

**The 17<sup>th</sup> Resource Committee of Genetic Materials**  
**Evaluation and Suggestions**

**(January 16, 2019)**

**Gene Engineering Division**

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1. Achievements and plans for the Division

- (1) Have the current achievements reached the standards of the projects (research) from the major international bioresource centers?
- The Division has the second largest number of bioresources in the world, and they are of the similar to or even higher level in diversity and quantity when compared with the world's major bioresource centers. The Division holds unique, versatile, high-quality, and comprehensive lineup of resources such as those developed in Japan, bacterial artificial chromosome (BAC) libraries of mouse strain C57BL/6N, and cDNA libraries comprising 80% and more than 50% of human and mouse genomes, respectively. By dealing with many intellectual property rights and licenses, the Division is enabling the distribution of various resources such as those with the Gateway system and fluorescent reporters. Recently, the Division has also collected the resources related to new technologies like CRISPR/Cas9-related vectors. It is also important that the Division is committed to maintenance, preservation, and provision of bioresources in compliance with the law, as a public institution. The number of distributed bioresources is increasing year by year.
  - The Division maintains exceptionally high-quality resources and satisfies global standards. The Division has become internationally accredited for the quality control (QC) with a recall rate of 0%. Sequence confirmation is performed for the collected vectors, and the preservation and distribution procedures are thoroughly managed. Barcodes will be introduced for shipping management.
  - It is important as an infrastructure for the research community that the Division acquires various information that accompanies bioresources, arrange and consolidate it, and make it available for users. This is also important for maximizing the active use of bioresources.
  - It is of great significance as the world-leading bioresource center that the Division is actively committed to the development of novel bioresources and technologies necessary for the maintenance and preservation of bioresources within the BioResource Research Center (BRC), as it leads to improving ability and motivation of the staff as well as the quality of overall operation.
  - The amount of distributed resources is one tenth of that of Addgene. This may be partly due to the large differences in types of resources that are possessed and the scale of laboratories. However, it is necessary to analyze the main causes and make improvements.

(2) Have sufficient achievements been made for contributing to society and to the research community within Japan and overseas?

- The Division provides approximately 1,300 resources each year to universities, research institutions, and companies in a wide range of fields internationally, particularly focusing on medical and dental universities within Japan. The Division has made sufficient achievement. There are over 300 new users every year. The number of distribution to new users is also growing. In particular, the fact that the Division distributes resources to for-profit companies can be referred to as the Division's contribution to society and strength that is not found in Addgene. As the accomplishment of the resource distribution, approximately 100 papers are published every year, and thus, the Division is contributing to the development of academic research in Japan.
- It is appraisable that the Division is focusing on further expanding Japan's original bioresources and promoting their active use by approaching researchers within Japan and overseas and asking for the deposition of the unique bioresources they established.
- The Division has made a constant contribution to research community, but it is expected that the Division will give more impact by further increasing the number of collections and raising the quality of bioresources to be distributed. It is also necessary to secure budget achieve this.
- The Division is hosting technical training courses for research community as well as lectures and events for the public.
- It should be noted that there are only few repeat users.

(3) Are current activities and plans based on the results of the 3rd Mid- to Long-Term Plan or the achievements in the previous position? Are they in line with the BRC's 4th Mid- to Long-Term Plan (7 years from 2018 to 2024)? Are they appropriate and do they contribute to the development of the center?

- Current activities and plans are in line with the mission of the 4th Mid to Long-Term Plan and generally appropriate. They are being operated appropriately and will contribute to the development of the center.
- There are some situations to be noticed, such as the emergence of Addgene,
- It would be desirable to more actively promote joint research with domestic and international research institutions. Moreover, in order to further promote utilization of bioresources, it is necessary to make efforts to increase the number of repeat customers. To achieve this, it is important to create next opportunities for the users to request resources by encouraging them through the value of the BRC, which will be raised by increase of resource lineup, rapid distribution of high-quality resources at low cost, periodic delivery of information on the applications and newly added resources, and improvement of search function.

(4) What are resources to be developed and research/ technological development to be undertaken in addition to those currently planned in the initial 4th Mid- to Long-Term Plan?

- Novel genetic materials that never existed before have emerged with newly-developed technologies such as barcode technology. Whether or not these materials should be collected and distributed is a matter to be discussed in the future, and it is necessary to exchange information with researchers who are developing such technologies.
- The Division needs to be engaged in cost-effective challenges using cutting-edge technology, making a clear distinction from private entities.
- In recent years, endeavor is being made toward realization of personalized medicine. In this context, researchers in medical research on diseases and drug discovery for the treatment are elucidating pathological mechanisms based on more detailed disease segmentation and conducting more detailed research for individuals with different genetic backgrounds and complex environmental factors. Therefore, the clinical samples and bioresources derived thereof that are characterized with individual variants and the differences with genetic backgrounds are becoming increasingly important. It is desirable that the BRC is equipped with not only the bioresources as "references" for classifying "wild-type," "normal," and "healthy," but also those with more complexity and genetic diversity that can be characterized as "disease," "variants," and "polymorphism".
- It is also important to add and consolidate various information associated with bioresources for increase of their value. Information on the relationships between diseases and genetic variants/polymorphisms as well as genetic characteristics and omics information of cell lines and model mice greatly stimulate researchers in selecting research materials. Accompanying information should not necessarily be prepared by the BRC itself. In recent years, databases of various research results have been compiled, and there exist widely-used databases for each research field, such as the NCBI's Gene, OMIM, ClinVar, and dbSNPs databases in the US as well as the Sanger Institute COSMIC database in the UK. By strengthening the linkages with such external databases, researchers would be directed to the information on BRC bioresources when they consult articles and databases, and naturally they will be actively using the bioresources.

## 2. SWOT analysis

### (1) Are the results of the presented SWOT analysis valid?

- They are reasonable.
- Comparison of the Division with Addgene in the SWOT analysis was very informative. There are many common features in that they both operate a biorepository, but as a public institution, the BRC is clearly different from Addgene. It should be more emphasized that BRC is actively engaged in the development of novel bioresources and new technologies for preservation and active use of bioresources and in technical support and human resources development for related organizations in Asian countries, which makes the BRC distinguished from Addgene, merely a bioresource supplier.

### (2) Are the countermeasures for the results of the SWOT analysis appropriate?

- The countermeasures are appropriate.
- "Selection and concentration" of resources is necessary.
- It is necessary to increase the numbers of distributed and utilized bioresources by further enhancing dissemination of information to users and promotion of active use.
- The Division should not hesitate to vigorously adopt the merits for which Addgene is highly evaluated, such as the simplicity and speediness of procedures, free from their conventional operation while maintaining their QC and reliability that only the BRC can provide.

## 3. International collaboration

### (1) Is the international collaboration being actively addressed, and is the Division functioning as a hub of international scientific technology?

- The Division is actively committed to international collaboration.
- The Division is playing a pivotal role in Asia, exchanging information with the staff of relevant divisions in other repositories at the international meeting of the Asian Network of Research Resource Centers (ANRRC).
- RIKEN BRC functions as an international hub for bioresources, together with the biorepositories in Europe and the US, and its activity is regarded as a model project in developing countries. However, in recent years, efforts to retain bioresources within their own countries are fueled up, and the promotion of international cooperation, particularly with other Asian countries, is an important issue.

- Regarding cooperation and sharing with resource centers in other nations, the BRC should ask them to conclude an agreement that resources developed in Japan should not be deposited to Addgene but to the BRC. It would also be beneficial for research centers to cross-link their home page's URLs, to ensure that both parties' resources can be searched at the same time.

#### 4. PI assessment

##### (1) Is the PI fulfilling the role in line with the BRC mission?

- The PI is fulfilling the role.
- It is appraisable that the number of distributed bioresources has consistently exceeded 1,200 items every year over the past 6 years. Moreover, the Division is endeavoring to enrich necessary information for promoting active use of bioresources as well as to collaborate with other databases such as Kyoto Encyclopedia of Genes and Genomes (KEGG) and PubMed for enhancing usability.
- Identification of resources and confirmation of their authenticity are extremely important for securing the reliability that forms the basis of the bioresource center's operation. Such QC can only be possible with careful work by the devoted staff members, and we would like to express our respect to the PI that he is sincerely and decidedly committed to the QC, without neglecting its significance.

##### (2) Do the PI's achievements in research and development (R&D) satisfy international standards in light of the following three aspects? (i) Results output and impact, (ii) Contribution to specific missions of each laboratory regarding research support and collaborative exchange programs within RIKEN, (iii) Pioneering new fields of research, acquisition, and commercialization of intellectual property rights, social education for science, the fusion of different fields, and social contribution

- The Division is collecting and distribution resources that have high utility value. The research outcomes and achievements of the Division, support for research activities, and social contribution are sufficient. Moreover, the Division is fulfilling the mission through close collaboration within RIKEN,

- (i) Consolidation of meta-information and sequence information is steadily advancing in the Gene Engineering Division, under the slogan "No information, no bioresources." However, it is disappointing that the analytical results of the data do not appear to be updated frequently. Moreover, examples of the cases where BRC resource is used and the achievements by the users are being posted in the BRC website as articles both in Japanese and English, and it is necessary to further increase such opportunities for promotion.
  - (ii) The Division has a potential to further develop in the aspects of providing research support and pioneering new fields of research. It is hoped that the Division will restructure the organization so that research-supporting staff members are fully committed to collecting and maintaining bioresources and that researchers can focus entirely on pioneering new fields. It would be desirable that the Division should release a unique research outcome generated with RIKEN's full capacities; for example, such as novel research using differentiation reporter markers.
  - (iii) Recent decline of interest in science among young people is a serious problem. Information dissemination and public relations (PR) activities for the general public, such as the events "Tsukuba PhD kids program: science experiment classes," "lectures for high school students," "facility tour for middle and high school and university students," "Open campus day during Science & Technology Week," and "Science lectures for adult citizens," are simple but highly significant activities that will not only facilitate understanding and education of local residents but support the foundation of Japan as a nation with top science and technology. We look forward to the BRC's continuous activities for social education in the future.
- (3) Is the PI appropriately tackling the management and operation of the Division? In addition, does the PI make efforts for training and development of young talent?
- The PI is constructing and operating a system that complies with laws pertaining to exports.
  - As a part of training for young staff, the PI is actively encouraging the Division's members to conduct the following activities:
    - To participate lectures for qualifying the ISO9001 Quality Management internal auditors,
    - To survey users' papers,
    - To draft brief flyers to be distributed for PR at academic conferences as well as online articles for introducing focused bioresources, and
    - To participate in major academic conferences.
  - To further develop and pioneer new fields of research in the future, we would like the PI to recruit diverse young staff and actively promote personnel exchange.

End