Gunbai Column No. 03

Sweet potato harvesting event held at Denka Farm in October 2017. The local people receive us more and more warmly every year, telling us that they look forward to seeing us again the next year, and it is hugely rewarding for those who take part.

For as Long as There Are Things We Can Do

Denka and The Great East Japan Earthquake

On March 11, 2011, Tohoku's coast was laid waste to by a colossal tsunami. This was just one effect of the Great East Japan Earthquake that caused unprecedented damage. At the time, the state of the stricken area was broadcast on the news every day, and volunteers from all over the country came rushing to provide help. However, as time passes, reports become less frequent, and the memory of the disaster fade away. Various problems that are difficult to resolve, such as restoring the livelihoods and industries of those who were affected, have been neglected.

However, since summer 2011, Denka has continued to conduct volunteer activities focusing on the restoration of disaster-hit areas, centering around Minamisanriku-cho, Miyagi Prefecture. In addition, we have also started a project to resuscitate fields damaged by high salt levels, making use of our own company's underground pipes and fertilizer. We have been discussing various possibilities with the local associations and farmers, and in 2017, we planted 600 sweet potatoes. This plot of land is called the "Denka Pilot Farm," and while attempting to generally improve the quality of the soil, we are also currently engaging in test cultivations of onions and rice.

The scars left behind by disasters are not the sort of things that can be easily erased. However, if we continue to do what we can and make use of Denka's technology, we should be able to soothe the wounds at least a little. With that thought in our hearts, Denka will continue our activities, all the while listening to what the people need.

The DenkaWay Spring 2020 Vol.03

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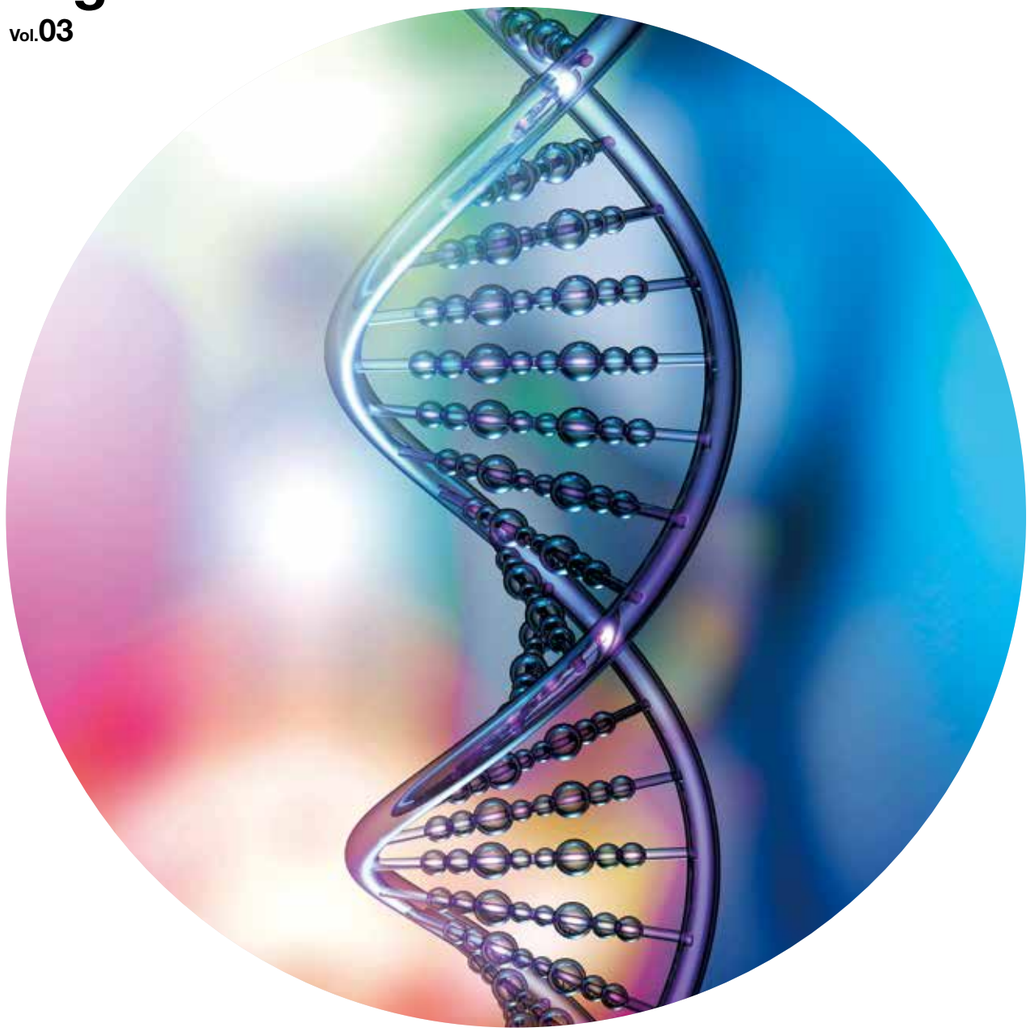
Denka

The DenkaWay

Spring

2020 | Vol.03



How We Can Serve People's Lives

Contents

Challengers for
Denka Value-Up

Reorganization of Healthcare Business and Group Trading Companies

Transformation and Collaboration of The Denka Group

On April 1, 2020, the Group was reorganized for the purpose of achieving the management plan Denka Value-Up. In the field of healthcare, which is positioned as a growth area in the management plan, Denka Seiken was merged with Denka. In addition, two trading companies were also merged to make a fresh start as YK Akros.

Merged!

Combining knowledge and technologies for further growth in the healthcare business!

Denka × Denka Seiken

Reborn!

A single trading company capable of drawing out the potential of the Denka Group!

Akros Trading × YK Inoas

The Group has been reorganized to combine human resources, knowledge, and technologies independently cultivated in the same business fields. The resulting synergy will open up new possibilities for the Denka Group.

Denka Seiken specializes in the development and manufacturing of vaccines and reagents for clinical testing, while Denka conducts cutting-edge R&D, including research on oncogene panel testing and development of norovirus vaccine using plant-based genetic modification technology (owned by Icon Genetics GmbH). This merger will expand the scale of these companies and realize an R&D and sales system capable of quickly capturing changing medical needs.

Then, there's Akros Trading, which specializes in overseas business, and YK Inoas, which boasts an elaborate network across Japan. Their human resources and sales networks will be combined into a single trading company with vast management resources.

There are business opportunities waiting for the Denka Group in numerous fields all over the world. The synergies created through this merger will be the key to unlocking these opportunities.

Creating the future of healthcare by taking on ever larger challenges

Denka Seiken is the core of the Denka Group's healthcare business. Some of you may be wondering, "Sales and profits are growing, so why do a merger?" The reason is that to further expand the business, we need to take on ever larger challenges.

At our Niigata Plant, we have invested 16 billion yen in the construction of a new building for processing undiluted solutions of influenza vaccines. An investment of this scale would not have been possible with Denka Seiken alone. However, it was realized through the support of Denka.

For over 70 years since its founding, Denka Seiken has been developing and manufacturing vaccines and diagnostic drugs using its antigen-antibody reaction technologies. However, we have yet to embark into the field of genetic testing. It is also not uncommon for technological innovations to render existing technologies useless or for new infectious diseases to change medical needs. By merging with Denka, which uses its expertise in semiconductors to develop cutting-edge technologies in fields such as genetic testing, Denka Seiken can expand its range of business fields.

On the other hand, the latest technologies created through R&D* and open innovation at Denka's four research bases would not have been commercialized without our know-how, production facilities, and sales channels. You might say that R&D provides the input, and Denka Seiken provides the output. By combining these two, Denka's healthcare business can reach new heights.

We also hope that the merger will facilitate interaction between employees and create new value. For example, we may be able to help other divisions to specialize. It is often difficult to enter medical and healthcare fields due to numerous hurdles such as pharmaceutical approval, clinical trials, and safety and quality assurance. However, by leveraging the know-how cultivated by Denka Seiken, other divisions may be able to launch businesses in these areas.

We will also be able to achieve further growth by drawing on the knowledge of other divisions. This need not be limited to technical and medical knowledge. We can also take advantage of production engineering know-how, overseas business experience, and operational improvements in general affairs/HR.

After the integration, Denka Seiken will follow the corporate philosophies of "respecting the dignity of life" and "protecting people's health." We will provide products that contribute to the health of all people by detecting diseases early and preventing epidemics. We are confident that this added value will also lead to profits. I encourage everyone in the Denka Group to collaborate across divisional boundaries and take on new challenges with the Life Innovation Division.

Life Innovation Division

*R&D bases: Life Innovation Center, Machida, Tokyo; Kagamida Plant, Gosen, Niigata Prefecture; Icon, Germany; Denka Life Innovation Research, Singapore

Management Interview Denka and Denka Seiken. Akros Trading and YK Inoas. What lies in the future for these companies that made a fresh start in this April? We posed this question to Hideki Takahashi, Executive Officer, Life Innovation, and Kenji Nakano, President, YK Akros.

Challengers for
Denka Value-Up

YK Akros

Leading the Denka Group on the offensive in Asia

This merger will create YK Akros, a trading company with sales of about 90 billion yen. This is a relatively large for a chemical trading company. We intend to leverage this scale to go on the offensive, aiming for sales of 100 billion yen. Our growth strategy's key phrase is "Earning in Asia." We are planning to grow the business in Asian countries and regions such as China, Taiwan, Thailand, Malaysia, India, Indonesia and Vietnam.

What customers want from a trading company is "information." Or in other words, new proposals. Up until now, we have been accumulating information, human resources, and merchandise under different roles—Akros Trading has been focusing on Southeast Asia and overseas countries, while YK Inoas has been developing its network in Japan. However, now that the barrier between these two companies has come down, we can draw on even greater management resources. For example, YK Inoas boasts a housing construction department, a solution not available to Akros Trading. By combining the specialties of these two companies, we will be able to do business in a wide range of fields. I hope that together, we can become an engine that allows the Denka Group to earn in Asia.

We are also planning on enhancing our "defense." Given the new scale of the company, it is now possible to set up systems to control risks. This includes credit management, internal auditing, and governance enhancement. In particular, overseas business and construction are two areas that entail many risks. If one intends to step on the accelerator, it is prudent to also invest in good brakes.

Of course, strengthening collaboration with Denka is also an important theme. We stand to learn much about development, manufacturing, and sales strategies, and this knowledge can then be incorporated into our proposals for customers. Meanwhile, we can provide feedback to Denka from a trading company perspective, which may lead to new businesses. In order to contribute to the growth goals of the Denka Group, YK Akros must go beyond simply moving goods around—we must become a trading company capable of leading the Denka Group by creating new strategies. And while it may take some time, I would also like us to start handling products from the Life Innovation Division.

To YK Akros employees, I say, "Do not underestimate your potential! Take on new challenges!" To everyone else in the Denka Group, I would like to say, "Please use YK Akros!" Moving forward, we must work together for the further growth of the Group, so please to not hesitate to rely on us. Let's trust each other, exchange honest opinions, and build a synergistic relationship.

We Drive Denka

Two Fresh Starts!

Everyone is ready to face new challenges.
We have captured some images of the two new companies making fresh starts.

Challengers for
Denka Value-Up

Forward!

Life Innovation Division

New encounters, new ideas, new innovations. With the merger, barriers will come down, and there will be new opportunities to connect with domestic and foreign colleagues in Tokyo, Niigata, Germany, and Singapore. We will continue to deliver products that protect people's health.

1 Life Innovation Division, Head Office, Tokyo 2 Employees are constantly on the lookout for new trends in the ever-changing field of medicine 3 Office in Kagamida Plant, Gosen, Niigata Prefecture. Here, vaccines and diagnostics are developed to protect people's health 4 Life Innovation Division staff working at Kagamida Factory

YK Akros

With the establishment of YK Akros, former Akros Trading and YK Inoas employees are now working in the same offices. This means new opportunities to meet people and exchange opinions. It is also a chance to connect with each other. Let's passionately lead the Denka Group as YK Akros!

1 With the establishment of YK Akros, we have begun reviewing our meeting systems to create bigger, faster strategies. 2 YK Akros offices. 3 A communication space. A small change of pace can lead to new business-changing ideas. 4 A meeting space.

Special Feature

How We Can Serve People's Lives

From vaccines and diagnostic reagents, to cancer treatment and genetic testing—Denka's Life Innovation is constantly creating new value in the areas of prevention, diagnosis, and treatment, helping enrich people's lives.

Amazing the World with Innovation

The enriched lives that Denka creates.

Societal problems include the ageing population and the increasing risk of infectious diseases.
Denka provides solutions to these problems.

“We want to provide active lives to an ageing society.”

**In this super-ageing society, the number of cancer sufferers and people with knee pain owing to ailments such as osteoarthritis of the knee is growing.
Denka is contributing to people’s QOL improvements in the fields of cancer treatment and arthralgia recovery.**

Relieving arthralgia.

We produce a joint function improver using the macromolecular sodium hyaluronate created through our unique fermentation process.

A challenge to analyze oncogenes.

We are developing a panel testing system that analyzes gene mutations in solid tumors, focusing on more than 400 oncogenes. Through this, we are creating environments that allow the optimum treatment service for each individual patient to be provided.

A challenge to treat malignant brain tumors.

We are developing a new production technology for the implementation of a new cancer treatment. This treatment uses a genetically modified herpes simplex virus 1, which is a specially designed virus that multiplies only in cancer cells and not in normal cells.

Amazing the World with Innovation

“We want to protect people from infectious diseases.”

**Due to the growth of developing countries and the evolution of transportation systems, the risk of infectious diseases spreading has greatly increased.
Denka aims to protect the lives of people from infectious diseases in the fields of prevention and diagnosis.**

Supporting people’s lives in the field of prevention.

Denka (formerly Denka Seiken) has continued to provide influenza vaccines with pursuit of safety and effectiveness for over 70 years.

Influenza HA Vaccine

Featured technology

A challenge to treat sepsis.

We are developing a new technology to detect pathogenic bacteria in the blood, using the unique "πCode™ Technology," which enables simultaneous multiplex assays.

More effective infectious disease diagnosis through rapid testing.

We contribute to hospitals and any other medical settings with our rapid influenza diagnostic kit, which can make diagnoses possible in just five minutes.

Rapid influenza diagnostic kit

“We want to make daily skincare more refreshing.”

**In this diversifying and rapidly changing social environment, the time available to spend on selfcare is limited.
By offering basic cosmetics, Denka makes daily skincare feel better.**

Making dry skin moist and supple.

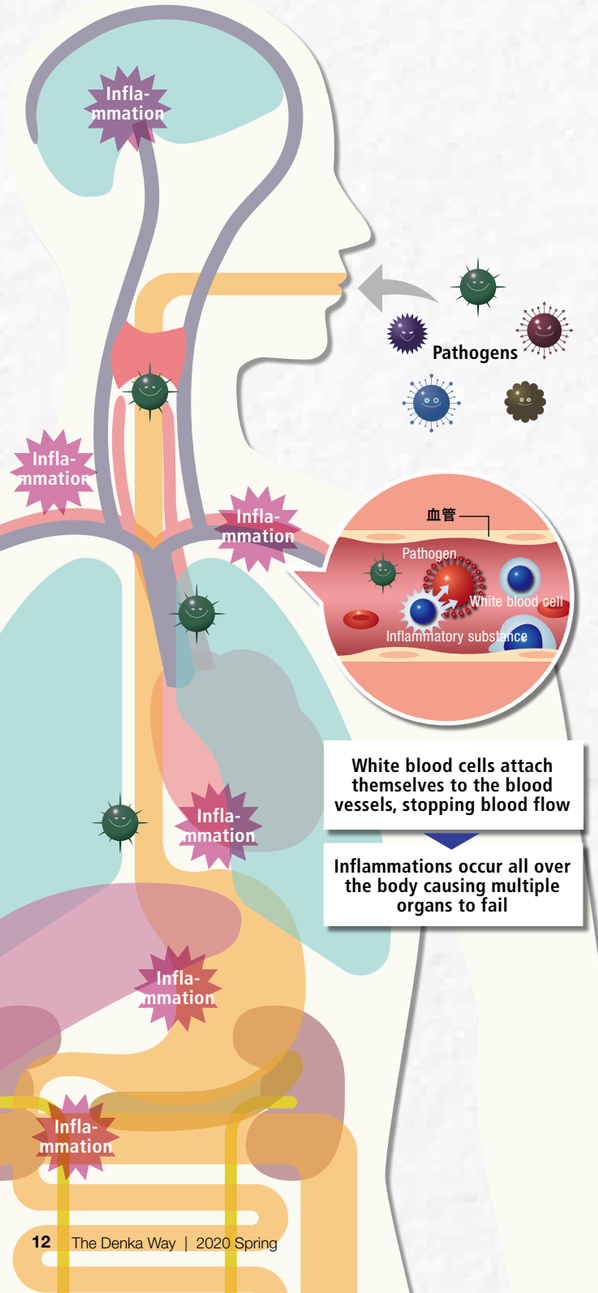
We offer basic cosmetics under the name “uruoi” making use of Denka high purity hyaluronic acid (D.P.H.A.), a substance cultivated through our unique fermentation process. It is scentless, has no color added, and is only slightly acidic and can help people achieve smooth, moist skin.

uruoi

Featured technology

A New Gene Detection System For Saving Sepsis Patients

Currently, Denka is carrying out R&D with Taiwanese company PlexBio on the gene detection system which helps increase the speed of sepsis diagnoses, in order to resolve the problems in sepsis diagnosis and protect the lives of patients.



What is sepsis?

Sepsis is a syndrome where pathogens enter the bloodstream and cause serious symptoms to appear throughout the body. As the likelihood of death increases over time, rapid diagnosis and treatment is essential. However, there are a number of different pathogens that can cause the problem, so ascertaining the correct bactericide can be difficult. Not only does early identification of the particular type of pathogen save the patient's life, but also helps to counteract the evolution of drug-resistant pathogens.

Deaths caused by sepsis every year around the world

1,100 million

With every hour that treatment is delayed,

the risk of death rises by 7.6%

There are many possible pathogens, so identifying an effective bactericide is difficult

May lead to the occurrence of

Drug-resistant pathogens*

when not treated with proper bactericide

*Drug-resistant pathogens are pathogens that have become immune to bactericides that should be lethal for them. Some possess the ability naturally, some receive it from other bacteria, and sometimes it is introduced through the administering of medicines.

References:
「Global, regional, and national sepsis incidence and mortality, 1990-2017: analysis for the Global Burden of Disease Study」
「Kumar A, Roberts D, Wood KE, et al. Duration of hypotension before initiation of effective antimicrobial therapy is the critical determinant of survival in human septic shock. Crit Care Med 2006; 34:1589-96.」
「Brun-Buisson C. The epidemiology of the systemic inflammatory response. Intensive Care Med 2000; 26 Suppl.1: 64-74.」

Process of sepsis diagnosis

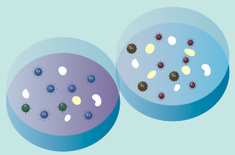
Current method

Blood drawn

A blood sample is drawn from patients who may have contracted sepsis. Whether or not bacteria are present is confirmed.

Blood cultivat ed

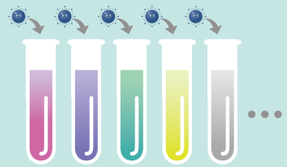
The most time-consuming process, as it is done by hand



The bacteria in the blood is cultivated in a culture medium using the necessary nutrients.

Simultaneous diagnosis

Requires time to detect pathogens and identify the type of bacteria



The colonies in the media are inspected and the type of bacteria is identified.

Medicine sensitivity test

Requires time to verify the effectiveness of each bactericide

Using automatic analysis machines, the medicine that will have the best effect is investigated.

New gene detection system

Analyzes the type of bacteria and its drug resistance simultaneously.

Problem

Takes two days minimum to get the results of the analysis.

Aim for shorter analysis time.

Amazing the World with Innovation

Experiment for the Future

A New Gene Detection System that Creates the Future of QOL

Our new gene detection system is expected to refine the current sepsis diagnoses. We spoke to the project members from the Vaccine & Bio Research Department at the Denka Innovation Center who are helping to push forward R&D.

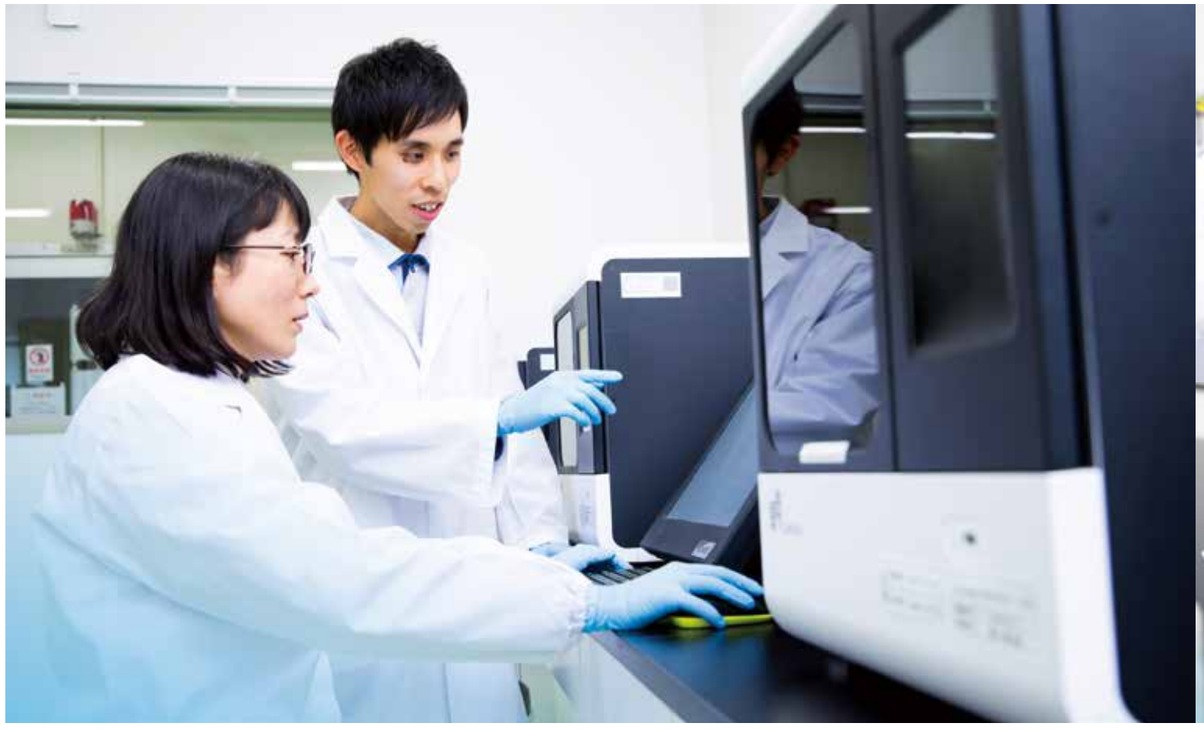
Life Innovation Research Institute, Denka Innovation Center
Vaccine & Bio Research Department

Yoichi Ide
Doctor of Veterinary Medicine
Director, Vaccine & Bio Research Department
Coordinates the Vaccine & Bio Research Department who develop next-generation vaccines and diagnostic reagents.

Noriyuki Izumiya
Group Leader
Coordinates the project. He ensures that there is an environment allowing research to smoothly progress.

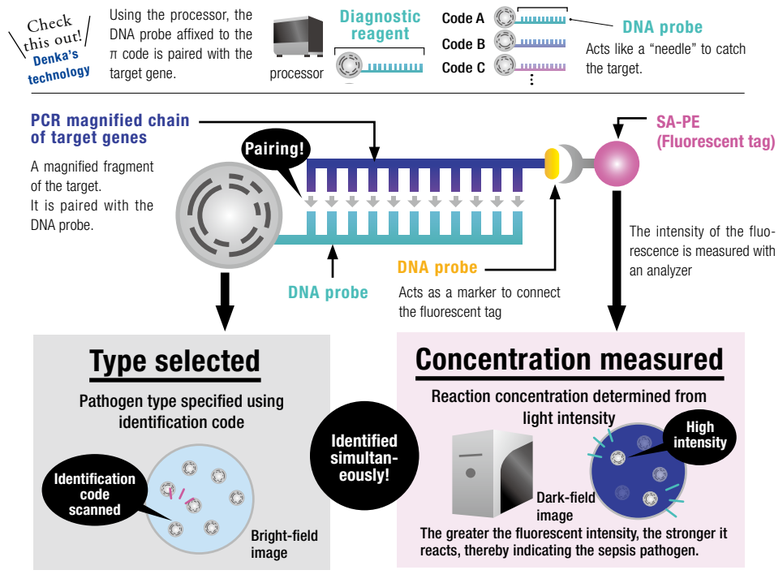
Kentaro Sakai
Gathers expertise from PlexBio, and brings together the nine members as the leader of the project team.

Mizuho Higuchi
Member of the project team. She develops diagnostic reagents with DNA probes affixed to the π code.



New gene detection system using the π code

For each π code, a DNA probe for the target pathogen is created through nucleic acid fixation, and the relevant test subject is acquired. Scanning the identification code identifies the pathogen. Furthermore, a fluorescent tag is also attached to the subject, and by combining it with the highly sensitive fluorometric method which identifies the subject by measuring the fluorescence, simultaneous multiplex assays was enabled.



Sparking innovation in sepsis diagnosis through simultaneous multiplex assays

Life Innovation Research Institute's development team of the new gene detection system from the Denka Innovation Center is working to see just how quickly they can determine the pathogens responsible for individual cases of sepsis and deliver the appropriate treatment.

In current tests to find the pathogens responsible for sepsis, specimens of patients' urine, sputum, or feces are cultivated, the existence of pathogens confirmed and type simultaneously determined, and, whether or not bactericide will be effective is verified. While this testing process is both accurate and effective, it can take over two days to receive the results.

The main benefit of the new system is bringing together the identification code, known as π code, and fluorometric detection methods to achieve highly sensitive, simultaneous multiplex assays. As a result, in addition to being able to determine the relevant pathogens and their immunity to medicine at the same time, the high level of sensitivity is expected to bring test times down to less than a day.

Dr. Ide, the Director of the Vaccine & Bio Research Department tells us a little more about the significance of the new system. "As the likelihood of death increases over time, early diagnosis and rapid treatment is essential. An accurate medicine choice also helps prevent pathogens from developing immunities. If we can create a medical equipment (in vitro diagnostics) that utilizes this technology, we will be able to greatly improve sepsis patients' QOL." As well as saving sepsis patients' lives, this new system is a fantastic innovation that also acts as a countermeasure to the evolution of drug resistant pathogens.

Creating new possibilities for Denka through open innovation

Denka Group's Vaccine & Bio Department that engages in development of next-generation vaccines and diagnostic reagents kicked off this project in 2016. They decided to collaborate with Taiwan-based PlexBio, which works on medical equipment development and provides biotechnology services. They also acquired exclusive rights for sales of the new gene detection system in areas such as the infectious disease field in both Japan and the ASEAN region, as well as development and marketing rights for test reagents.

In March 2016, Mr. Sakai was sent to Taiwan to learn more about the new system. "The areas that our company was responsible for were the reagent diagnostics using the PCR method where genes are magnified, and the detection reagents with π code affixed to DNA probes. This was the first time Denka had engaged in the development of reagents for genetic testing. While thinking about how much we could make use of PlexBio's expertise as our own, I learnt about the company's technology from their reagent production methods to their machine-based measurement methods."

Simultaneous and multiplex detection of the target!

Amazing the World with Innovation

In October the same year, the Life Innovation Research Institute's research theme was officially decided. With Ms. Higuchi also joining as a researcher, the team members have been growing, and reagent development has been progressing. Ms. Higuchi tells us that "What makes sepsis so unique is that the pathogens considered to be the cause come in a huge number of forms; they can be either bacteria, viruses, or fungi. My job is to detect the genetic arrangements of the various differing pathogens and organize them. The same type of pathogens can also have different genetic makeups, and I am slowly building up a database through countless trial and error processes." The expertise gained from open innovation with PlexBio is now finally starting to take root.

Making use of Denka's strengths, and continuing to improve to people's QOL

Denka's goal for the near future is to obtain regulatory approval for a product using the new gene detection system. Following this, while paying close attention to the market, they will develop it into a diagnosis platform to accurately meet demands. "The key to success is to show Denka's strengths as a general chemical manufacturer," says Mr. Izumitani, Group Leader. He goes on to tell us how making use of Denka's unique expertise is also important in the commercialization process. "Of course, this system is not made only with healthcare technology, but also involves semi-conductor technology. If and when we enter the quality control phase in the future, I imagine that problems will appear that cannot be solved simply through expertise in bio. At Denka, we have an environment where we can collaborate with people from other fields of expertise, such as those in Electronics & Innovative Products. By bringing together the expertise from all of our divisions, I would like us to make the best products possible for patients."

To finish things up, Mr. Ide talks about the Vaccine and Bio Research Division's vision for the future. "The main feature of simultaneous multiplex assays are that they can be used not only for sepsis, but repurposed to provide testing for other infectious diseases, or illnesses affecting, for example, the respiratory or digestive systems. Through this research, we would like to create a new future for QOL. We will continue to work hard to achieve this."

The high-aiming and enthusiastic employees at Denka will enrich ever more enrich more people's lives in the future.

Clement Huang
Sales & Marketing
International Sales & Marketing Director (APAC/ME)
PlexBio Co., Ltd.

Worked closely with Mr. Sakai to coordinate the development of the new gene detection system.

I was very impressed by Denka's analysis and market research capabilities and the professionalism they displayed in flexibly and rapidly responding to various situations. Thanks to open innovation, the development of the new gene detection system is progressing smoothly. Contributing to people's lives is key to standing out from our competitors in the biotechnology industry, and I am determined to make this project a success in order to serve our customers and sepsis patients.

Future R&D Schedule

Our current R&D is aimed at applying for pharmaceutical approval for the gene detection system for use in the field of sepsis as quickly as possible. Going forward, we intend to apply the simultaneous multiplex detection process to a variety of different fields.

Examples
- Fungal infections
- Viral infections
- Immunology
- General use in life sciences including research

etc.

With the power of chemistry,
we want to create a world
where everyone can live peacefully.

Amazing the World with Innovation

DENKA TOPICS

Introducing Denka Group news topics from January to March 2020

Jan.

New development of high heat-resistanct acrylic elastomer for automobiles

In January, we newly developed a special high heat-resistant acrylic elastomer. While it was previously difficult to achieve with acrylic-based elastomers, we have finally succeeded in making a product that can withstand temperatures of up to about 190ºC. It can be used as turbo hose rubber for gasoline vehicles, helping promote the downsizing of engines and generally contributing to a reduced environmental impact.

Jan.

TEFKA® adopted for the CLT PARK HARUMI Pavilion supervised by Kengo Kuma

TEFKA® is applied between panels of CLT

Denka has been extending the applications of TEFKA® high performance fluoride film to architectural membrane structures, and it was recently adopted for an event facility in Tokyo's Chuo Ward, CLT PARK HARUMI Pavilion, which was supervised by an acclaimed Japanese architect, Kengo Kuma. TEFKA® has been well received for its high transparency and light transmissivity equal to that of glass, and this is the first time it has been used for structures made of CLT.

Jan.

Denka ramps up sales of new functional resin, the Denka IPX Series

In January, Denka ramped up sales of the Denka IPX Series, a new grade of the Denka IP® ABS heat resistance modifier. In addition to the characteristic high resistance to heat and low-level VOC of Denka IP®, it also realizes enhanced performance in all areas including improved chemical resistance and coatability. It meets a lot of the demands in the automobile industry that have appeared following the rise of hybrid and electric vehicles.

Jan.

Outstanding results in the CDP Water Security Report 2019 and CDP Climate Change Report 2019

In surveys that London-based company CDP holds, which rate corporations on the transparency of their environmental information disclosure and management's participation, Denka received a rating of B in the CDP Water Security Report 2019 and an A- in the CDP Climate Change Report 2019. We will continue to enhance the disclosure of our environmental information and continue with our management path which places importance on ESG (Environment, Society, and Governance).

Feb.

Construction of the new integrated office, "Omuta Innovation Hub" completed

On February 27, the construction of our new integrated office, the "Omuta Innovation Hub" was completed inside the premises of the Omuta Plant (Fukuoka Prefecture). This brings together the previously scattered divisions of production, research, production technology, and allows us to realize unified and functional operation as a hub of the plant. We will also be promoting process and work-style reforms, aiming for improved productivity.

Mar.

Accelerating R&D for norovirus vaccine, genomic tumor testing, and COVID-19 testing kit

Image of a general testing kit

In order to further accelerate the R&D in the healthcare-related businesses, Denka Group is currently focused on expanding its research facilities and promoting open innovation. One of the group companies, Icon Genetics GmbH, is planning to launch a new R&D facility in Germany for the development of norovirus vaccine, while Denka plans to establish a joint research institute in collaboration with Kyushu University, aiming to contribute to the development of genomic testing technology for tumor. In addition, Denka, formerly Denka Seiken, has entered into a joint research contract with the National Institute of Infectious Diseases in relation to the development of a simple testing kit for COVID-19. We will continue to be committed to improving people's QOL.