

## Building and Sustaining a Regional Health Research and Innovation Network in Southeast Asia<sup>\*1</sup>

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The Association of Southeast Asian Nations (ASEAN) has a continuum of member nations at different stages of economic and health development, with the majority of the countries belonging to the middle- and low-income categories. While there are ASEAN member states that are more advanced in terms of health systems and programs, the majority still suffer from communicable and non-communicable diseases. With 8.6% of the share of the world's total population, the region contributes 27% of the global burden of infectious and parasitic diseases (WHO, 2007). There is clearly a link between economic capacity as reflected by GDP per capita and the status of health of the population across the ASEAN member states.

Based on national poverty lines, Cambodia, Lao PDR, Myanmar and the Philippines have more than 25% of their population living below the national poverty lines. On the other hand, Malaysia and Thailand had less than 10% of their populations living below national poverty lines in 2007 while in Viet Nam, the latest estimate in 2007 was 14.8%. Overall, all countries have showed consistent improvement in poverty reduction.

Infectious tropical diseases also continue to be a challenge to the health sector despite developments in health research and development (R&D) and medical technology. There is widespread concern about the emergence and reemergence of some infectious diseases such as tuberculosis, Severe Acute Respiratory Syndrome (SARS), avian influenza, and Chikungunya. These tropical infectious diseases form part of

the neglected tropical diseases (NTDs) alluded to by international organizations. These diseases include infections that have shown low economic returns for investments in health products R&D. However, from a human capital perspective, these so-called NTDs not only place a significant burden on the health system, but they also adversely affect productivity and efficiency of human capital in their respective societies.

Budgetary limitations for health research also cause difficulty in pursuing R&D initiatives. With scarce resources for health research, efforts to pursue health research activities in many of the ASEAN nations are limited.

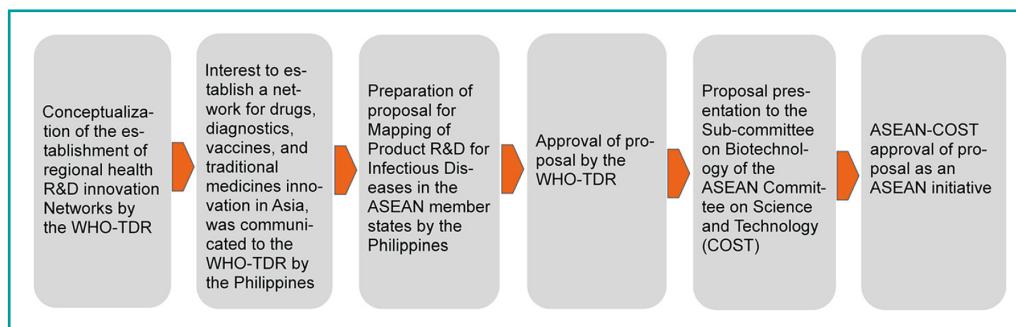
In terms of human resources, the ratio of R&D personnel to the population varies across the ASEAN nations with countries including Singapore, Malaysia, and Thailand having more R&D personnel than the rest of the ASEAN nations. The proportion of researchers to population is also much higher in the more developed nations in the ASEAN (e.g., Singapore and Malaysia) compared to those which are less economically developed. It is apparent that many of the ASEAN nations fall below the ratio of researchers to population recommended by the United Nations Educational, Scientific and Cultural Organization (UNESCO). This significantly reduces R&D productivity in the region.

Considering all of these public health challenges and hindrances to providing better quality of health in the ASEAN, activities towards the establishment of a regional health innovation network were initiated with the goal of enhancing product discovery and providing a sustain-

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**Fig. 1 First stage of the establishment of the ASEAN-NDI**

Following the establishment of the ANDI, interest to establish a similar health R&D innovation network, the ASEAN-NDI, was communicated by the Philippines to the WHO-TDR through PCHRD-DOST. With funding support from the WHO-TDR, the activities of the Network were started, including the ASEAN health R&D landscape mapping.

able essential health R&D through intraregional collaboration—a framework suggested by the World Health Assembly (WHA) Resolution 61.21, Global Strategy and Plan of Action on Public Health, Innovation, and Intellectual Property (GSPA-PHI).

The ASEAN Network for Drugs, Diagnostics, Vaccines, and Traditional Medicines Innovation (ASEAN-NDI) was founded in 2009 in line with the objectives of the GSPA-PHI, which include promotion of R&D, development of North-South and South-South partnerships to support capacity building, and establishment of strategic research networks to facilitate better coordination of stakeholders. It was conceptualized to parallel the African Network for Drugs and Diagnostics Innovation (ANDI), a network championed by the World Health Organization Special Programme for Research and Training in Tropical Diseases (WHO-TDR), which started the idea of establishing regional innovation networks.

The ASEAN-NDI is a regional innovation network composed of the ASEAN member states, namely: Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Vietnam. Its concept was proposed by the Philippines to the ASEAN and was first discussed among the ASEAN member states during the 40th Meeting of the ASEAN Sub-Committee on Biotechnology (SCB) in Bali, Indonesia on 25-26 May 2009, and was later adopted by the ASEAN Committee on Science and Technology (COST) as its own initiative. The ASEAN, through the COST, approved

the creation of the ASEAN-NDI in 2009. Start-up funds to support the establishment of the Network were provided by the WHO-TDR. The Philippine Council for Health Research and Development (PCHRD) of the Department of Science and Technology (DOST) served as the secretariat of the ASEAN-NDI, with Dr. Jaime C. Montoya as the overall coordinator (**Fig. 1**).

The ASEAN-NDI was established to ensure that health technology development and the capacity of member states are appropriately maximized and managed according to regional health needs. It aims to build a sustainable partnership among the ten ASEAN countries to rapidly build the needed human resource, technology, and financing for health development and security.

The enhancement of public R&D capacity to prioritize the public good elements of innovative policy tools and harness the private sector is one strategy most relevant to the 61st WHA framework. The aim was to build developing countries' leadership and capability in addressing major endemic health issues, as well as issues concerning access to health products by the poor. One of the critical elements of the framework was setting up R&D networks in disease endemic countries.

To lay the groundwork towards this initiative, the ASEAN SCB endorsed a mapping activity to be carried out in order to assess the product R&D landscape for the triple burden of disease in the region, including infectious tropical diseases, non-communicable diseases, and prevent-

**Table 1** Number of articles and ranking of the ASEAN member States with biomedical articles, 2005-2009

Country	Number of biomedical articles	Rank	Number of articles on infectious diseases	Rank
Thailand	12,568	1	2,698	1
Singapore	12,405	2	578	2
Malaysia	7,071	3	509	3
Indonesia	1,324	4	335	4
Cambodia	318	6	204	5
Philippines	574	5	154	6
Laos	168	7	80	7
Myanmar	103	9	50	8
Brunei Darussalam	163	8	25	9
Vietnam	86	10	25	9

able diseases due to accidents and traumas.

“Mapping of Product R&D Landscape for Infectious Tropical Diseases in ASEAN Member States” was conceptualized with the aim of mapping out the capabilities of the ASEAN member countries on drugs, diagnostics, vaccines, and traditional medicine innovation on infectious tropical diseases; identifying gaps and opportunities in the ASEAN; creating a database of institutions, networks, and initiatives with capacities for innovation; and providing the template for the establishment of an ASEAN regional network for innovation in product R&D.

The planned mapping activity was further refined during the first organizational meeting held in Manila, Philippines on 21 October 2009. Attended by delegates from the ASEAN who were identified through the assistance of the SCB members and the ASEAN Secretariat, participants agreed to focus the mapping exercise on infectious diseases such as malaria, tuberculosis, schistosomiasis, dengue, leishmaniasis, lymphatic filariasis, and helminthiasis, as well as on other diseases of public health importance.

The mapping activity was conducted from December 2009 to November 2010, through survey and key informant interviews among researchers and institutions, and a review of Elsevier’s Scopus database. The mapping activity gathered records on institutional data of R&D institutions across the ASEAN region.

The exercise showed that there is keen interest among the ASEAN institutions in each coun-

try to pursue health R&D. While some countries such as Brunei Darussalam and Cambodia are still in their infancy, others such as Singapore, Malaysia, and Thailand are far advanced in R&D.

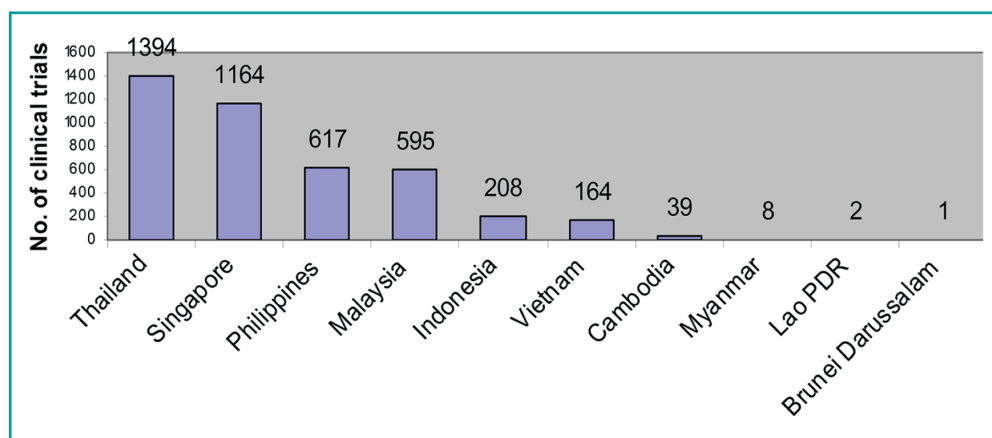
One measure for this is the number of biomedical and infectious disease articles that these three countries produced from 2005-2009 as compared to the other member states (**Table 1**).

The ASEAN region has substantial human resources and institutions that can support the pursuit of R&D on drugs, diagnostics, vaccines, and traditional medicine.

There are major institutions located in the different ASEAN nations that can be tapped for future collaboration. The ASEAN also has a number of institutions that have the capacity to produce drugs, diagnostics, vaccines, and traditional medicine.

One of the challenges that arises from the disparity across the ASEAN countries is that a number of countries work on the same disease and for the same product (i.e., drugs, vaccines, etc.), which results in duplication and wastes time and resources. This shows that although collaborating ventures may have limitations imposed by funding/sponsoring partners, the ASEAN member states need to explore and expand collaborative engagements with other ASEAN member states with the end goal of enhancing capacity in the region and minimizing duplication of efforts.

Asia, including the ASEAN, is a major player



**Fig. 2 Number of Clinical Trials conducted per country in Southeast Asia**

Countries in the ASEAN region have been recently identified as an emerging potential in the field of clinical trials. In order to assess the focus of current clinical trials in the region, absolute numbers of clinical trials were obtained from the Clinicaltrials.gov database (as of July 2010). It was found that most clinical trials reported are focused on maladies and conditions such as neoplasms and cancers.

in the future of pharmaceuticals. The recent slow-down in major Western countries has led to the outsourcing of developmental work in developing countries including the ASEAN (Fig. 2). The growing presence of clinical research organizations in the region and the increasing number of clinical trials being conducted are testimonies to the presence of capable human resources and growing importance of the region in the future of the pharmaceutical industry.

The disparity across the ASEAN member states indicates some gaps that need to be addressed. There is a problem of reduced coordination among clusters of researchers and innovators. There is also a problem of infrastructure and resources in some countries, which can be addressed by implementing working arrangements among the ASEAN member states, and by sharing resources and expertise. Concerns such as funding and logistics support, and ethical considerations need to be addressed by their respective countries and by the ASEAN as a whole. Intellectual property concerns, which may arise from collaborative ventures, are issues that need to be laid down and agreed upon at the onset.

The extensive collaboration among the ASEAN member states and with other major research centers in the world indicates that the ASEAN countries have the capacity to pursue

collaborative R&D activities on health products development (Figs. 3 and 4). These are illustrated by collaborations in the area of diagnostics and the area of vaccines development.

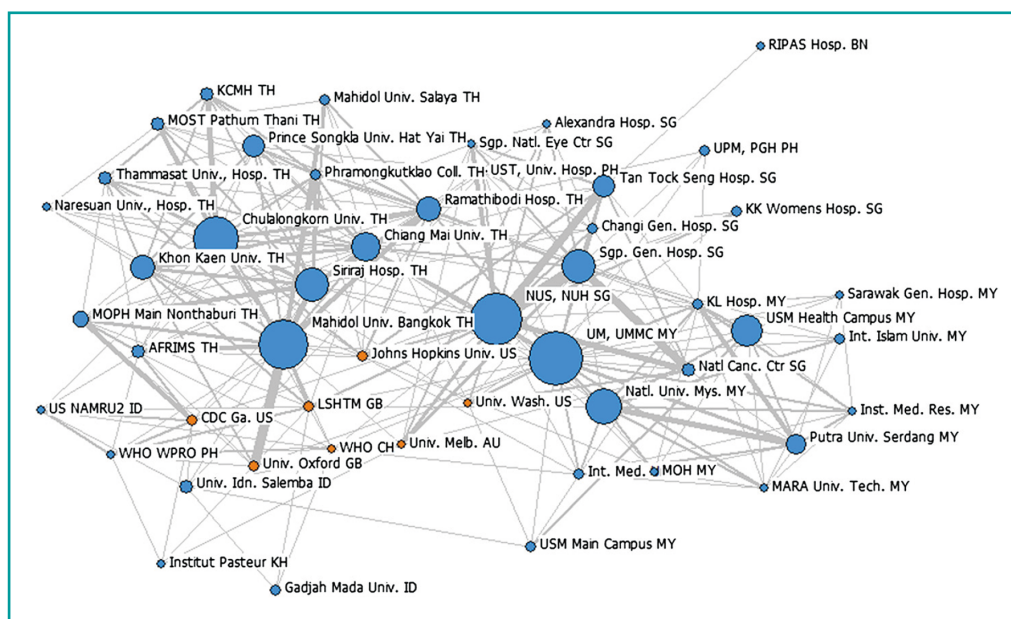
The ASEAN has been used in several free trade agreements and harmonization initiatives. Hence, embarking on an ASEAN initiative that will strengthen the scientific ties to address neglected diseases will not be difficult. The ASEAN member states can facilitate the exchange of expertise, resources, and health products as they have been working in other initiatives to improve the region. Under the ASEAN umbrella where harmonization and collaboration are the key elements, these arrangements can be easily addressed.

The results of the mapping were presented and discussed during the second organizational meeting held in Manila, Philippines on 6 December 2010. A website, [www.asean-ndi.org](http://www.asean-ndi.org), was created to serve as a repository of the mapping exercise-related information.

The conclusions from the mapping activity triggered the call for the preparation of a Strategic Business Plan (SBP) and the creation of a Task Force (TF) that will serve as an ad hoc group who will guide the development of the plan. The SBP will:

- Assess and recommend how ASEAN member states can come together to establish a center





**Fig. 3 Networks for diagnostics research collaborations among the top 50 most productive institutions (within and outside the ASEAN) based on articles on diagnostics**

Size of the nodes indicates relative number of articles. Thicker links indicate more instances of collaboration between the two institutions. Blue nodes are institutions in the ASEAN, while orange nodes represent institutions outside the ASEAN. Thai, Singaporean, and Malaysian universities and research centers have most of the collaborations on publications on diagnostics compared with the other ASEAN countries. Most of the collaborations are with the ASEAN member states but there are some collaborations with research centers in the United States, Great Britain, Australia, and Switzerland.

for drugs, diagnostics, vaccines, and traditional medicine innovation to address public health threats in ASEAN.

- Provide plans for an inter-governmental, collaborative response to the lack of access of poor countries and people to health products.
- Create public research and development (R&D) capacity while harnessing the strengths and potential contributions (technical and financial) of the stakeholders including the private sector.

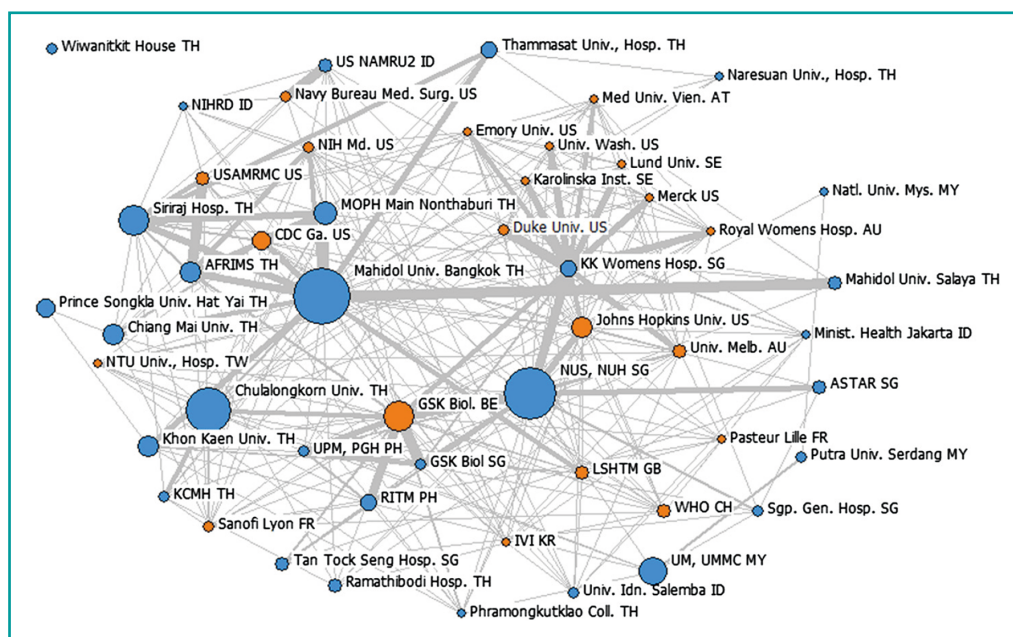
On 20 October 2011, the first ASEAN-NDI Task Force meeting was held in Manila, Philippines where the initial outline of the draft SBP and timelines were discussed.

The ASEAN-NDI is envisioned to become Asia's premier facilitator for collaborative innovation in R&D for health products, benefiting primarily the ASEAN but more open to global markets. As a network involving the ten ASEAN member countries, the ASEAN-NDI will build the needed human resources, technological capacity, and financing to ensure sustainable

health, development, and security. These inputs will be translated into research and eventually into the production of innovative health products and services that will be made available within and even outside the ASEAN.

The R&D and delivery value chain structure that underlines the ASEAN-NDI's business model is spelled out in the aggregate—specifically for the core partners in R&D, multilateral partners, and donors, which the ASEAN-NDI shall tap for research in priority diseases. The stress on the entire value chain will result to R&D being viewed from a perspective beyond bricks and mortars, management issues, and knowledge and information systems.

The ASEAN-NDI value chain is patterned from Michael Porter's business management concept, which defines the chain of activities that result in the production of the desired delivered final products/services. This concept was likewise reflected in the ANDI business plan where there is a value chain scoped for core diseases,



**Fig. 4 Network for vaccine research collaborations among the top 50 most productive institutions (within and outside the ASEAN) based on articles on vaccines**

Thai, Malaysian, and Singapore-based research centers dominate the scene with their networks in vaccine development. The collaborations are not only within the ASEAN but also with other countries such as the USA, Australia, Belgium, Austria, France, South Korea, Taiwan, Sweden, and Switzerland. GSK Belgium was a dominant collaborating partner in the ASEAN with respect to vaccine-related articles.

traditional medicine, and immediate druggable compounds.

The major activities of the R&D and delivery value chain include: (1) basic research, (2) assay/model development, (3) compound/candidate screening, (4) lead generation/optimization, (5) pre-clinical trials, (6) clinical trials, and (7) manufacturing and delivery/access. It is regional and even global in extent, involving private enterprises, public sector institutions and governments, non-profit organizations, and donor agencies, which may have done related work on the priority disease areas in the past, and may be willing to collaborate.

The governance structure comprise a policy-making and strategic direction setting by a 14-person Governing Council and a four-person Executive Committee. The ASEAN-NDI is designed to operate in a hub-and-spokes model, in contrast to the hierarchical models where initiatives emanate only from the top. The National Coordinators relate to their respective country R&D hubs independent of the system

of other members, but relate to the overall ASEAN-NDI network hub in the Philippines.

Innovation Communities (IC) will also be established. The most important outcome of the ICs will be the coordinated and cooperative strategy that the stakeholders develop through the sharing of best practices, and R&D knowledge to meet the common challenge at hand.

Details regarding the SBP were presented during the First ASEAN-NDI Stakeholders Meeting in Manila on 5 June 2013. Future plans for the ASEAN-NDI, including the proposed collaborative activities, were also discussed, taking advantage of the presence of representatives from the WHO, and the Africa and China NDIs. These activities include holding joint regional consultations on the development of demonstration projects, collaborating in setting up a global health R&D observatory, and forming a wider network composed of the regional innovation networks.

One innovative technology that has revolutionized the healthcare sector in the region is

ICT. The advantages of using ICT in health are very much apparent and clear in developing various reforms to answer the unique challenges that the ASEAN region will be facing. It is paramount that the region harness this technology in order to further the gains of an innovation network such as ASEAN-NDI.

At this juncture, I would like to share with you the Philippine experience on how we are exploiting ICT in developing products and services that will improve health care delivery in the country.

The Philippine eHealth Strategic Framework and Plan recognizes two pervasive challenges that remain to be the major stumbling blocks in the delivery of quality health care in the Philippines, namely;

At the moment, close to 60% of tertiary hospitals are located in urban areas and that 87% of health professionals are found in urban areas. However, because 70% of Filipinos live in rural areas, access to health professionals and quality health facilities is very limited.

With regards to decision making, our policy makers have difficulty creating relevant and timely policies because they do not have access to the most relevant and newest health information. Currently, consolidation of health data in the Philippines can sometimes take 2 years. This puts a dent in the decision-making process because of delay in the availability of much needed health statistics.

These challenges led the national government to push for initiatives to utilize ICT for health. The Philippines first attempted to utilize ICT for health in the year 1987 with the development of Field Health Services and Information System or FHSIS of the country's Department of Health (DOH), which was a database for barangay health centers and rural health units. At the time, the infrastructure to properly utilize ICT for health was still immature and that majority of Filipinos have no to very limited access to a computer.

In 1998, with the objectives to develop information resources in the form of specialty databases, electronic journals, health advisory, and directories; while at the same time, provide a forum for online discussions on health concerns of Filipinos, the Philippine Council for Health Research and Development of the Department of Science and Technology (PCHRD-DOST)

launched the electronic Health Information Village or eHealth Village.

Following the eHealth Village, PCHRD spearheaded the development databases and Internet resources on surgery, biomedical devices, tuberculosis, reproductive health, medicinal plants, managed health care, and malaria in the country. This initiatives, later on became the foundation of our presently ongoing work of HERDIN (Health Research Development Information Network), a comprehensive national database on health researches.

PCHRD developed databases for various health research initiatives such as the Health Research and Development Information Network or HERDIN database which serves as the national repository of health researches in the Philippines with more than 50,000 citations and bibliographic information, to date and the Philippine Health Research Registry or PHRR which is a publicly available database of ongoing health and health-related researches from 2011 onwards. Both of these registries will be replicated as regional registries to capture the depth and breadth of research in ASEAN region, as well.

In cooperation with other agencies, PCHRD-DOST also supported efforts to develop more databases such as the ASEAN-NDI and the Philippine Traditional Knowledge Digital Library—Health or TKDL which provides information on traditional knowledge in health including ethnobotanical studies, traditional healing practices and rituals as well as current researches being conducted in selected ethnolinguistic groups in the Philippines.

The region, through a recent meeting of experts and researchers on traditional medicine have also identified the need for a similar regional database for ASEAN which will document the traditional medicine knowledge in the different ethnic communities and serve as a basis for local and international research collaboration for the development of potential drug candidates.

The PCHRD is also very active in pursuing the national government's initiative to transform the health care delivery system in the Philippines through the eHealth program.

The PCHRD is at forefront of the country's initiative to adopt ICT as a strategic tool to help address the challenges and demands of

making health care services more efficient and effective in order to ensure equitable access to quality health services for every Filipino, primarily through the Philippine Health Information Exchange.

Staying true to the concepts of ICT of connecting people, PCHRD hopes to reinforce our “connection” with stakeholders, especially the Philippine Medical Association and all the doctors in the country, to make our dreams come true. This will be facilitated also by the development of key databases such as patients, health care providers and health facility registries.

It is this same convergent strategy that we hope to replicate in Southeast Asia through the ASEAN-NDI in order to facilitate the research gains in the health sector that will redound to better quality of life for all the people of ASEAN.

The global contribution of the ASEAN-NDI will be significant. The ASEAN-NDI will improve health R&D by driving innovation through collaboration not only among the ASEAN member states but with other networks and health R&D institutions. Engagement of non-ASEAN stakeholders is also vital considering that infectious diseases and NTDs are emerging in European countries and other Western states.

In a recent study by Hotez and Papageorgiou (2013), it was deduced that one way to address NTDs and infections of poverty is to establish a center for fundamental and translational research in which product development activities including R&D on drugs, diagnostics, and vaccines are conducted. This is the main thrust of the ASEAN-NDI, and with many countries sharing the same health challenges, the Network may be the link to providing solutions not only in the ASEAN but in other regions as well.

The ASEAN-NDI will coordinate research by partnering with research networks, developing capacity-building initiatives, supporting R&D infrastructural improvement, advocating for more research investment, and enhancing regional access to health products.

ASEAN-NDI will start by enhancing collaboration among the ASEAN member states to

address the specific health needs of the ASEAN, but collaboration with other countries will soon follow. This is consistent with the GSPA-PHI goal of making a network of networks wherein the ASEAN-NDI can partner up with other NDIs (ANDI, China-NDI, India-NDI, etc.) that have been established and form the nucleus for South-South collaboration.

With a number of NTDs and vector-borne diseases which affect both the African and Asian regions, network collaboration will be helpful in developing and conducting R&D projects which result in programs and policies which address such public health threats. Likewise, with their expertise in traditional medicine development, the India and China NDIs can also help the ASEAN-NDI form its strategies in advancing the ASEAN’s own traditional medicine.

Through regional network collaboration, global health problems will be addressed by properly channeling resources and partnering on projects according to collective needs. This will capacitate the different regions to contribute to the advancement of global health R&D while providing solutions for their own health challenges.

To close my talk on the establishment of an ASEAN innovation network, let me quote India’s first Prime Minister, Jawaharlal Nehru, a true visionary, who said that: “I see no way out of our vicious cycle of poverty except through the means that science and technology has placed at our disposal.” Adding further that “... because we are poor, we cannot afford not to do research.”

Very much like how Dr. Takemi envisioned to use his knowledge for the greater good of mankind, I hope that this event will help us have a very fruitful exchange of ideas and strategies in order for us to deliver the utmost service to mankind.

We are doctors and we are in the best position to change the lives of the people who seek our help. Let us continue moving forward not as individual countries but as one ASEAN community committed to health for all.