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The 442nd International Symposium on Therapy

The 442nd International Symposium on Therapy was held at the Gakushi Kaikan in Tokyo on January 23, 2020. Dr. Takahisa Murakami, Director of the International Medical Society of Japan (IMSJ), presided over the meeting.

Medical innovation and venture business

Introductory Message from the Chair

Takahisa Murakami, MD, PhD
Director, IMSJ

In order for new medical technologies and medicinal products to actually be widely used in the medical field, industrialization is needed. Japan has many technological seeds in the fields of medicine, engineering, and pharmacy, even by international standards. On the other hand, advanced medical

care is expected in many fields such as treatment of rare diseases, regenerative medicine, and precision medicine, and smoother industrialization (including research elements such as translational research) is expected. In addition, the current system of the pharmaceutical affairs approval system and the medical insurance system may need to be changed or rebuilt in order to establish new technologies. For this reason, it is necessary to develop human resources having a broad perspective from an interdisciplinary perspective, develop a think tank that can make policy proposals in a timely and accurate manner, and establish a base for voluntarily conducting translational research. Today, we invited Dr. Hiromichi Kimura and Dr. Kazunori Kataoka, who have been aware of this issue for a long time, have been working on human resource development and development of bases to solve them, and have continued to disseminate it in society.

Lecture I

Human Resources for Medical Innovation Ecosystem

Hikomichi Kimura, Ph.D.
Project Professor
Institute for Future Initiatives
The University of Tokyo

Tonomachi in Kawasaki city was the place where the auto plant of Isuzu's had been, in which research institutes on life science have been integrated. Center of Open Innovation Network for Smart Health (COINS), one of the 18 COI streams supported by JST, was launched at Tonomachi. Our challenging experience in Tonomachi with COINS project will be discussed.

Innovation Center of NanoMedicine (iCONM) was established as a center of COINS in 2015. COINS is partnering with Kawasaki city government, and an unique research project since iCONM runs outside an university while the other COI projects are running in universities. The concept of iCONM is based on more open innovation and further diversity; 1) researchers in iCONM are working at academia, industries, or startups. 2) 30% of the researchers are non-Japanese, and 3) the expertise of the researchers in iCONM is multidisciplinary. There are relaxative spaces, "magnet areas", which are designed to gather people and make innovation happen. In addition, atrium areas enable us to recognize each other even in a different floor, which is not seen in a general research institute. The facilities for device processing at first floor, chemical synthesis at second floor, and bio/chemical experiments at third floor, are fully equipped with advanced instruments. Animal facility is also maintained at fourth floor. The high-end facilities are also characteristic of iCONM, helping the researchers to perform all experiments on nanomedicine under one roof.

iCONM is the distinctive institute in terms of not

only building, but also research. Although academic researches are mostly driven by seeds of technology, thus, the research in iCONM is driven by market. We aim for the society that can completely change from treatment to prevention of diseases: anyone, anytime and anywhere, can be free from any diseases. The nano-scaled micelles, which are called smart nanomachines, circulate in our body and monitor our health, enabling early detection, diagnosis, treatment, and prevention of diseases. The concept is called as "In-body hospitals", from which we recognize what challenges we should address by backcasting. For instance, the organization in iCONM consists of sub-groups based on social implementation as well as natural science, producing three startups from COINS. As of 2020, two of the startups successfully raised fund.

COI program runs for 9 years and expires by March of 2022. Our project makes the transition to next era, and COINS are currently kicking off post-COI projects. For example, in order to realize our project, it is required to construct innovation ecosystem in which human resource, capital, and innovative technology present and recurrent. As seen in world ecosystems, startups present in the ecosystem and dramatically show their appearance. In particular, Boston has successfully established the ecosystem because incubators for startups play a key role in supporting the growth of startups. iCONM will be a hot spot for the ecosystem, in which resident startups are integrated and supported, leading to the realization of "In-body hospitals"

Most people thought that "In-body hospitals" was just a dream when COINS launched in 2013. It will not be distant future that the smart nanomachines would circulate in our body and let them monitor our health 24 hours a day so that we can concentrate ourselves to pursue our dream without being disturbed by any diseases.

Lecture II

Be a Dream Come True: In-Body Hospitals by Nano Technology

Kazunori Kataoka, Ph.D., Dr.h.c.
Director General
Innovation Center of NanoMedicine
Kawasaki Institute of Industrial Promotion

Recently, many medical laboratories and companies are clustering and advancing into Tonomachi, Kawasaki city, the KING (Kawasaki Innovation Gateway) SKY FRONT, that is a special district for medical innovation. Innovation Center of NanoMedicine (iCONM), Kawasaki Institute of industrial promotion started with subsidies by the Ministry of Education, Culture, Sports, Science and Technology in July 2015. A lot of members from universities, including the University of Tokyo, institutes, and companies have participated in Center of Open Innovation Network for Smart Health (COINS), one of the Center of Innovation programs (COI Stream), that is an iCONM's main research project and advanced collaborations with industry, government and academia. The novelty of COINS concept is trying to realize Smart Life Care Society where people become more and more healthier in a way without mental, physical, economical burden, and yet by releasing from difficult diseases to cure with the development of nanomachines that autonomously patrol, diagnose and treat the microscopic environment inside the human body. This world has been previously thought as something like SF for decades, but now it becomes a reality. In recent years, the vector of medical device development is heading towards sending medicinal devices into the human body through miniaturization, with high functionalization and minimal invasiveness, as seen an example of capsule endoscope, but it is nearly impossible to construct the system that patrol the whole human body using tiny medical devices. Therefore, as innovative approaches based

on the molecular technologies, COINS is trying to form the highly functionalized virus size (~50 nm) nanomachines using self-assembly of functional molecules (lego molecules) containing the system necessary for treating or diagnosing diseases. This concept may completely change the conventional ideas that patients are forced to be diagnosed and treated in hospitals. We are aiming at achievement of radical innovation of building In-Body hospitals that enable patients to diagnose and treat their diseases in the body. In this lecture, I would like to introduce iCONM as an innovation platform, and then outline the COINS's research projects. I hope we can share the dreams of In-Body hospitals with participants of this Symposium.

Discourse

Introduction of the speaker of discourse

Takahisa Murakami, MD, PhD
Director, IMSJ

Kazuma Momoi, who has traveled around the world as a photographer, will make a speech. He wrote books such as "Seimei ga meguru hoshi Chikyu (Flavelle Kan)" and "Kibo no daichi (Iwanami Shoten)," and he was featured in the TV program "Jonetsu tairiku" of TBS.

What are humans doing now on Earth ?

Kazuma Momoi
Specially Appointed Professor
Keisen University

As a photographer and journalist, I have visited more than 140 countries around the world. That experience

makes me strongly feel that the world is now at a major turning point. In other words, it is a turning point of civilization. Today, I will tell you about that through my experience of the Spanish Pilgrimage to Santiago, which I am currently putting my most effort into. It was in the 10th century that the pilgrimage to Santiago, Santiago de Compostela, the northwest city in Spain, the third holy site of Christianity, began. The first motive was the discovery of the remains of Jacob, a disciple of Jesus, in the church of this city shortly before that.

At that time, it was also part of the Reconquista (National Restoration Movement), in which Christians regained Spain, which was under the control of the Islamic Empire.

Is that a religious event born from religious conflict?

"Black Earth" written by Professor Timothy Schneider of Yale University contains interesting insights. It explains that Nazi Germany, led by Hitler, conquered Ukraine and Poland, known as the "black earth," because they were frightened by the food crisis and were deeply afraid of the crisis of their own survival. The root of the Nazi's behavioral principle was the fear of running out of food.

World War II began in Poland. The Ukraine was a tower tank of the Soviet Union. War and food were closely related.

Now, return to Spain. The country is 1.3 times that of Japan, and the population is 50 million, which is half that of Japan. It is worth noting that the majority of the land is relatively flat unlike Japan, where 70% of the country is forested. Moreover, since the climate is mild, it is one of the leading food production power in Europe and a country where "black earth" suitable for the production of crops spreads.

If you go to southern Spain, you can see the African continent 14 kilometers away over the Strait of Gibraltar. If you look at Google Maps, you can see that brown land is spread in Africa unlike green Spain.

A phrase "to add fuel to the fire" is suitable to

understand the cause of the war starting. In this case, I think that the elements of "fire" are "land (territory)", "food", "water", and "resources." And the elements of "fuel" are "religion" and "ethnic." All elements of fire are on the earth, and a crisis of survival occurs without them. On the other hand, the element of fuel is on the human mind, and is a concept that contains a fictional part largely.

In the whole history of wars, 7% of the wars began due to religion. In terms of the number of deaths, it's only 2%. I'm not saying that there is no war caused only by religion or ethnicity, but the war in which these elements of fuel became the true "cause" is very few, and the death toll is small.

As said by a proverb of "a baited cat may grow as fierce as a lion," wars and conflicts, where the likelihood of biological death is extremely high, occur only in case of facing with biological death.

Tetsu Nakamura (Doctor, Peshawar-kai), who was killed in Afghanistan at the end of last year, had worked on large-scale irrigation for more than a decade, and the reason why he was particular about water is just that water is the most fundamental factor in conflict resolution in Afghanistan.

If you continue walking in Spain on the Santiago pilgrimage, you will be able to experience how Spain is blessed with "black earth". That's why Spain continued to be a place of longing.

I have experienced five pilgrimages so far. I walked 950km in 2019. Moreover, I walk 800km with students next month. Pilgrims stay at pilgrimage inns, which are only for pilgrims, and they cost about 10 euros (1200 yen) per night on average. As a pilgrim with a pilgrimage handbook, I have got various help from the local people. As soon as a student on my team with broken shoes arrived at a pilgrimage inn, a local person who came to look for the student bought the student the finest light climbing shoes. The local person said that he heard from the information network of the pilgrimage route that there was a

person with a broken shoe in our team.

Also, when a student left a smartphone in a pilgrimage inn 350 kilometers away, its landlord took the trouble to deliver it. Of course, the landlord didn't charge money at all, and he returned on the road of 350 kilometers immediately after handing us the smartphone.

Why do the Spanish people so cherish the pilgrimage route?

The biggest reason is that 300,000 people every year gather to walk along the pilgrimage route, which covers whole Spain like a net. The 300,000 people

become passionate fans of Spain by continuing to walk on the land of Spain with a hearty hospitality. I am not the exception. Those who have come to like Spain do not want to attack Spain. This is the intangible "national security" of Spain, which has continued to be the scene of war and conflict because of the black earth.

In Spain, exclusive far-right forces are starting to have power. However, the route teaches us that a good idea that "meeting" and "knowing" ensure safety is in the world.