

Microbial Culture Collection (MCC) and International Depository Authority (IDA) at National Centre for Cell Science, Pune

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Abstract Culture collections are valuable resources for the sustainable use of microbial diversity and its conservation. Advances in biotechnology have further increased their importance and some of these have been recognized as International Depository Authority (IDA) for the deposition of patent cultures. Microbial Culture Collection at National Centre for Cell Science was established by the Department of Biotechnology, Government of India is country's newest culture collection with largest holdings. It is recognized as an IDA under the Budapest Treaty and Designated National Repository under the Biodiversity Act 2002. This article describes its various service related activities.

Keywords Culture collection · International Depository Authority · Biodiversity conservation

Microbes constitute the largest biomass on the earth and comprise of three domains of life (bacteria, archaea and eukaryotes). Almost 90 % of this diversity is still unexplored. These microbes play an integral and unique role in the functioning of the ecosystems in maintaining a sustainable biosphere and productivity [1]. They are responsible for nutrient recycling and detoxification. They act as biological control agents, biocatalysts and produce a wide variety of products that have pharmaceutical and industrial applications. They are also thought to be solutions for the food and energy crisis that the world may face in future. We also understand today that they would play fundamental role in improving the quality of life, alleviate poverty, malnutrition, etc. Advent of metagenomics era and projects like

metagenomic analysis of Human Intestinal Tract, Human Microbiome Project and soil metagenome (Terragenome) have further emphasized their vital role on the planet and also on human health. However events like global warming, life style changes and anthropogenic activities are resulting in the loss of microbial diversity, but unfortunately microbes not being visible the loss is not perceived.

Culture collections play a vital role in the conservation and sustainable use of microbial resources [2]. They also provide the authentic biological material for high quality research and teaching [3] in the form of reference strains, reagents for quality control, etc. The advances in molecular biology have resulted in the continued discovery of new microbial taxa and strains and there is a need to preserve these so as to make them accessible to other researchers for research, teaching and for biotechnological exploitation. Individual laboratories are unable to do this due to lack of financial support and manpower. This role is thus played by a culture collection.

Culture Collections All Over the World

Culture collections have more than a century old history. Prof. Frantisek Karl of Prague could be regarded as pioneer in this. He was the first one to collect the cultures and made them available to others for a fee. After his death in 1911, his collection was transferred to University of Vienna in 1915 [4]. Initially the emphasis of cultures was for taxonomy and epidemiology, with advances in microbiology and biotechnology, modern day culture collections have much more diverse role. Their number has also increased significantly. There are 647 culture collections in 70 countries registered with WDCM (World Data Centre for Microorganisms) database as on 4 September 2013 (www.wfcc.info). Good infrastructure and

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Table 1 List of some important culture collections and their holdings

Ranks	Countries	Total hold	Number of culture collections
1	Japan	247,037	25
2	USA	242,436	24
3	Brazil	176,902	65
4	India	152,849	27
5	China	146,162	25
6	Republic of Korea	145,009	21
7	Germany	93,368	13
8	Netherlands	90,775	6
9	Denmark	88,566	3
10	France	86,350	38
11	UK	84,210	19
12	Australia	82,946	34
13	Canada	82,315	18
14	Taiwan	67,227	2
15	Russian Federation	60,168	22
16	Belgium	56,128	7
17	Sweden	52,700	3
18	Thailand	43,251	60
19	New Zealand	25,045	6
20	Italy	23,879	10

Source <http://www.wfcc.info/ccinfo/statistics>

expertise in long term preservation, characterization and identification of diverse group of microorganisms are necessary for a good service culture collection. These important activities require adequate funding and skilled manpower which small laboratories in universities and research institutes do not have. These culture collections are supported by different Government and private funding agencies. Among 644 culture collections 253 are supported by universities while 252 are supported by Government while 56, 39 and 20 are supported by semi-governmental organisations, private and industries. There are around 11 culture collections registered with WDCM from Africa, 153 from America, 220 from Asia, 22 from Oceania and 220 from Europe (www.wfcc.info). Some important culture collections in the world along with their holdings are given in the Table 1.

The Budapest Treaty on International Recognition of Deposit of Microorganisms for the Purpose of Patent Procedure

A significant number of products in Biotechnology have microbial origin and it was mandated by patent laws of most countries that the concerned organism be deposited in a

Table 2 List of different forms under the Budapest Treaty and Regulations are given in table

Form types	Purposes
BP/1	Statement in the Case of an Original Deposit
BP/2	Statement in the Case of a New Deposit with the Same International Depository Authority
BP/3	Form BP/3 Statement in the Case of a New Deposit with Another International Depository Authority
BP/4	Receipt in the Case of an Original Deposit
BP/5	Receipt in the Case of a New Deposit
BP/6	Receipt in the Case of a Transfer
BP/7	Communication of the Later Indication or an Amendment of the Scientific Description and/or Proposed Taxonomic Designation
BP/8	Attestation Concerning the Later Indication or an Amendment of the Scientific Description and/or Proposed Taxonomic Designation
BP/9	Viability Statement
BP/10	Request for the Furnishing of Samples of Deposited Microorganisms
BP/11	Request for the Furnishing of Samples of Deposited Microorganisms
BP/12	Form BP/12 Request for the Furnishing of Samples of Deposited Microorganisms
BP/13	Form BP/13 Request for the Furnishing of Samples of Deposited Microorganisms
BP/14	Form BP/14 Notification of the Furnishing of Samples of Deposited

Source www.wipo.int

culture collection. An International Treaty was signed at Budapest, Hungary in 1977 and came into force in 1980. At present 78 countries including India are signatory to the treaty. The treaty is administered by World Intellectual Property Organization (WIPO), Geneva. As per provisions of the treaty, cultures deposited at any of the International Depository Authority (IDA) are recognised by the member states for the patent purpose. The contracting state has authority to designate any suitable culture collection in its territory that has requisite staff and facilities to perform scientific and administrative functions as an IDA. The state also needs to give assurance of its continued existence. It is also required that such depository is impartial and be available to any depositor and same conditions. The depository takes the responsibility of maintaining the microbes in live and pure form as per IDA regulations and charges suitable fee for this. It is obliged to maintain secrecy about the deposited organisms and furnish samples as prescribed in the regulations. All operations of IDAs follow uniform rules and regulations including forms recommended under the Budapest Treaty. It is important to note here that depository's role is limited only to maintain the culture in pure and viable

Table 3 The different institutes involved in DBT's Microbial Prospecting project and their roles

Serial numbers	Institutes	Principal Investigators	Responsibilities
1	National Environment Engineering Research Institute, Nagpur	Dr. Hemant J. Purohit	Project Co-ordinator and microbial isolations from effluent treatment plants
2	M.S. Swaminathan Research Foundation, Chennai	Dr. Sudha Nair (Dr. V. K. Prabavathi)	Microbial isolations from mangroves and Eastern Ghats
3	Institute of Genomics and Integrated Biology, Delhi	Dr. V. C. Kalia	Microbial isolations from river sediments
4	Delhi University, Delhi	Prof. Rup Lal	Microbial isolations from hot springs of Himachal Pradesh
5	Guru Nanak Dev University, Amritsar	Prof. B. S. Chadha	Microbial isolations from wet land ecosystems of North West India
6	Institute of Life Sciences, Bhubaneswar	Dr. S. Das	Isolation of extremophiles from Orissa, Bihar and Bengal
7	National Institute of Oceanography, Goa	Dr. N. Ramaiah	Microbial isolations from marine sediments
8	Institute Biodiversity and Sustainable Development, Imphal	Dr. O. N. Tiwari	Microbial isolations from North East
9	National Centre for Cell Science, Pune	Dr. Yogesh Shouche	Microbial isolations from guts of the insects and soil from Western Ghat and preservation of all the isolates generated in the project
10	Piramal Life Sciences Limited	Dr. Arun Balakrishnan Dr. Saji George	Screening for anti infective, anti cancer, anti inflammation and anti diabetic activities

form. It has neither the authority nor mechanism to verify the specific properties of the culture(s) that are patented. That responsibility lies solely with the depositor and he has to carry out the depositor check on the sample furnished to him to ensure that the culture preserved at the IDA has the specific property. On request from the depositor, additional services are offered in specific formats. The details of which are listed in Table 2.

As of 26 April 2013, there are 42 such International Depositories that accept various microbial forms like recombinant DNA constructs, bacteria, fungi, yeasts, plant cells, cell lines for patent purpose.

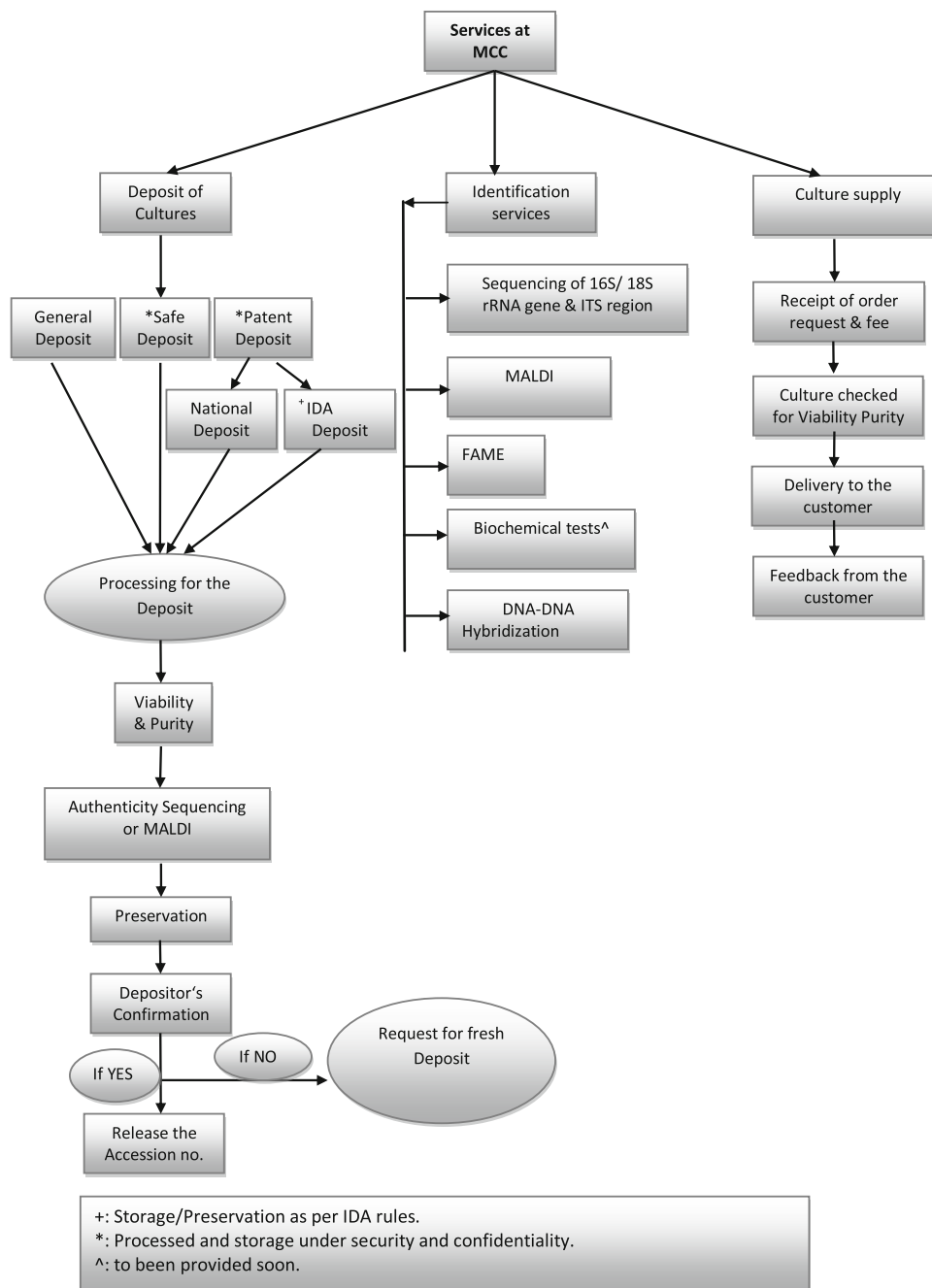
Culture Collections in India

Although 27 culture collections in India are registered with WDCM but only a few provides regular services to the scientific community. Major among them are Microbial Culture Collection (MCC, Pune), Microbial Type Culture Collection (IMTECH, Chandigarh), National Fungal Culture Collection of India (Pune), National Collection of Industrial Microorganisms (Pune), agriculturally important National Bureau of Microorganisms and National Collection of Dairy Cultures (Karnal), etc. (Source http://www.wfcc.info/ccinfo/collection/col_by_country/i/91). Both MCC and MTCC are recognized as IDAs.

Genesis of MCC

In 2007, Department of Biotechnology took major initiative in microbial prospecting and undertook a screening program involving nine institutes across the country and one pharmaceutical company [5]. The various institutes involved in this program, their niche areas and the Principal Investigator are shown in Table 3. From DBT side the activity was monitored by Dr. Renu Swarup and Mr. Sundeep Sarin (subsequently Dr. Manoj Modi). This ambitious program envisaged collection of over 2 lakh isolates from these different ecological niches. In the early stages of inception of this program, Dr. Amit Ghosh, Ex Director, CSIR-Institute of Microbial Technology, India suggested that it would be advisable that the isolates generated from this activity be deposited at a single location for future use. Thus the MCC at National Centre for Cell Science (NCCS) Pune was borne. DBT mandated that all the isolates generated in this project would be made available at this collection for future use by others who wish to exploit them for biotechnological purposes. MCC is presently affiliated with NCCS, Pune. MCC got recognition as IDA by the WIPO, Geneva, Switzerland under Budapest Treaty on 9th April 2011, and recently MCC is also recognized as Designated National Repository for Microorganisms on 8 July 2013 by Ministry of Environment and Forests (MoEF), New Delhi, India under Biological Diversity Act 2002. MCC accepts microorganisms for deposit under general, safe, patent, and IDA deposit.

Fig. 1 Flow chart of the services at MCC, Pune India



Status of MCC

MCC holds more than 150,000 bacterial strains isolated under DBT's Microbial Prospecting project. These are provided to the investigators who wish to undertake large scale screening programs under Material Transfer Agreement. More than 300 bacterial cultures and 75 fungal cultures have been deposited as general deposit which is accessible to public and 26 strains have been deposited as patent deposits under IDA. The cultures are preserved in three different forms -80°C , liquid nitrogen and in lyophilized form. The

cultures are supplied to the users either as lyophilized ampoule or as growing culture on the slant. It has expertise to handle all the major groups of bacteria including anoxygenic phototrophic bacteria and anaerobes. Currently it can accept only BSL-2 category organisms but the infrastructure is being developed for handling BSL-3 category organisms. MCC also provides various services to institutes/universities and industries like supply of cultures, identification services (16S rRNA gene sequencing, phylogenetic tree construction, MALDI-TOF, FAME, DNA–DNA hybridization and Biochemical characterization, etc.) and educational services

(workshops in colleges and universities, hands on trainings, etc.). The details for these could be found at the website.

<http://www.nccs.res.in/mcc/index.html>.

A schematic diagram of the operations at MCC is shown in Fig. 1.

It is envisaged that it will soon be an independent entity that will serve the nation for the characterization, authentication and long term preservation of precious microbial resources.

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