

QUALITY CONTROL OF MICROBIAL RESOURCES: THE NEW DEMANDS OF THE BIOECONOMY ERA

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Introduction

The bioeconomy is defined as that part of economic activities which captures the latent value in biological processes and renewable bioresources to produce improved health and sustainable growth and development. A more narrow concept of the biobased economy deals with industrial applications and can be defined as an economy that uses renewable bioresources, efficient bioprocesses and eco-industrial clusters to produce sustainable bioproducts, jobs and income (OECD, 2004). In order to meet modern demands for the further advancement of bioeconomy the OCDE introduced a new concept of repositories and providers of high quality biological materials and information: Biological Resources Centres (BRCs). BRCs are considered to be one of the key elements for sustainable international scientific infrastructure, which is necessary to underpin successful delivery of the benefits of biotechnology, whether within the health sector, the industrial sector or other sectors, and in turn ensure that these advances help drive economical growth. In more detail, BRCs are defined by OECD as service providers and repositories of the living cells, genomes of organisms, and information relating to heredity and functions of biological systems. BRCs contain collections of culturable organisms (*e.g.* microorganisms, plant, animal cells), replicable parts of these (*e.g.* genomes, plasmids, virus, cDNAs), viable but not yet culturable organisms, cells and tissues, as well as database containing molecular, physiological and structural information relevant to these collections and related bioinformatics (OECD, 2001). Thus BRCs are fundamental to harnessing and preserving the world's biodiversity and genetic resources and serve as an essential element of the infrastructure for research and development. BRCs serve a multitude of functions and assume a range of shapes and forms. Some are large national centres performing a comprehensive role providing access to diverse organisms. Other centres play much narrower, yet important, roles, supplying limited but crucial specialised resources.

The issue

BRCs are considered as the next generation culture collections. In an era of globalisation, the OECD BRC initiative to establish the virtual infrastructure Global Biological Resource Centre Network (GBRCN) was essential and requires collections to meet the GBRCN operational standards (OECD, 2007). No single collection can provide the needs of biotechnology and bioeconomy and so a collaborative approach is absolutely necessary. The culture collections have worked for a long time in organisations at global (WFCC – World Federation of Culture Collections) or regional levels (*e.g.* European Culture Collections' Organisation (ECCO) and Asian Consortium for the Conservation and Sustainable Use of Microbial Resources (ACM)). They have shared biodiversity information at national (NBIF), European (ENIBI) or global (GBIF) levels (Fig. 1). However, to guarantee high-quality BRCs and global network efficiency, the transition of traditional culture collections to BRCs is needed to be based on international quality management criteria.

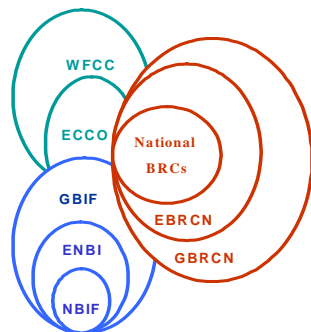


Figure 1 – Interfaces between different organisations and levels of globalisation of BRCs.

For culture collections to work altogether (in a network), they need policies and legal frameworks at international, regional and national levels to establish, enhance and develop collections and create BRCs around the world (e.g. sound facilities, suitable human resources, appropriate preservation technologies; e-catalogues and data management, adherence to national and international criteria including intellectual property rights (IPR) regulations, material transfer agreements (MTAs), biosafety and biosecurity standards, etc.). A strategic plan for the co-ordination of policy and legislation development for the protection of biological resources and sustainable utilisation is required. Additionally, quality management and quality control assessment mechanisms are necessary at the network level. Data sharing is vital to organise networks, make best use of the distributed data and deliver useful output to the user. There is a need to implement mechanisms to collate information, analyse it and make it accessible. This will deliver the interoperability of validated data and increase the digitalisation of collection databases. Finally, sustainability is essential and mechanisms are needed to meet operational costs, developmental needs and to retain member interest and involvement.

The GBRCN benefits

There is an ever-increasing demand for authentic reference materials as industries are adopting certification or accreditation as a means to demonstrate quality and competence. This may be the driving force for the business elements of a collection's strategy for long-term sustainability. Also, it is an increasing requirement to satisfy the funders of research who seek high quality science and solutions. The ability to demonstrate competence to carry out and manage high quality research is being recognised by Research Councils, Government Funding Agencies and Private Foundations.

The culture collection benefits

The culture collections gain the recognition that they operate to international, scientifically-based quality criteria which are international marks of quality and help to raise their profiles. They will share tasks with common policies and procedures. Collections will have common access to data, enabling links to be made to other international initiatives without duplication of effort although with a common approach to data access, sharing and interoperability. Such culture collections will improve data usage and be able to work in collaborative research and development programmes.

The user benefits

The end-user in a one-stop shop, can find the biological materials, and associated information, that they need. The scheme has the guarantee of conformity of quality and authenticity of biological materials but also of processes and procedures to access them. Confidence is gained that the materials are fit for purpose with assurances that national laws, policies and procedures have been followed.

Conclusions

There are two advantages of a certification process at the national level, being based on international quality criteria: recognition by (a) the State of the activities of a BRC, and (b) the other countries of shared quality level. From the bioeconomy aspect, BRCs operating with best practice guidelines reinforce and stimulate a sound future and economical growth.

References

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