

Sustainable use and preservation of biological resources



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Microorganisms, microbially derived biotechnological applications and as causative agents of human, animal and plant disease are becoming increasingly significant in national economies. However, there remains a significant information gap on their species, ecological and genetic diversity^{1,2}. Despite the recognition of their commercial value still little is known about their functional roles in sustaining global ‘life support systems’, such as in agriculture, forest, coastal and freshwater ecosystems as well as their detrimental roles in the environment. As a result, sustainable use, preservation of microbial resources and effective strategies to combat infections are of immense importance to mankind. Culture collections are thus the cornerstones of biotechnology, sustainable futures and infection control.

Many traditional culture collections (CCs) are now transitioning to operate as Biological Resource Centres since the Organisation for Economic Co-operation and Development (OECD) Task Force in 1999 developed the concept and guidelines for the BRCs (<http://www.oecd.org/sti/emerging-tech/biologicalresourcecentres.htm>). The BRCs play a crucial role in the preservation and provision of biological resources, research and development, conservation of biodiversity, and as repositories for the protection of intellectual property and resources for public information and policy formulation¹. Meanwhile, The UN-Convention on Biological Diversity (CBD) was the first agreement to address all aspects of biological diversity: species, ecosystems and genetic resources. It marks the first time that genetic diversity is specifically covered in a binding global treaty (<https://www.cbd.int/convention/>). The subsequent Nagoya Protocol of the CBD ensures fair and equitable sharing of

the benefits arising from the utilisation of genetic resources, including appropriate access to genetic resources and appropriate transfer of relevant technologies (<https://www.cbd.int/abs/>).

The need to efficiently capture, store, process and analyse large scale information related to the biological resources has also increased due to the advances in molecular biology. As a result, an Ad Hoc Technical Expert Group (AHTEG) on Digital Sequence Information on Genetic Resources was established at the CBD, followed by the actions to clarify terminology and concepts, and to assess the extent and the terms and conditions of the use of digital sequence information of genetic resources in the context of the Nagoya Protocol (<https://www.cbd.int/abs/dsi-gr/2017-2018/default.shtml>).

The value of any BRC is directly linked to the diversity and quality of the cultures held and the extent and quality of the associated data with the preserved material. In addition, BRCs are the bodies that the public and the policy-makers can call on for objective help in developing regulations and guidelines for the safe and ethical use of biological resources while ensuring compliance with the three key objectives of the CBD. The World Federation for Culture Collections (WFCC; <http://www.wfcc.info/>) is the largest independent global organisation that represents microbial culture collections concerned with the collection, authentication, maintenance and distribution of cultures of microorganisms and cultured cells. The Federation has developed synergistic capacity with leading organisations (e.g. CBD, GBIF, WIPO, ISO, ECCO) and contributes toward the increase of knowledge on microbial diversity and in turn

Table 1. Major microbial collections currently active in Australia.

Culture collection	Year established	Institute	Collection curator	Microorganisms stored	Preservation method	Access	Website
Australian National Algae Culture Collection (ANACC)	1967	CSIRO	Ian Jameson ian.jameson@csiro.au 03 6232 5117	A	FT, O	PA, CA	https://www.csiro.au/en/Research/Collections/ANACC
Australian National Reference Laboratory in Medical Mycology (AMMRL)	1949	Royal North Shore Hospital, NSW Health Pathology	Kerry Weeks kerry.weeks@health.nsw.gov.au 02 9926 4319	B, FF, YF, A	RT	OA	
AWRI Wine Microorganism Culture Collection (AWRI)	1939	The Australian Wine Research Institute	Angus Forgan culture@awri.com.au 08 8313 6600	B, FF, YF	FR	PA, CA, SS	https://www.awri.com.au/research_and_development/wine-microorganism/
CSIRO Manufacturing Collection of Biocatalytic Microorganisms	2001	CSIRO	Dr Geoff Dumsday geoff.dumsday@csiro.au 03 9545 2344	B, FF, YF	FR	CA	
CSIRO Manufacturing Wood Inhabiting Fungi Collection	~1930	CSIRO	Dr Geoff Dumsday geoff.dumsday@csiro.au 03 9545 2344	FF	O	CA	
DAFWA Plant Pathology Culture Collection (WAC)	1960	Department of Agriculture & Food Western Australia	Nuccia Eyres neyres@agric.wa.gov.au 08 9368 3929	B, V, FF, YF	FD, FR	OA, CA	
FRR Culture Collection (FRR)	1970	CSIRO	Mark Wilson mark.wilson@csiro.au 02 9490 8315	FF, YF	FD	OA	www.foodscience.csiro.au/fcc
IFM Culture Collection	1997	IFM Quality Services Pty. Ltd.	Ingrid Flemming ingridflemming@ifmqs.com.au 02 9618 3311	B, FF, YF	FT, RT, RS, FD, FR	CA	
Murdoch University Algal Culture Collection	1983	Murdoch University	Associate Professor Navid Moheimani n.moheimani@murdoch.edu.au 08 9360 2333	A	FT, RT, O	PA	
National Mycology Reference Centre (ACH)	1962	SA Pathology	Dr Sarah Kidd Sarah.kidd@sa.gov.au 08 8222 3544	FF, YF	RT, FR	OA, CA	
<i>Neurospora crassa</i> Mutants Collection	1971	Flinders University	Professor David Catcheside david.catcheside@flinders.edu.au 08 8201 2335	FF	O	OA, CA	
NSW Plant Pathology & Mycology Herbarium (DAR)	1960	Orange Agricultural Institute	Dr Jordan Bailey Jordan.bailey@dpi.nsw.gov.au 02 6391 3985	B, V, FF	RS, FD, FR	OA, PA	http://www.dpi.nsw.gov.au/about-us/services/collections/herbarium
Queensland Plant Pathology Herbarium Culture Collection (BRIP)	1966	Queensland Plant Pathology Herbarium	Dr Roger Shivas roger.shivas@daff.qld.gov.au 04 0976 1956	B, FF, YF	FR	OA	collections.daff.qld.gov.au
PathWest Queen Elizabeth II Medical Culture Collection (DMPMC)	1966	Department of Microbiology, Queen Elizabeth II Medical Centre	Ian Arthur ian.arthur@health.wa.gov.au 08 6383 4531	B, FF, YF	RT, FR	CA, SS	
University of the Sunshine Coast Microbial Library (USC-ML)	2001	University of the Sunshine Coast	Dr Ipek Kurtböke ikurbok@usc.edu.au 07 5430 2819	B, BP	O	CA, SS	
UWA <i>Helicobacter pylori</i> Culture Collection	1997	University of Western Australia	Barry Marshall barry.marshall@uwa.edu.au 08 6457 4815	B	FR	CA	
Victorian Plant Pathogen Herbarium (VPRI)	~1890	Agriculture Victoria	Dr Jacqueline Edwards jacky.edwards@agriculture.vic.gov.au 03 9032 7330	B, V, FF	RT, RS, FD	PA, CA, O	
Westmead Medical Mycology Collection (WM)	1980	Westmead Institute For Medical Research	Professor Wieland Meyer wieland.meyer@sydney.edu.au 02 8627 3430	FF, YF	RS, FD, FR	OA, CA	
Wine Microbiology Culture Collection	2008	Waite Campus, University of Adelaide	Professor Vladimir Jiranek vladimir.jiranek@adelaide.edu.au 08 8313 6651	B, YF	FR	OA	

A, algae; B, bacteria; BP, bacteriophage; CA, collaborative access; FD, freeze dried and stored at 4–10°C; FF, filamentous fungi; FR, stored at –80°C; FT, frequent transfer; GP, stored in liquid nitrogen (gas phase); LP, stored in liquid nitrogen (liquid phase); O, other; OA, open access; P, protozoa; PA, purchased access; RS, refrigerated storage; RT, room temperature; SS, study-specific access; V, virus; YF, yeast fungi.

facilitates the strengthening of the roles of microbial culture collections as tools for research in biodiversity and biosystematics.

In light of the above developments, this special issue of *Microbiology Australia* is dedicated to the sustainable use and preservation of microbial resources. Beatriz Gómez-Castro and Regina Kipper from the CBD provide an overview of the *Nagoya Protocol on Access and Benefit-Sharing*, followed by two examples from Germany and Brazil. Manuela da Silva from Brazil contributes with a view from a non-Nagoya Protocol country, whereas Andrey Yurkov, Hilke Marie Püschner and Amber Hartman Scholz from the DSMZ, Germany, inform us about the European Union's first Registered Collection under the Nagoya Protocol. Tim Fitzgerald provides expert information on the biological deposits for patenting purposes under the Budapest Treaty. David Smith and Matthew Ryan visit the International Postal, Quarantine and Safety regulations. Juncai Ma, Linhuan Wu and İpek Kurtböke provide an update on the 2019 status of the World Data Centre for Microorganisms (WDCM) Global Catalogue of Microorganisms. William B Whitman, Hans-Peter Klenk, David R Arahal, Rosa Aznar, George Garrity, Michael Pester, and Philip Hugenholtz provide information on their collaborative initiative entitled *Genomic Encyclopedia of Bacteria and Archaea (GEBA) VI: learning from type strains*. Wieland Meyer, Ian Arthur, David Ellis, Alex Kan, Sarah Kidd, Krystina Maszewska and Kerry Weeks provide an overview of the major medical mycology culture collections in Australia. Roger Shivas,

Dean Beasley, Kaylene Bransgrove, Yu Pei Tan and Geoff Bulow inform us on *Biodiscovery and the Queensland Plant Pathology Herbarium*. Lynda Wright provides information on the Australian Biobanks for serum and cells of human and animals. Lindsay Sly reviews historical aspects of Australian culture collections of microorganisms and explores new roles and opportunities for a network of *Australian Collections of Microorganisms* in the microbiome era.

The Australian Microbial Resources Research Network (AMRRN) was a nationwide initiative with the aim of developing a world class research network to discover and exploit Australian microbial resources and to make these resources and associated information available for applications in science, research, industry and education. In this special issue, we the guest editors, revisit the concept and call for a renewed nationwide effort by the Council of Heads of Australian Collections of Microorganisms (CHACM) to take the AMRRN concept further to fulfilment (see article by Sly), and to realise Skerman's WDCM vision of fully cataloguing microbial collections and making this information freely accessible. A list of major currently active microbial collections in Australia is provided in Table 1.

References

1. Kurtböke, D.İ. (Ed.) (2017) *Microbial resources: from functional existence in nature to applications*. Elsevier, Academic Press.
2. Kurtböke, D.İ. and Swings, J. (Eds.) (2004) *Microbial Genetic Resources and Biodiscovery*. Queensland Complete Printing Services, Australia.

Do you know...

Finding penicillin to treat infections wasn't the only major scientific discovery that shaped the amazing career of Percival (Val) Landon Bazeley. In January 1951, having overseen CSL commencing large-scale penicillin production, and completing a medical degree, Bazeley became interested in polio research. Again Bill Keogh saw the importance of local production of a crucial treatment for infectious disease. With the assistance of Sir Macfarlane Burnet, he approached the Prime Minister and arranged for Bazeley to be sent to Jonas Salk's laboratory in Pittsburgh. Bazeley worked with Salk and was responsible for the production of the lots of vaccine used in the first clinical trials in the US. Bazeley returned to Australia in 1955 to set up production of Salk vaccine at CSL. By June 1956 he had arranged for the production of 390 000 doses of vaccine, which rose to five million doses per annum in the next two years. To achieve all this he worked a seven-day week and could be found in the laboratories on public holidays and on one occasion, on Christmas Day.

Val Bazeley was truly a great Australian, a man of action and a man of great vision. The Bazeley oration ensures his name will be honoured as long as ASM continues bringing microbiologists together.

Taken from notes provided by Professor Ian Gust.