

# The Role of the European Microbial Resource Research Infrastructure Project

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## Abstract

MIRRI, the Microbial Resource Research Infrastructure, is a pan-European project that supports research and development in academia and industry by improving access to microbial resources. To date the landscape of mBRCs (microbial domain Biological Resource Centres) is fragmented: for researchers it is time consuming to find the appropriate place for a deposited resource, what kind of associated data for this resource exists and who he would find the expert to contact for more detailed information. There is a disadvantage for the mBRCs too, because, due to the lack of coordination of policy and practice, financial resources are wasted in duplication of biological material and of human efforts. As a result researchers and technical staff are slowed down in their attempts to provide optimal service to the user community. Put more dramatically and in a global way: not even a mere glimpse of biodiversity is currently visible in public microbial resource holdings. This situation clearly impedes the research and development across Europe. MIRRI will address the challenge of access to microbial diversity and its potential by providing a single virtual portal facilitating access to microbial resources, the related data as well as expertise, thereby accelerating discovery and fostering innovation in the field of biotechnology.

## Keywords

Microorganisms; Associated data; Expertise; Bio-economy; Innovation; Training and education

## Abbreviations

BBMRI-ERIC: Biobanking and BioMolecular Resources Research Infrastructure; CCU: Central Coordinating Unit; EMBRC: European Marine Biological Resource Centre; ERINHA: European Research Infrastructure on Highly Pathogenic Agents; EU-OPENSREEN: European Infrastructure of Open Screening Platforms for Chemical Biology; ERIC: European Research Infrastructure Consortium; ESFRI: European Strategy Forum on Research Infrastructures; EU: European Union; mBRC: microbial domain Biological Resource Centre; GBRCN: Global Biological Resource Centre Network; MIRRI: Microbial Resource Research Infrastructure; RI: research infrastructure

## Text

Microorganisms are dwarfs in size, but giants in numbers. Despite their proven global significance for the survival of life on our planet, a major fraction of their potential is still unused. This is on the one hand due to the difficulty to isolate representatives of the huge range of physiologically diverse microorganisms (it is estimated that only about 1% of the estimated number of species have been described to date [1]), on the other hand only a small amount of resources, mainly type and reference strains, used in publications are publicly available [2,3]. Most of the microorganisms widely accessible to researchers are deposited in at least one public culture collection where appropriate long-term storage of resources is assured.

The traditional concept of public culture collections has witnessed a paradigm shift with the implementation of the OECD Pest Practice Guidelines [4]; those managed under a quality management system and have added the element collaboration and networking [5] developed into a microbial domain Biological Resource Centre (mBRC). Nevertheless, culture collections as well as mBRCs play a crucial role in supporting R&D by providing the starting material as well as knowledge and expertise. Despite this well-known fact, most authors of scientific publications refuse to deposit microbial resources in a public culture collection because of protection of interests; others because of the unawareness that this possibility exists. A shift in mind-set is more than overdue.

The current landscape of culture collections and mBRCs across Europe is fragmented; although there are some basic collaborations and network activities, there is not a coordinated approach to preserve and distribute microbial raw material and expertise. Redundant holdings of resources occupy the space necessary for newly isolated strains, existing associated data are spread and not interoperable and the valuable expertise within the collections is often not obvious to the user clientele.

Only by sensible coordination of collections, i.e. focussing on their strengths, improving their offers to academic and industrial research, can the European bio-economy keep pace with the worldwide competition in innovations. This challenge will be undertaken by MIRRI, the Microbial Resource Research Infrastructure. MIRRI was placed on the European Strategy Forum on Infrastructure (ESFRI) roadmap in 2010 [6], belonging to the third generation of EU-funded infrastructures. With its focus on microbial resources MIRRI covers areas of biotechnology which are yet underrepresented in other ESFRI projects. Serving researchers in white, blue, green and red biotechnology sectors, MIRRI bridges to other research infrastructures such as EMBRC (European Marine Biological Resource Centre), EU-OPENSREEN (European Infrastructure of Open Screening Platforms for Chemical Biology), BBMRI-ERIC (Biobanking and BioMolecular Resources Research Infrastructure) and ERINHA (European Research Infrastructure on Highly Pathogenic Agents). During the current Preparatory Phase (2012–2015) 16 Partner and 20 Collaborating Parties from 19 countries throughout Europe are developing strategies for the infrastructure. Realisation of these strategies will start with the beginning of the Implementation Phase in 2016.

### But Why is MIRRI Needed? What will MIRRI Change?

Coverage of microbial diversity in Europe is patchy. As there are redundancies in holdings, some smaller collections do not have an online catalogue, existing associated data to microbial resources are scattered and the full package of resource and information is not easily accessible. As a consequence, it is difficult for the users of microbial resources to obtain all the information associated with a given microorganism, including even widely used type and reference strains. Time consuming internet searches are only partially successful in finding out where the microbe needed for study can be obtained, what kind of associated data are available and where the expertise (i.e. technical and practical knowhow) for handling this microorganism is located. This scenario clearly impedes the research in the field of microbiology and biotechnology.

MIRRI is currently developing strategies to overcome this situation see Figure 1. A coordinated approach to mBRC holdings will be implemented, unnecessary redundancies will be avoided and space for new isolated microorganisms will be created. It is also envisaged to integrate elements of research collections into the MIRRI database which have not been accessible to the public yet. To ensure consistent quality of the offered microbial resources, quality management systems will be introduced (if not already in place) by all partner mBRCs and basic minimal standards will be provided to interested academic holdings. These quality standards will also apply to the services (e.g. different methods for identification and characterisation of microorganisms) offered by the mBRCs. It is known that only a small percentage of microbial resources used in publications is publicly available from mBRCs [2,3]. MIRRI will make efforts to change this by fostering mandatory deposit of 'key' resources generated by public funding and cited in the scientific literature in mBRCs. The criteria for 'key' strains in bacteriology and mycology have been defined and published [7].

Another big challenge MIRRI will face is the interoperability of data associated with microbial resources. The MIRRI Information System will establish a virtual portal which not only provides access to the mBRC databases, but also -omics and other databases. This will enable the users to rapidly and easily access information about resource availability, existing associated data, offered services and location of expertise and - more importantly - by searching through one gateway. MIRRI is built within a network of European research infrastructures; this will facilitate the access to other infrastructures for the MIRRI user community and help to provide solutions to questions outside the field of microbial resources. MIRRI aims to enhance the European Research Area through knowledge and technology transfer. For example, expert platforms will be created which will be available for consultancy by users of microbial resources. Compiling available expertise from inside and outside of MIRRI, reliable solutions will be provided for microbiological problems. In addition, high-quality training and education programs are under development. These courses will be targeted to researchers of all levels, offering valuable training in the field of microbiology and related fields of life sciences.

In summary, with the implementation of MIRRI the exploitation of microbial resources will be improved, thereby supporting R&D in academy and industry. This European coordinated infrastructure can serve as a nucleus for linking with other emerging research infrastructures, for example the U.S., South America or East Asia, with the ultimate goal to create a Global Biological Resource Centre Network (GBRCN) [8].

### How is MIRRI going to Achieve this?

The MIRRI infrastructure will be built around a central core established under the European Research Infrastructure Consortium (ERIC) guidelines. The MIRRI-ERIC, representing the legal entity of MIRRI, will be located with the Central Coordinating Unit (CCU) which will steer and harmonize the activities of the different national nodes of MIRRI. Each National Node can then act as a hub for the national network of culture collections (or mBRCs). Entry points for requests are envisioned via the MIRRI virtual portal or through the CCU/National Node or via the individual member mBRC. A business plan is currently under development to ensure proper implementation and sustainability of elaborated strategies for the future MIRRI.

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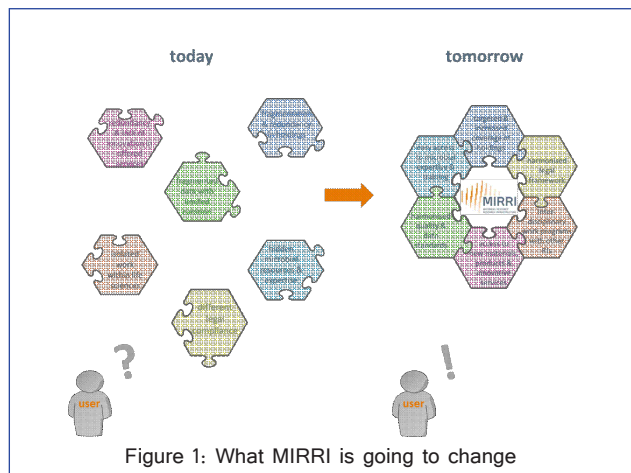


Figure 1: What MIRRI is going to change

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