: metagenomic & culturomic analysis, fungal/yeasts/bacterial species isolation and identification.
- *In vitro* screening of food preservation activities: antifungal, antibacterial.
- Analysis of relevant metabolites for food production (e.g. exopolysaccharide, esters, superior alcohols, volatile compounds in wine production).
- Microalgae strain selection and mass culture optimisation for aquaculture feed and food ingredients production.
- Food-waste products recycling: isolation, identification and characterisation of degrading strains.

Food safety

- Genome analysis for food safety strain requirements i.e. antimicrobial resistance (AMR), antimicrobial production, toxigenicity and pathogenicity.
- Food safety assessment based on genomic information (according to EFSA).
- Analysis of mycotoxin profiles.
- Investigation of food contamination and identification of bacteria and fungi applying an integrated polyphasic approach (e.g. identification of *Alicyclobacillus* sp., frequent spoiler of fruit juices).

Agriculture

- Selection and characterisation of arbuscular mycorrhizal fungi strains for application in agricultural and horticultural crops.
- Biofertilizers: identification and quantification for registry purposes.
- Biocontrol agents: identification and characterisation of strains used as biocontrol agents (e.g. *Trichoderma harzianum*).
- Investigation of microbial activities with impact in soil nutrients (e.g. siderophore production, phosphate solubilisation).

ENVIRONMENT & ENERGY

Bioremediation

- Compositional and functional characterisation of microbiomes from metal contaminated sites, strain isolation (cyanobacteria, bacteria, fungi, yeasts, microalgae) and taxonomic characterisation. Screening of tolerance to heavy metals.
- Screening of existing microbial resources (cyanobacteria, bacteria, fungi, yeasts, microalgae) for biotransformation of organic pollutants (e.g. phthalates, polycyclic aromatic hydrocarbons).
- Characterisation of microbial communities, isolation of autochthonous strains or selection of strains in mBRC (bacteria, cyanobacteria, fungi, microalgae) for application in wastewater treatment processes.

Biomass valorisation and bioenergy production

- Assessment from genome annotation of specific enzymatic activities for biofuel production (e.g. hydrolytic activities) and *in vitro* validation in bacteria.
- Characterisation of microbial communities and/or screening and isolation of autochthonous strains for enzymatic activities aimed at biomass degradation and waste-to-energy valorisation.
- Microalgae strain selection, ecophysiology, growth and mass culture for biofuel production.

Biomaterials and bioindustry

- Bioplastics: production of polyhydroalkanoates.
- Self-healing concrete: strain for microbial calcium carbonate deposition and counselling for processes development.
- Analysis of relevant enzymatic activities with environmental and industrial interest (alginase, chitinase, lignolytic activity, agarase, amylase, β-glucanase, protease...).
- Counselling for microbial bioprocesses: growth and productivity, screening of tolerances under technological conditions, analysis of biotechnological relevant behaviour (e.g. flocculation, foaming).

MIRRI provides top-level expertise, training and education

MIRRI offers access to a wide selection of experts and training and education opportunities, covering different aspects of the use of microbial resources

Expert clusters*

- Legal Issues
- Microbial Taxonomy
- Cultivation & Preservation
- Applications & Technologies

(Health & Food, Agro-Food and Environment & Energy)

- IT & Data Management
- mBRC Quality Management

Training & Education*

- European Advance Studies Course on Microbial Resources Centre (EuroMiRC)

* Coming soon

In short, MIRRI offers to researchers and to companies:

- Single point of access to 50+ world-class biorepositories.
- Broad catalogue of 400,000+ high-quality microbial resources and data.
- State-of-the-art facilities and technological platforms.
- Cutting-edge services, techniques and technologies.
- Top-level scientific/technical expertise.
- Training opportunities.
- Tailor-made, flexible and cost-competitive/cost-free solutions.

Interested in accessing MIRRI's resources and services?

- **MIRRI's digital material targeted to broad audience and the catalogue of microbial resources is to be freely accessible online, therefore open to any interested user. Access to other MIRRI services is to be restricted to users from academia, business/industry and public service institutions, and requires registration in the MIRRI platform and/or application for requesting access.**

- **Three types of access can be distinguished: *Physical*, *Remote* and *Virtual*. Physical and Remote access follow the principles of the "European Charter for Access to Research Infrastructures", and offer opportunities to users by providing qualified personnel and dedicated equipment.**

- **Depending on the purpose of the access, four different access modes are to be available: *Excellence-driven*, *Market-driven*, *Technical need-driven*, and *Wide*.**

MIRRI is engaged to provide as much as open and free access as (financially) possible, especially for Member and Observer countries. However, for sustainability reasons, free-open access will not always be implemented, in which case user fees may apply, especially for users from countries that are not contributing Members or for those following a market-driven mode of access.

For more detailed information about access modalities and conditions, please consult MIRRI's Access Policy available at www.mirri.org and/or contact us at access@mirri.org.

Interested in having your country or organisation joining MIRRI?

Advantages for countries joining MIRRI:

- Coordinate and mutualise a comprehensive set of resources and services for the benefit of its scientific and entrepreneurial communities.
- Stimulate the scientific and technological development of its regions.
- Boost the competitiveness of product and service development in the different sectors of biotechnology.
- Foster investment and job creation.
- Obtain key insights for strategic planning and policy making.

Advantages for organisations* joining MIRRI:

- Become more competitive and provide improved harmonised services as a result of the exchange of knowledge.
- Improve sustainability, enlarge holdings in a coordinated, standardised and coherent manner, in line with their major expertise.
- Improve the standardised data offer associated to the microbial resources, by connection to the MIRRI Information System.
- Increase the accessibility to their capacities, taking advantage of the higher profile conferred by the MIRRI brand.

* e.g. mBRCs, culture collections or research institutes.

For more information on how to join MIRRI, please visit www.mirri.org and/or contact us at info@mirri.org

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www.mirri.org

Social media

https://www.linkedin.com/company/microbial-resource-research-infrastructure

https://twitter.com/MIRRI_live

https://www.facebook.com/mirri.esfri

https://www.youtube.com/user/MicrobialResourceRI

The Microbial Resource Research Infrastructure (MIRRI) is integrated in the European Strategy Forum on Research Infrastructures (ESFRI) Roadmap.

MIRRI is partly supported by the European Union, through the project "Implementation & Sustainability of Microbial Resource Research Infrastructure for 21st Century" (IS_MIRRI21), which has received funding from the Horizon 2020 Research and Innovation programme, under the Grant Agreement no. 871129. This document reflects only the author's view and the Commission is not responsible for any use that may be made of the information it contains.