



Connecting industry and the Bioresource Collection and Research Center (BCRC) in Taiwan

The Bioresource Collection and Research Center (BCRC) aims to connect with industry in Taiwan. Intellectual property and quality management systems are integrated to BCRC's management accordingly.

From microorganisms to bioresource

BCRC (previously known as Culture Collection and Research Center (CCRC)) was founded in 1982 as a division of the Food Industry Research and Development Institute (FIRDI), a non-profit organisation established in 1967 with the funds from the canning industry to develop the food industry in Taiwan. The connection with FIRDI ensures that the mission of BCRC is to service industry.

In early days, the staff specialised in inactivating microorganisms to prevent food spoilage. Although the Economic Affairs Authority recognised the importance of a centralised culture collection in Taiwan, culture collections were not considered to be profitable businesses. Today, BCRC is responsible for and committed to building a general collection of microorganisms, instead of focusing on a collection for the food industry.

With the rise of the biotechnology era, BCRC began to expand its collection from microorganisms to other kinds of bioresources, including cell lines,

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recombinant DNA vectors and hosts, DNA libraries, environmental genetic resources, and stem cells. Based on the ready built infrastructure, BCRC was designated by the authorities in Taiwan and now functions as an 'agriculture microorganism bank', the only 'patent microorganism depository', a 'cell bank', and an 'environmental microorganism bank'.

Connecting with industry

To connect with industry, besides the normal capabilities of BRCs for preservation, identification and training, BCRC also has capabilities for strain screening and improvement, fermentation and downstream processing. Industrial application projects at BCRC include developing

probiotics (such as *Bifidobacterium*, lactic acid bacteria, *Sporolactobacillus*, *Lactobacillus acidophilus*), traditional fermented products (such as stinky to-fu, fermented vegetables, fermented sweet rice, alcoholic drink, vinegar drink, nata), agro-biotech products (such as giberellic acid, antagonistic microorganisms, bio-fertilisers), edible mushrooms (such as *Ganoderma lucidum*, *Trametes versicolor*, *Agaricus blazei*, *Grifola frondos*), special chemical producing strains (such as aminopeptidase, isoamylase, 7-ACA-related enzymes, erythritol, chitin, chitosan, lysine, phenylalanine), and strains with functional properties (such as SOD-like, glutathione).

Besides those projects initiated and performed by BCRC with government financial support, BCRC is also involved in joint research projects in cooperation with, and with partial financial support from, academia or industry. BCRC also may acquire technologies from academia and use these as a basis for further research and development.

To meet industrial application needs, some developed technologies are protected by intellectual property rights (IPR) in the form of patents or trade secrets. About 50 patents have already been issued. The technologies are then taken up by industries through technology licensing or transfer, or conducting contract



tests based on established techniques (such as bifidobacteria isolation and identification).

Some space at BCRC is reserved for rental by start-up companies which have many ideas and technologies but lack facilities. Companies can rent laboratories and equipment from BCRC during their embryonic stage. Indeed, a few companies 'incubated' at BCRC have since become profitable industrial scale companies. For example, a cord blood bank company rents a laboratory and stock room space in BCRC for the business of collecting umbilical cord blood from newborn infants, and obtains BCRC's specialised technical support for preservation and bank management. The company now has an important market share.

Integrating intellectual property management

To meet the needs of industry, protecting developed technologies with IPR is important. Patents and trade secrets are useful IPRs for technologies. Using patents to exclude others from making, using, and selling patented technologies allows patent holders or their licensees to advantageously develop the markets. Trade secrets can be protected from being obtained by others without authorisation.

Accordingly, BCRC integrates IPR management into the technology development process. In the formative R&D idea stage, existing patents are analysed. From the patent analysis, researchers can assess the strength of the patent to the technologies to be developed and who the major patent

players and likely future competitors or partners would be. The information is used to decide the strategy for the R&D project, taking into consideration future technology transfer to industry.

In this R&D stage, a watching brief is kept on newly issued patents and the R&D direction adjusted from time to time. During this stage, patents will be filed in a timely manner and in accordance with the R&D strategy. Some technology that might easily be designed around, and thus not suitable for patent protection, can be protected with trade secrets. After the R&D stage is completed, technology with a patent or trade secret can be transferred to the industrial partners or competitors.

Integrating the quality management system

Industry expects that services will be supported by a quality management system. Accordingly, BCRC has, since 2001, integrated an ISO 9001:2000 quality management system for the services of (1) patent-related microorganism depository, (2) contract microbial identifications and tests, and (3) cultivation and preservation of animal cells. The services of (4) cultivation, collection, preservation and distribution of bioresources and (5) cultivation, collection, preservation and distribution of gene libraries have also joined the ISO system since 2004 and 2005 respectively.

Adoption of the ISO system improves industry's satisfaction. Firstly, the ISO system smooths service processes. For example, in the patent depository services, the average processing time for

a deposit shortened by 7.6 days from 2002 to 2003.

Secondly, industry's needs can be identified. For example, to strengthen the conformity of the ISO "determination of product requirements", the bioresource collection and distribution service has adopted material acquisition agreements when acquiring resources, and material transfer agreements when distributing resources. The requests from customers can be identified in the agreement. Moreover, the processes of Plan-Do-Check-Act established in the ISO system allow BCRC to continually improve service quality with higher customer satisfaction. Notably, the percentage of the customers satisfied with the ISO services improved from 80% in 2001 to 85% in 2003.

Perspectives

BCRC will continue to provide services that meet industry's needs by developing technologies with IPR protection, and by quality management systems. Developing more innovative and value-added services to contribute to the bioindustry in Taiwan will be the future challenges.

BCRC is now shifting its research focus from developing technologies for immediate industrial production to establishing platforms for industrial application. Advances in genomics and informatics have enabled platforms such as DNA libraries, fermentation libraries, target screening techniques, to be applied to the existing BCRC collection. The approach is expected to speed up discovery of useful bioresources, especially from the cultures in the current collection that are ready at hand, abundant and neglected or forgotten.