Concept paper of the 6th APAC DA session (April 5, 2017 at Shinagawa Conference Center Tokyo)

I. Theme of the 6th APAC DA session

■ Progress of APAC DAEWG activity

Drug Discovery Alliances Expert Working Group (DAEWG) was organized in 2013 with people from APAC member economies to realize the APAC mission "To expedite the launch of innovative medicines for the peoples in Asia". When the DAEWG began its activity, each Asian economy had supported academia and venture companies in the life science sector to strengthen their domestic research foundation for the drug discovery. However, there was an issue in using outcomes from academic research for the drug discovery in the pharmaceutical industry; although some drug seeds generated by academia or venture companies had potential to be innovative drugs, it was no effective way to identify a pharmaceutical company collaborating with them. DAEWG decided to address this issue first because overcoming this issue could be the most practical approach to promote cross-border open innovation in Asia and realize the APAC mission in the long term perspective.

In order to promote application of academic research to the drug discovery, DAEWG collaborated with Osaka Chamber of Commerce and Industry (OCCI) and adopted their Drug Seeds Alliance Network Japan (DSANJ). DSANJ consists of DSANJ data base (DSANJ-DB) and DSANJ Business Meeting (DSANJ-Biz Meeting); DSANJ-DB has stored information on academic drug seeds and has proved to be a very useful tool for promoting open innovation between academia and industry. DSANJ-Biz Meeting is an initiative to facilitate business meetings between academia and industry using non-confidential information. At this point, more than 60 companies are using DSANJ to screen their future partners.

With a lot of support by OCCI, DAEWG has tried to deploy the DSAN system to other Asian economies. The first milestone is to create a situation in which the DSAN system is introduced to 3-4 Asian countries, however, our goal of this initiative is to promote cross-border open innovation by establishing an Asian-wide data base "DSAN-Asia" that consists of the domestic DSAN system in each economy. In 2015, some drug seeds stored at the DSANJ were shared with Taiwanese venture companies. At this point, Taiwan is trying to establish a similar data base to DSAN and Thailand considers adopting the system to facilitate domestic open innovation. DAEWG will continue to encourage other Asian countries to promote domestic open innovation using the system.

Other than the effort to deploy the DSAN system to other Asian countries, DAEWG expanded its scope to cover capacity building, business development (BD), drug discovery using natural products and Asia-specific diseases. As a result, the DAEWG is now working on the five pillar activities at this point.

■ Importance of capacity building

Of those pillar activities, it is critical for each Asian country to develop academic researchers who have profound knowledge and expertise in drug discovery. However, since drug discovery consists of multiple processes and activities, it is still difficult for academic researchers to learn drug discovery at their curriculum. It would be ideal that there is sufficient interactive communication/collaboration between academia and industry in each economy, however, even Japan has room for improvement in this aspect.

Since level of researchers is a key to success of open innovation, DAEWG has thought seriously about how to develop researchers who will lead the cross-border open innovation in the near future.

In order to develop researchers who would be involved in drug discovery in Asian economies, we have shared information on drug discovery in each Asian economy as well as the best practices of open innovation by arranging seminars in BioJapan and the APAC annual conferences. However, since drug discovery is composed of many processes and activities, we have to admit that there is limitation in promoting human resource development just by information sharing. Therefore, DAEWG decided to take one step further and provide researchers in Asian economies with an opportunity of open innovation where they are participating in and learn drug discovery through their firsthand experience.

When it comes to considering open innovation in Asia, it would be necessary to pursue not only human resource development but also the outcomes we will obtain in the activity. If we could promote an open innovation that synergizes research strengths of Asian economies, it would be a model case in which Asian economies could improve their competitiveness in the drug discovery under a unique collaboration framework. Based on this idea, we selected "drug discovery using natural compounds" as the theme of the 6th APAC DA session. As described below, collaboration in "drug discovery using natural compounds" is expected to enhance collaboration among Asian economies using their research strengths, which well aligns with APAC and DAEWG goals. The DAEWG will try to further advance "drug discovery using natural compounds", and we will share the outcomes of our activities at the APAC session. We hope that the participants at the session could well understand potential of natural compounds as well as unique and attractive opportunities Asian economies have.

■ Situation of drug discovery using natural compounds

Since natural compounds have various biological activities, they have actively studied as an important starting point in drug discovery. Although about 30% of pharmaceutical drugs are originated from natural compounds which proved the importance of natural compounds in drug discovery, for the following reasons, the number of companies actively using natural compounds for their drug discovery has decreased significantly.

- Isolation of natural compounds with biological activity requires long term investment
- Difficulty of chemical synthesis and derivatization to obtain compounds with desirable biological and physicochemical properties
- Import and export of natural resources must be done in complying with the Convention on Biological Diversity/Access and Benefit Sharing
- Chemical library with high structural diversity created using combinatorial chemistry has become commercially available
- Drug discovery based on structural information of biomolecules such as kinases has become a standard drug discovery method

■ Potential of drug discovery using natural compounds

As mentioned above, about 30% of medicines are derived from natural compounds. This fact indicates that natural compounds are still attractive and useful drug discovery seeds. The DAEWG discussed the potential of natural compounds for drug discovery for one year. We also obtained feedbacks from JPMA R&D committee member companies about their expectation to natural compounds. As a result, we have reached

a consensus that an open innovation using natural compounds is worth being pursued by the APAC DAEWG for the following reasons;

- Many Asian economies have diversified natural environments that are attractive source of natural compounds. Some economies such as Thailand and Malaysia have tried to build strength in drug discovery making the best use of natural resources in the countries, which reflects their initiatives to build natural compound library.
- When it comes to developing medicine for the treatment of lifestyle diseases such as high blood pressure, the route of administration is particularly important and the oral administration is desirable in most cases. Since natural products have large molecular weights and are low bio-availability in general, natural product tends to be less attractive as a seed compound. However, development of drugs discovery targeting serious diseases such as cancer and rare diseases has been done more actively compared to before, which could allow pharmaceutical companies to consider injection and infusion as rote of administration as long as expected efficacy is realized.
- A questionnaire taken at the JPMA R&D committee in July revealed that Japanese pharmaceutical companies are positive in using natural compounds in drug discovery.
- Collaboration has become a critical topic in Japan which encourages the Japanese pharmaceutical companies to collaborate with their competitors in non-competitive research areas. As a result, sharing of chemical library has become a common practice these days, which could realize a consortium with Asian countries to promote use of natural compound for drug discovery.

I. Contents of the 6th APAC DA session

In the 6th APAC DA session, in addition to knowledge sharing about potential of natural compounds for drug discovery, the DAEWG plans to show our activities, expecting in-depth discussion at the panel discussion on how to promote open innovation in Asia.

The contents of the session are shown below. In this year's DA session, we are going to share the taskforce team activities: (1) possibility of consortium with Asian economies making use of natural products, (2) a guideline for procedures related to import and export of natural resources.

In order to promote open innovation utilizing natural products in Asia, we need to import and export research materials in a simple manner, but at the same time, we have to comply with Nagoya Protocol on Biological Diversity (the fair and equitable distribution of the benefits arising from the opportunity to acquire genetic resources and their use) to realize a win-win situation. However, an opportunity to learn the information on necessary procedures and processes accompanying the importing and exporting of research materials is limited, which is assumed as a factor that could deter a cross-border exchange of research materials derived from natural resources. To address this issue, the taskforce team plans to conduct a case study assuming a consortium where research materials derived from natural resource are exchanged between Japan and Thailand, and create a draft guideline on procedures and processes necessary for importing and exporting research materials. At the DA session at the 6th APAC, the team will

present a guideline as we as share lessons learned from their initiative.

APAC DA Session: Dawning Era in Drug Discovery with Natural Resources in Asia

(April 5, 2017 at Shinagawa Conference Center Tokyo)

Chair: Chi & Hasuoka

13:15 ▸ 13:20 **Introduction to the DA Session**; Hasuoka, JPMA

13:20 ▸ 13:45 **Keynote Lecture**

Continued Efforts to Discover New Drugs using Natural Resources; Shinya, Japan

13:45 ▸ 14:45 **Presentation**

13:45 ▸ 14:00 Drug discovery using natural compounds in Thailand; Wanchai, Thailand

14:00 ▸ 14:15 Drug discovery using natural compounds in Taiwan; Muh-Hwan, Taiwan

14:15 ▸ 14:30 Application of Natural Resources to Drug Discovery in Eisai; Tagami, Japan

14:30 ▸ 14:45 Activities of Pillar 5-Natural Product Drug Discovery Network-; Nares, Thailand

14:45 ▸ 15:10 **Panel Discussion**

・Implementation of drug discovery using natural resources in Asia

・Issues & solution for drug discovery by natural resources in Asia all member & floor

15:10 ▸ 15:15 **Session closing**; Chi, Taiwan

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