Evaluations and Comments

10th Meeting of the

RIKEN BioResource Center Resource Committee of Microbial Materials

(April 7, 2014)

1. Achievements

(1) Are there any activities or achievements worthy of special mention?

(a) Is the Division functioning adequately as an infrastructure for science? What are its plans and achievements? What of the quantity and quality of its users' output (number of papers)?

- The number of microorganisms deposited over the past 10 years, particularly from Asian countries, has been increasing at a very high rate. This is a result of the Japan Collection of Microorganisms (JCM) continuously making a strong alliance with other Asian countries over the years. In addition, the JCM's microbial research has advanced by accepting foreign exchange students and providing them with education and research guidance, and this has created an amazing positive spiral with a synergistic increase in the deposits/provisions/research papers. This is a phenomenon not seen in the primary facilities of other countries, and the JCM has established a solid reputation in the world as the leading microbial resource center in Asia.
- The JCM's policy of collecting leading resources in the fields of environment and health science has been deemed appropriate, and the JCM has also worked to make difficult-to-culture microorganisms available as a resource to users to meet their needs.
- The number of reported new strains of bacteria/archaea has increased greatly. The JCM has demonstrated a solid performance in meeting those increased needs, closing the gap to become No. 1 in the collection of new type strains of bacteria. In addition, the Division contributes to the international research community that uses the microorganisms, demonstrating excellent results as an academic infrastructure.
- Most of the deposits are from overseas. It is very advantageous for Japanese researchers that

there are plenty of microbial resources in Japan that can be rapidly and easily utilized. A relatively high percentage of deposited strains have quality-related problems, increasing the burden the JCM must bear. Still, the JCM not only serves as a supply source for high quality research materials, but also contributes to the reliability of research content presented by depositors, which is the greatest advantage to them. However, the number of microorganisms that can be deposited with the JCM is nearing its capacity, so improvements must be made to avoid negative effects on storage and provision quality.

- At least 500 research papers utilizing JCM strains are published annually in the fields of environment and health science. This shows that the JCM's microbial infrastructure policies are producing definitive results. Some of these papers are presented in Nature and Science, and the high quality of these papers also contributes to cutting-edge research at the top levels.

(b) Is the Division functioning adequately as an infrastructure for society? What are its industry and international contributions? Is it returning the fruits of its achievements to the Japanese people, and has it stimulated people's imaginations?

- The resources collected at the JCM are frequently utilized by industry as well as for collaborative research between industry and academia. Each year, the resources are used in at least 100 patents aimed at solving environmental problems, improving human health, etc. In this way, the JCM has made marked contributions to society. Some of the resources have even been made into commercial products. This allows the JCM's efforts to actually be returned to the lives of the general public, helping them achieve their dreams.
- As for the JCM's contribution to the international community, the JCM has created a positive spiral connected to research and development in Asia, a result that is highly regarded as a distinct feature in the world. The JCM pulls ahead of other organizations to rank world No. 2 in the quantity of accepted deposits of new type strains. The fact that three-fourths of these deposits are from overseas demonstrates the JCM's unparalleled international contributions in research infrastructure.
- The JCM has a diverse collection of microorganisms, such as lactic acid bacteria, which enables to respond the demands for active utilization of microorganisms in health-related fields. These fields are deeply tied to the lives of the public and are not only helpful to society but are also good areas in which to achieve recognition of the importance of

microbial resources. We hope to further strengthen the JCM's contributions in health-related fields.

(2) R&D, technology development, resource development, characterizations and quality control

- **Have these activities been effectively applied in advancing BRC's bioresource infrastructure program?**
- **Have advanced and innovative results been produced?**

- Upon receipt of microorganism deposits, the JCM performs quality control tests related to microbial growth, contamination, properties, genetic analysis, etc., in compliance with ISO 9001. By establishing an infrastructure that ensures more reliability of resources, the JCM has seen good results.
- Taking into account the convenience of users, the JCM has made a thorough effort to more readily provide even difficult-to-culture microorganisms. The project of providing genomic DNA and microbial active culture of difficult-to-culture microorganisms or those of BSL2, is also showing good results.
- The JCM completed an investigation into the countries of origin and acquisition history of strains recorded in 1993 and later and have been appropriately preparing for the enactment of the Nagoya Protocol.
- Taxonomic information is consistently being added to improve the database. An increase in the utilization of collected microbial resources can be expected, since it is becoming easier to utilize information from the microbial strain database.
- The JCM has continued to advance its resource infrastructure project at a high level and has been collaborating with related facilities inside and outside of Japan to develop new resources/resource-related technologies. Needless to say, the results of the presentation of 23 original research papers in FY 2013 were useful to the resource infrastructure project.

(3) Other matters

- **Education and training**
- **Collaborations within BRC and within RIKEN**
- **Collaborations inside and outside Japan**

- **Public relations activities**

- The JCM has formed various collaborative research partnerships with overseas researchers as well as Japanese universities, research laboratories, and other divisions of RIKEN. As a result, many original research papers on new microbial strains, genome analysis and other topics have been reported, demonstrating the strong alliances within Japan and around the world.
- The JCM is fulfilling its responsibilities as an international resource center by participating in international academic societies, acting as members of international committees such as the WFCC, and accepting foreign researchers. In addition, the JCM is advancing Asia-centered international alliances, such as ANRRC, ACM, and SATREPS, and plays a central role in each. Continued active participation in this international network is desirable, and will become even more important for managing the many type strains deposited from Asia once the Nagoya Protocol goes into effect.
- The JCM is engaged in many public relations activities, which include enhancing the JCM strain database and preparing annual reports and pamphlets. We hope that the JCM strives to align collection activities with the needs of the research community and that those needs continue to be reflected in resource infrastructure policies in the future.

(4) Response to items pointed out previously

- The JCM is appropriately responding to the previously indicated points, utilizing amply the characteristics of the JCM. It is important that the JCM continues performing and strengthening those activities.

2. Plans as RIKEN's proposed change of status to a new system for Independent Administrative Institutions

(1) Are plans of the Division appropriate to the proposed change in RIKEN's status? Please evaluate and give us advice and suggestions from the following view point:

(a) Can dramatic advances be expected from their strategies and plans for the next 5 to 7 years?

- **Will they be able to function as an essential infrastructure for science,**

innovation, and society?

- **Are there any new resources that they should place priority on collection?**
- **What kinds of results and effects can be expected?**

- The JCM has specifically selected the pioneering resources to be collected, placing priority on its existing strategy that the resources are diverse microbial species and their type strains to be used for environmental and health research, and that their direction is appropriate. Specific proposals have been presented for these individual plans. If these proposals can be definitively executed, the JCM can fulfill its role in providing academic infrastructure, innovation infrastructure, and social infrastructure. Effective utilization of these infrastructures will promote pioneering research in related fields.
- Examples of new high-priority resources to collect in the plan include genome DNA of yet-uncultured microorganisms. Development of this new technology can convert the immense microbial genomes, which has yet to be revealed or developed, into usable resources. By utilizing these new genome resources, revolutionary advancements will be made in various fields, generating innovation and significantly impacting the academic world.
- The pre-existing JCM collection deposited/preserved by researchers inside and outside of RIKEN are at the highest levels in the world, producing revolutionary results in the form of a positive spiral related to research and development in Asia. Strategies required in the future are to expand leading microbial research in the fields of environment and health science, and to continue collecting microbial resources. However, most of the resources to be readied, which were mentioned in the plan, involve issues directly connected to society and innovation, and the new microbial resources to be collected have been precisely recognized.
- In preparation for the enactment of the Nagoya Protocol, it is extremely important for the JCM to have as its goal playing a role as a microbial resource center enabling researchers in Japan to easily utilize overseas resources, and also to consider aiming to fill a role equivalent to or larger than the “registered collection” of the EU. Although satisfying the requirements of the EU “registered collection” is not difficult for the JCM, we expect the JCM to aim to build a system that is the equal or better of the EU’s so that the JCM can take the leadership in Japan and Asia. In this way, the JCM can fulfill its role as a national research and development corporation, which is to “conduct and support R&D, and establish an

infrastructure for R&D by using a variety of methods in order to spread the fruits of our efforts to society and promote private innovation."

(b) Can dramatic advances be expected from their research and technology development plans for the next 5 to 7 years?

- **Are these plans effective and essential to promoting BRC's resource infrastructure?**
- **Can advanced and innovative results be expected?**

- Because the demand for microbial research in the environmental and health science fields will continue to increase greatly, it is important to utilize the three-tier structure of the RIKEN BioResource Center, to create 'microbial research and development teams' in these fields, and to build a system that leads to advancements through a close relationship with the bioresource infrastructure project. The JCM should create a positive spiral between research and the infrastructure project. New microbial resources that are obtained during expansion of this pioneering microbial research are highly valuable. Therefore, RIKEN BRC should primarily promote pioneering microbial research and new microbial resource development.
- Using genome information to uncover functions of microorganisms will be increasingly important to the functional development of new microorganisms. It is appropriate that the plan emphasizing the utilization of genome information has been established.
- As indicated in the plan, it is important to develop genetic engineering/modification technologies, etc. to effectively utilize previously unusable microorganisms and their functions, which will lead to revolutionary, cutting-edge results.

(2) Are suggestions made previously reflected in their current plans and strategies? Have they endeavored to re-inspect their activities to date and made appropriate decision about what should be continued or discontinued?

- The previous review has been reflected in the resource infrastructure and research and development plan.
- It is a concern that most of the researchers who are primary implementers of this plan are approaching retirement in 5 to 7 years. A system that recruits and educates new hires and

allows skills to be passed from experienced staff to new staff must be planned and implemented.