

MIRRI-IT: Italian Culture Collections

Subjects: Microbiology

Contributor: Luciana De Vero, M. Beatrice Boniotti, Budroni Marilena, Pietro Buzzini, Stefano Cassanelli, Roberta Comunian, Maria Gullo, Antonio Logrieco, Ilaria Mannazzu, Rosario Musumeci, Iolanda Perugini, Giancarlo Perrone, Andrea Pulvirenti, Paolo Romano, Benedetta Turchetti, Giovanna Cristina Varese

Microorganisms represent most of the biodiversity of living organisms in every ecological habitat. They have profound effects on the functioning of any ecosystem and, therefore, on the health of our planet and of human beings. Moreover, microorganisms are the main protagonists in food, medical and biotech industries, and have several environmental applications. Accordingly, the characterization and preservation of microbial biodiversity are essential not only for the maintenance of natural ecosystems but also for research purposes and biotechnological exploitation. In this context, culture collections (CCs) and microbial biological resource centres (mBRCs) are crucial for the safeguarding and circulation of biological resources, as well as for the progress of life sciences.

Keywords: biobanks ; biological resource centres ; biotechnology ; bioeconomy

1. Introduction

Culture collections (CCs) and microbial Biological Resource Centres (mBRCs) play a pivotal role in the safeguarding and circulation of biological resources and are fundamental for the progress of life sciences. Both are *ex-situ* repositories for biodiversity and providers of useful microorganisms (living cells and their replicable parts) and related information, for research and for environmental and industrial application ^{[1][2]}. CCs reach mBRC status after having implemented the Best Practice Guidelines defined by the Organisation for Economic, Cooperation and Development (OECD) and certified and/or accredited quality-assurance processes, according to dedicated standard norms ^[3]. Thus, mBRCs operate in a quality-controlled manner ^[4] and fulfil the quality standards required by the industry and by the scientific community ^[5]. This makes mBRCs key elements in sustainable international scientific infrastructures for the development of biotechnology and the bioeconomy as well as in facing societal challenges.

2. MIRRI-IT: The Italian Network of Culture Collections

Europe has played a pioneering role in the preservation of biological resources. The first public CC was created at the end of the 19th century at the German University of Prague. Within a few years, numerous other important collections arose in several European countries, which currently support a high number of CCs and host the largest and most diverse mBRCs. Most of these CCs are corporate members of the European Culture Collections Organisation (ECCO, <https://www.eccosite.org/>) that was established in 1981 with the aim of promoting collaboration and exchange of ideas and information about all aspects of the activity of CCs. Actually, 250 European CCs are registered in the World Data Centre for Microorganisms (WDCM, <http://www.wfcc.info/ccinfo/>), whose collections house more than 1.2 million strains.

Similar initiatives are underway in the USA ^{[6][7][8]}, Asia ^[9] and South America ^[10]. The global CC community mainly interacts through the activities of the World Federation for Culture Collections (WFCC, <https://www.wfcc.info/>), which actually involves 789 CCs from 77 Countries.

These networking activities are fundamental for increasing the quality and efficiency of the management of CCs; most of these, indeed, have to face common challenges, i.e., the adoption of appropriate quality control, safety, security and legal procedures (although the latter may differ among different countries), as well as the need for taxonomic, systematic and bioinformatic expertise. Often, these challenges must be faced with limited staff resources and insufficient financial commitment, which makes it difficult to maintain high standards and to guarantee excellent services ^{[11][12]}.

Examples of these networking activities are the Microbial Information Network Europe (MINE), Common Access to Biological Resources and Information (CABRI), European Biological Resource Centre Network (EBRCN) and the European Consortium of Microbial Resource Centres (EMbaRC), at European level, and the Global Biological Resource Centre Network (GBRCN) at global level. These networks developed strategies to transform CCs into mBRCs. They made

many efforts, with some relevant results, for the establishment of a suitable accreditation system, the definition of common standards and procedures, and the implementation of integrated on-line catalogues to facilitate consultation by the stakeholders.

The most recent and important activity of collections and research institutions in Europe is MIRRI (Microbial Resource Research Infrastructure, <http://www.mirri.org>), which was launched in 2010 as biomedical research infrastructure within the European Strategy Forum on Research Infrastructures (ESFRI, <https://www.esfri.eu/>) initiative. MIRRI seeks to improve access to high-quality microbial resources and to associated services and (meta)data by creating a pan-European, distributed infrastructure of CCs, mBRCs and stakeholders [2][11][12][13].

MIRRI, in November 2018, applied for its implementation in a European Research Infrastructure Consortium (ERIC) able to bring mBRC partners under a single legal umbrella supported by interested European member states. The foreseen configuration of MIRRI-ERIC currently involves 10 countries that have already signed a memorandum of understanding (Belgium, France, Greece, Italy, Latvia, Poland, Portugal, Russia, Spain and The Netherlands). They are called to provide financial support to the implementation of the Central Coordination Unit (CCU) that will serve as the executive management office, as well as, on a national level, their own national node (NN) and serve the needs of the national community. While the CCU is clearly defined at the European level by an agreement among interested countries, the NNs may follow various forms in order to adapt to the national context.

Regarding the Italian scenario, there are numerous CCs, which preserve a huge amount of biological resources that include bacteria, yeasts, filamentous fungi, microalgae, protozoa, plasmids, cyanobacteria, archaea, virus, phages and cell lines. However, many of these collections, including some hosted by universities and research centres, do not follow relevant international standards, and their databases are not always accessible on-line. In some cases, their existence is known solely through publications, conferences or just personal contacts. Some collections are constituted for special purposes or within the frame of specific projects and sometimes their maintenance is strictly dependent on research targets, resources and facilities, as well as specific interests of the scientists involved. Up to now, coordination among these collections has still been limited.

In September 2017, a joint research unit (JRU), named MIRRI-IT (Microbial Resource Research Infrastructure Italy, <http://www.mirri-it.it>), was founded by the Universities of Torino, Perugia, Modena and Reggio Emilia, the IRCCS Ospedale Policlinico San Martino of Genoa, and the Italian National Research Council (CNR). Sixteen new associated members, harbouring distinct collections, joined the MIRRI network afterwards (Table 1).

The mission of MIRRI-IT is to overcome fragmentation in the availability of resources and services offered by the Italian system of mBRCs and CCs, while enhancing the quality management system of the collections, focusing on the needs and challenges of the stakeholders interested in the biotechnological transfer of these resources. The main activities of MIRRI-IT are reported in scheme I.

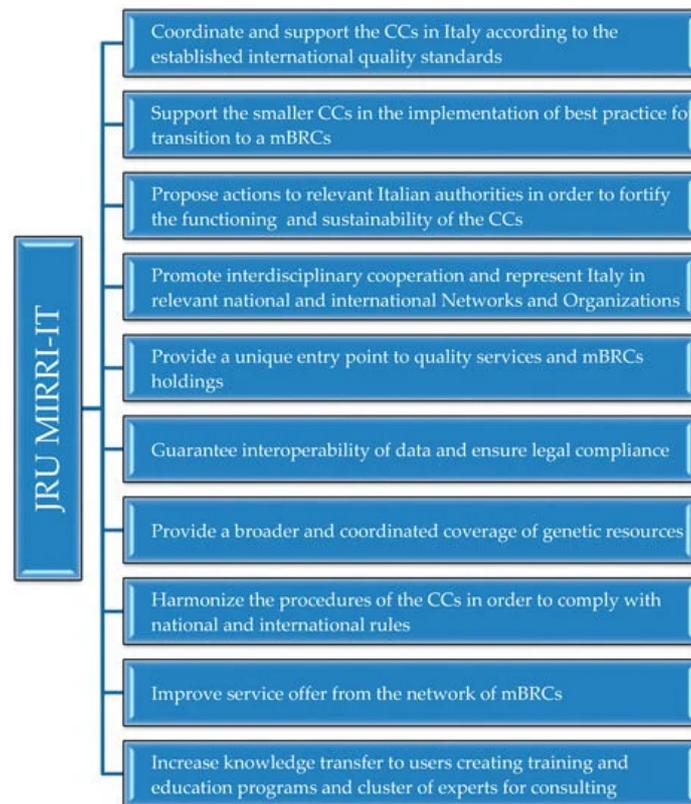
Table 1. Partners and associated members of the joint research unit MIRRI-IT.

| MIRRI-IT* Partners¹ and Associated Members² | Culture Collections | Biological Resources (Main Taxa) | Isolation Sources (Category) |
|--|----------------------------|--|---|
| Research Centres: | | | |
| Agenzia nazionale per le nuove tecnologie, l'energia e lo sviluppo economico sostenibile (ENEA) ² | ENEA collection | Bacteria, Fungi, Microalgae, Microbial consortia, Virus | Contaminated sites, Hypogea and archaeological sites, Food, Lake sediments, Sea, Soil, Rhizosphere, Water |
| Agenzia regionale per la ricerca in agricoltura, (Agris Sardegna) ² | Bonassai (BNSS) | Bacteria (Actinobacteria, Bacteroidetes, Firmicutes, Proteobacteria) | Animals, Food |

| | | | |
|--|--|--|---|
| Consiglio Nazionale delle Ricerche (CNR) ¹ | Agro-Food Microbial Culture Collection (ITEM) | Bacteria, Filamentous fungi, Yeasts | Air, Insects, Food, Plants, Soil |
| | Plant Viruses Italy (PLAVIT) | Mycoviruses, Phytoplasmas, Phages Plant viruses | Fungi, Plants |
| IRCCS Ospedale Policlinico San Martino of Genoa ¹ | Interlab Cell Line Collection (ICLC) | Cell lines | |
| Istituto Nazionale Malattie Infettive (INMI) "Lazzaro Spallanzani", Roma ² | INMI collection | Bacteria, Yeasts | Humans, Clinical isolates |
| Istituto Nazionale di Oceanografia e di Geofisica Sperimentale, Trieste (OGS) ² | Collection of Sea Microorganisms (COSMI) | Microalgae (predominantly Bacillariophyceae, Dinophyceae,) | Marine environments |
| Istituto Zooprofilattico Sperimentale della Lombardia e dell'Emilia Romagna (IZSLER) ² | Biobank of Veterinary Resources (BVR) | Cell lines, Bacteria, Fungi, Parasite, Virus | Animals, Feed, Food, Environments |
| Istituto Zooprofilattico Sperimentale delle Venezie (IZSVE) ² | European Union Reference Laboratory (EURL) Biobank | Viruses, Antigens, Polyclonal antisera | Animals |
| Universities: | | | |
| Sapienza University of Rome, Department of Environmental Biology ² | Fungal Biodiversity Laboratory (FBL) | Saprotrophic fungi | Litter, Contaminated sites, Soil, Water |
| University of Cagliari ² | DSMSP Collection | Bacteria, Moulds, Yeasts | Beverages, Environments, Food |
| University of Basilicata, School of Agricultural, Forestry, Food and Environmental Sciences ² | UNIBAS Yeast Collection (UBYC) | Yeasts | Beverages, Food |
| University of Genoa ² | Collection of DISTAV (CoID) | Bacteria, Fungi, Yeasts | Extreme environments, Human cadaver |
| University of Milano-Bicocca ² | MicroMiB Culture Collection (MicroMib) | Bacteria, Yeasts, Virus | Humans, Environments, Food |

| | | | |
|--|--|---|--|
| University of Modena and Reggio Emilia ¹ | Unimore Microbial Culture Collection (UMCC) | Bacteria (Lactic Acid Bacteria, Proteobacteria), Yeasts (Ascomycota) | Beverages, Food |
| University of Naples "Federico II", Department of Biology ² | Algal Collection University Federico II (ACUF) | Cyanobacteria, Microalgae | Aeroterrestrial habitats, Environments |
| University of Palermo, Department of Agricultural, Food and Forest Sciences ² | Herbarium SAF (SAF) | Macrofungi | Ascomata, Basidiomata |
| University of Pavia, Department of Earth and Environmental Sciences ² | Amico Fungo | Filamentous Fungi, Yeasts | Soil, Contaminated sites |
| University of Perugia ¹ | Industrial Yeasts Collection (DBVPG) | Yeasts, Yeast-like organisms | Foods and Beverages, Environments |
| University of Sassari ² | Microbial Culture Collection of University of Sassari (UNISS) | Bacteria (Firmicutes, Proteobacteria), Filamentous fungi, Yeasts (Ascomycota, Basidiomycota) | Agricultural by-products, Animals, Beverages, Environments, Food, Plants, Humans |
| University of Turin ¹ | Turin University Culture Collection (TUCC) including Mycotheca Universitatis Taurinensis (MUT) | Bacteria (Firmicutes, Lactic Acid bacteria, Proteobacteria) Filamentous fungi (Ascomycota, Basidiomycota, Mucoromycota), Yeasts | Animal and human clinical Samples, Extreme environments, Food |
| University of Tuscia, Department of Ecological and Biological Sciences ² | Culture Collection of Fungi from Extreme Environments (CCFEE) | Filamentous and Meristematic fungi, Lichens, Yeasts | Monuments, Contaminated sites, Rocks, Soil |

- www.mirri-it.it; ¹ = partners of MIRRI-IT; ² = associated members of MIRRI-IT.



Scheme I. Main activities of the joint research unit MIRRI-IT.

The publication can be found here: <https://www.mdpi.com/2076-2607/7/12/685/htm>

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