NBRC, a national biological resource centre of Japan

Something new from a culture collection

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As defined in the OECD report issued in 2001 [1], biological resource centres (BRCs) are an essential part of the infrastructure underpinning life sciences and biotechnology. A wide variety of biological materials such as microbial cultures, biomass, DNA, etc are supplied by BRCs. The databases available from BRCs are not only for the sales of materials, but also for those containing scientific information catching up with other advanced bioinformatics. In addition to these scientific contents, BRCs are expected to operate in the management of intellectual properties and promotion of the government's policy on biosafety, quarantine, etc.

Considering such significant roles of BRCs, the Ministry of Economy, Trade and Industry of Japan established NITE BRC (NBRC) in 2002 as the initial outcome of the OECD report on BRCs to promote bioindustry by using microbial materials.

Essential functions of BRCs following culture collection

Reference organism supplier

Sterilisation performance, activities of aseptic reagents or antibiotics as well as quality control of culture media are described in official guides on the microbial 'strains'. Strains are generally designated by national laws or regulations by the accession numbers in the domestic culture collection.

Depository of taxonomic type strains

When new species of bacteria or archaea are proposed, type strains representing the species are designated with the accession numbers of public culture collections in the description of the species [2]. The culture collections indicate the availability of the strains by issuing the certificate for validation in the *International Journal of Systematic and Evolutionary Microbiology*, the official journal of International Committee of Systematics of Prokaryotes. This rule is also recommended for yeasts and fungi.

The number of validly published species is rapidly increasing, as shown in Figure 1. The number of prokaryotic species (including subspecies) is almost 6,000 (as of July 2004), three times the number of January 1980 [3].

The management of intellectual property right of the biological resources

Biological specimens are regarded as international heritages to be made accessible to all of those who are interested. However, considering the potential benefit of bioresources, BRCs have to clearly indicate the limit of their use in the conditions for their deposit. Patent depositary is one of the essential functions of BRCs. The utilisation and transfer of biological materials is sometimes controlled by the country of origin under the Convention on Biological Diversity (CBD) [4] and related laws. BRCs always have to pay attention to these matters for accession and distribution of the materials.

Biosafety

Microorganisms are classified into four biosafety levels (BSL 1-4) based on their infectivity. The containment levels and choice of laboratories in BRCs are dependent upon the microorganisms. Several lists of microorganisms based on the biosafety level are available. BRCs are responsible for correct identification

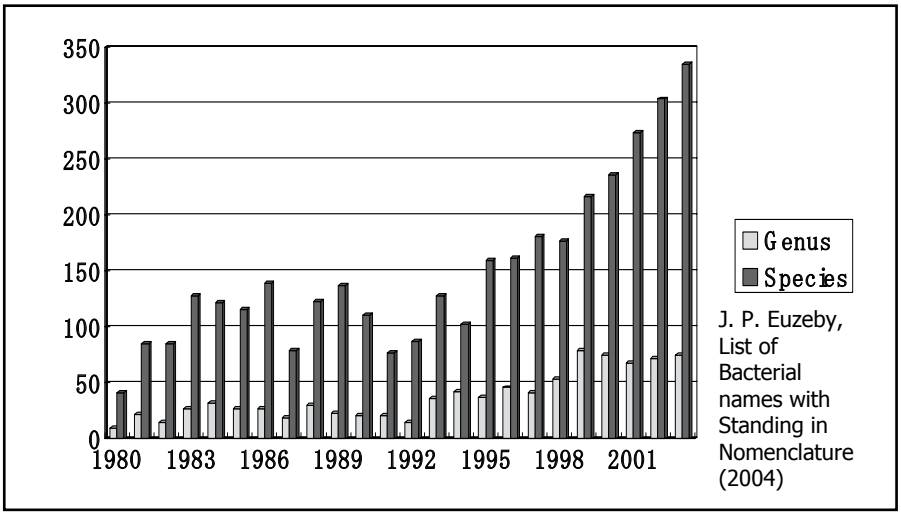

Figure 1. The numbers of genera and species of prokaryotes published [2].

and classification of their microorganisms for biosafety. This affects packaging for shipment, plant quarantine, etc. Needless to say, the highest attention should be given to protection against bioterrorism.

New approaches of BRCs

The microorganisms preserved in culture collections have mostly been reference organisms and archives of those used in scientific papers. BRCs are strongly expected to provide resources for development of completely novel or much higher activities than the previous ones for industrial purposes. Therefore, BRCs enrich their holding resources with novelty and diversity. The information accompanying the resources is also expected to be useful for selection and development of the resources for exploitation.

Supply of biological resources difficult to access and develop

The acquisition of bioresources has recently become more restricted. Export of biomaterials from resource-rich countries is controlled by laws stipulated on the basis of the CBD. Bioresources are generally more difficult to obtain by those in private sectors. Therefore, national BRCs are expected to establish a system to legally transport and supply materials to users with clear guidance with respect to the range of their use. Sometimes BRCs are involved in the benefit-sharing and further contracts for their industrial uses.

NBRC is promoting collaborations to explore novel microorganisms with researchers in South East Asian countries under memoranda of understanding (MOUs) with various institutes in accordance with CBD. The isolated microorganisms are taxonomically characterised and made available for the assay of production of bioactive compounds for evaluation. The resultant microorganisms are deposited in the culture collections of both sides for further utilisation under appropriate material transfer agreements (MTAs).

Clones derived from genome analysis

Microbial whole genome analysis provides a large amount of valuable information for utilisation. The genome of some 200 microorganisms has been analysed to date. The clones constructed for genome analysis used in NITE are available for distribution from NBRC. These clones are especially useful for those organisms that are difficult to cultivate or extract DNA, such as hyperthermophiles or eukaryotes such as the Koji mould (*Aspergillus oryzae*) [5].

Collaborations to explore research seeds by using biological resources and associated information

While a large number of microorganisms are preserved at BRCs, most of them are scarcely used. To stimulate use of such sleeping bioresources, the resources of NBRC are offered for screening of useful functions to cooperative research teams, including scientists from universities and private sectors. The results can be exploited for their industrial applications and the data obtained are added to the NBRC database as they are valuable for our planning of bioresource collection.

Applications for cooperative research of this type are open to the public. This is especially important for NBRC, which is financially supported by Ministry of Economy, Trade and Industry in order to enhance biotechnology industries.

Establishment and strengthening of a BRC network

Formation of a Global BRC Network (GBRCN) will be one of the subjects of the second term BRC taskforce of OECD. It is aimed to establish global standards for quality, transfer and safety as well as wide accessibility. A regional network will, therefore, also be important to discuss in this connection by raising some specific problems.

Roles of the scientific society, Japan Society for Culture Collections (JSCC)

JSCC is a scientific society to promote the activities of culture collections in Japan and the related studies such as taxonomy, preservation, informatics, etc. JSCC consists of 25 affiliate member culture

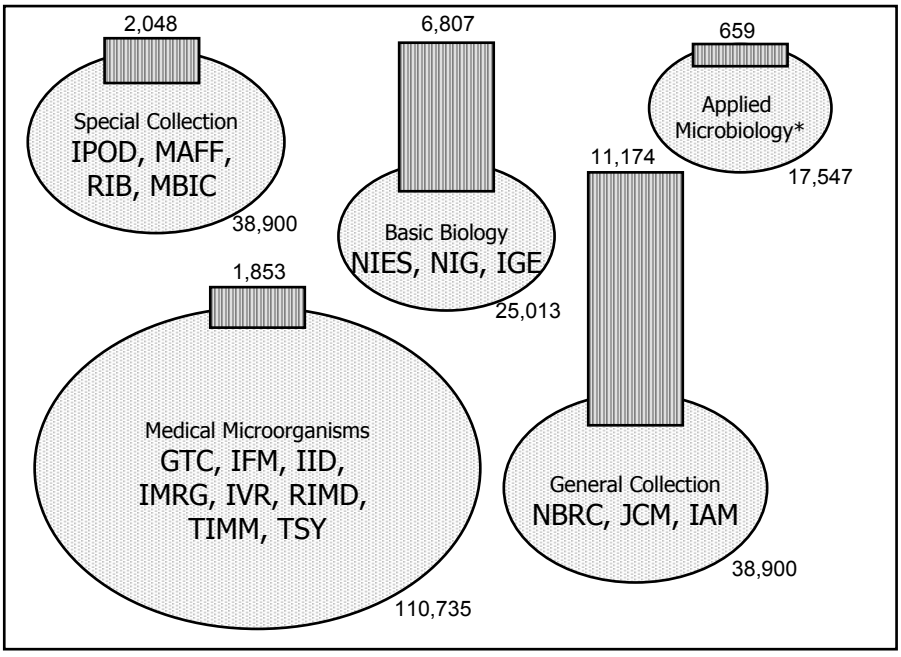

Figure 2. Numbers of holdings (area of ovals) and distribution (length of bars) of cultures from JSCC affiliated collections. Applied microbiology corresponds to AHU, ATU, HUT, NRIC, OUT, and RIFY (acronyms of collections: http://www.jscc.nig.ac.jp).

collections as well as individual and sustaining members. JSCC drafted the recommendation for the establishment of a national BRC in July 1999, and was approved by the Science Council of Japan, resulting in the NBRC.

A virtual BRC to supply a wide range of microbial resources with research-quality

The diversity of microorganisms and their scientific background are so wide and diverse that a single BRC is not able to cover the entire field. Twenty-five member collections affiliated with JSCC have their own specialty and characteristics in the collection. The total number of strains maintained in these 25 collections is 229,840 as of the end of March 2004 [6]. Cultures distributed by these collections were 22,554.

Affiliated collections are classified into five groups as shown in Figure 2. Almost 50% of the total distribution is shipped by the top three collections, although the organisms preserved by them are approximately 17% of the total. These collections have administrative personnel for accession and distribution. Therefore, a unified database functioning as virtual centres of the member collections is in plan, so that they contribute to the efficient distribution of microorganisms in Japan.

Conclusion

BRCs are envisaged as serving an essential function within the community of life sciences and biotechnology. Industries expect national BRCs to take the leadership in the establishment of code of conduct for handling bioresources. The biosafety level for hazardous and/or genetically modified organisms requires social consensus.

One of the roles of BRCs will be to coordinate industries and consumers. An equally important role will be to expand the users of bioresources. Supply of qualified materials and appropriate information will surely support the activities of users. BRCs have to provide materials used in popular research subjects. However, it is quite common that a microorganism is not used for several decades until it is recognised for a certain function. Materials, therefore, have to be maintained even if they are not used for a long time.

The existence of a stable financial backup system makes it possible to work for the establishment of an infrastructure for the community. In addition, each BRC is a component of the global BRC network. Long-term strategies and perspectives are required for the management of national BRCs.

References

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ASM joins APACE

The Australian Professional Acknowledgement of Continuing Education (APACE) is a voluntary continuing education programme for medical scientists designed and administered by the Australian Institute of Medical Scientists (AIMS)

Recently the Australasian Association of Clinical Biochemists (AACB) and the Australian Society for Microbiology (ASM) signed a memorandum of understanding with AIMS to allow AACB and ASM members to also participate in the APACE programme.

AIMS will continue to administer the APACE programme. ASM members will be able to enrol in the programme for an annual fee of $25.00 (non-member rate $184.80). Applications from ASM members wishing to enrol in APACE will be processed initially by the ASM National Office. Application forms will be available shortly on the ASM website and joining APACE will be an option for members when paying their annual membership subscription.

Why join APACE

The healthcare industry is undergoing rapid changes and there is now a requirement for medical scientists, especially those in supervisory positions, to continually develop their knowledge and skills in relation to their professional practice through participation in a continuing education programme. By joining APACE, all medical scientists will have access to the same continuing education programme. To gain APACE accreditation, participants will be required to accumulate a minimum of 100 CEU credits within a maximum submission period of 2 years (3 years for rural members).

For more information about APACE and CEU credits go to http://www.aims.org.au/apace/apace.htm