



Cherry blossoms at the Denka Innovation Center

A place for employees and local residents can relax

## The Cherry Blossoms Watching Over Denka's History

Ten cherry blossom trees signal the start of spring at Denka's Innovation Center (formerly, Central Research Institute), located in Machida, Tokyo. They consist of eight *Yoshino* cherry trees and one *Yaezakura* and *Pendula Rosea*. Each of them is estimated to be around 70 years old. It is said that the *Yoshino* trees, whose petals are especially beautiful in blossom, have long been watching over Denka's history from their location near the main entrance,

A former employee shared the story of how the trees came to be. Around 1951, then-President Yosoichi Nomura ordered employees to purchase a *Paulownia tomentosa* tree in order to study the effects of lime nitrogen on plant growth. They used the opportunity to also purchase *Yoshino* cherry tree seedlings, which were then planted at the Meguro Research Institute, Denka's research hub at the time. Afterward, they were replanted at the Central Research Institute to commemorate the relocation of the Meguro Research Institute to Machida.

These cherry blossoms came to be known among employees as the symbol of the Central Research Institute. In the past, employees who had completed a half-day on Saturday would enjoy a round of drinks watching the cherry blossoms after breaking a sweat playing tennis and softball. Also, at the founding ceremony for the Innovation Center, commemorative photographs for long service commendations were taken in front of the trees, which has since become a tradition. During years when the company entrance ceremony was held at the Innovation Center, there were inquiries about the blossoms from the head office every day, showing that the trees had become an inseparable part of the "Denka Spring." The trees have also become a bridge between Denka and the local community, as many residents also look forward to their blossoming.

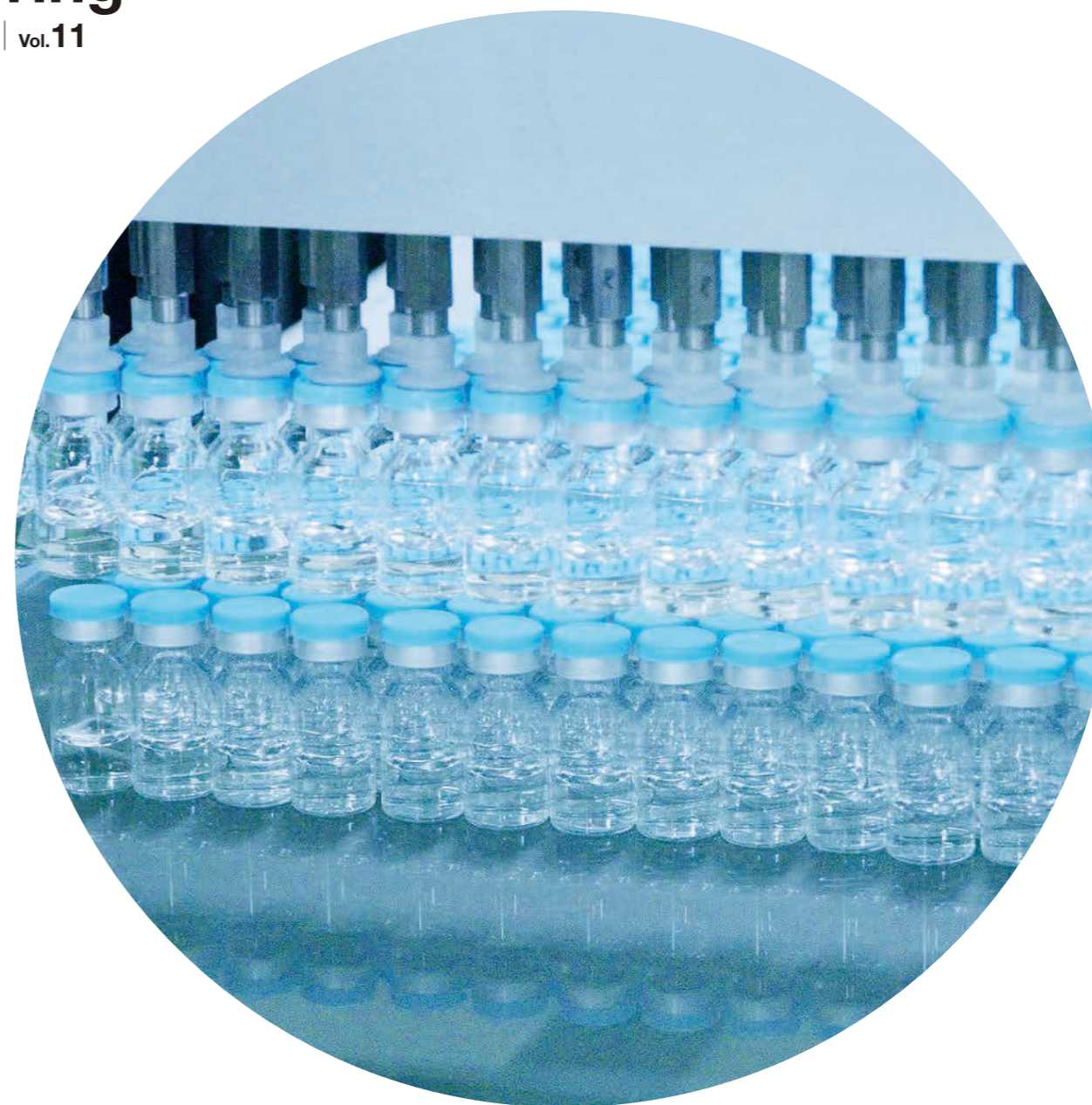
Just as they have continued watching over Denka's history until now, the cherry blossom trees will continue to place smiles on the faces of those who admire them.



# The DenkaWay

Spring

2022 | Vol.11



Protecting Society from Influenza

## Providing More Vaccines, Faster

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# Protecting Society from Influenza Providing More Vaccines, Faster

As one of the leading domestic manufacturers of influenza vaccines, Denka started manufacturing and selling the influenza HA vaccine in 1972, making it responsible for maintaining a stable supply of vaccines. To win the fight against infectious diseases and protect people's health, Denka will strengthen and expand its vaccine business.

## Gosen Site Niigata Factory

### Influenza Vaccine Stock Solution Facility

### Manufacturing No.42 Begins Operations

A new facility to produce influenza vaccine stock solution was built at the Niigata Factory in Denka's Gosen Site, and operations began in March. This will greatly enhance Denka's production capacity and make vaccines available to more people than ever before.

Influenza vaccines are made from a mixture of several virus strains. Since 2015, following worldwide epidemic trends, the Japanese government decided to switch from trivalent vaccines to quadrivalent vaccines. This meant that influenza vaccine manufacturers had to increase the types of stock solution produced to four, which requires more advanced manufacturing technology.

Denka's old manufacturing facility and production line at the Niigata Factory in the Gosen Site were made to handle only three types of stock solution. Naturally, the switch to four types in 2015 resulted in decreased productivity, which made it difficult to adequately address demand. Additionally, the required virus strains change yearly in line with epidemic forecasts, and years with difficult to manufacture strains suffer from a decrease in production quantity. Thus, in 2018, Denka decided to increase its influenza vaccine manufacturing capacity, starting the construction of the new stock solution

manufacturing facility.

The new manufacturing facility, which began operations in March 2022, has twice the capacity of the old facility. Manufacture of the vaccine stock solution typically starts between late February and early March every year, and shipping begins in mid-September. Vaccinations at medical institutions start from October. It takes around three weeks from the time of vaccination to develop immunity. Influenza epidemics start in December at the earliest. The increase in production capacity means vaccines can reach the market earlier than before, giving more people an opportunity to prepare for the flu season as soon as possible.

**Amazing  
the  
World**  
with Innovation

## 1 Doubled Production Capacity



## The New Manufacturing Facility Will Change Denka's Influenza Vaccine Production!



## 2 Increased Productivity with DX(Automation)

One of the defining characteristics of the new manufacturing facility is its process automation. A large amount of chicken eggs are used when manufacturing vaccines, and they need to be transported between processes. At the old facility, up to 5000 eggs would be transported by hand with a moving cart, which was a burdensome process. The new facility utilizes an AGV (Automatic Guided Vehicle) to automatically carry them between processes. Automation is also implemented for various other functions such as cleaning and disinfecting equipment.

### Examples of installed equipment

#### AGV (Pictured)

Loader  
Equipment which automatically loads trays on the moving cart.

#### Unloader

Equipment which automatically unloads trays from the moving cart.

Even when working at full capacity, the old facility experienced ups and downs in productivity due to yearly changes in virus strains. The new facility has roughly twice the capacity of the old one, allowing it to deliver more vaccines to the market in a shorter amount of time. This boost has enabled a more flexible response to yearly virus strain changes. We will aim to obtain the No. 1 share in the influenza vaccine manufacturing industry by utilizing the increased production.

### Examples of installed equipment (Pictured)

Automated egg candling machine, inoculator, liquid sampler, cultivation equipment



## 3 Enhanced Sterility

Lots of vaccine manufacturing processes require a sterile environment that prevents the mixing in of bacteria and foreign objects. The new facility features an isolator, equipment which makes it easy to keep the environment sterile, ensuring it is strictly maintained. This greatly contributes to superior product quality.

### Examples of installed equipment

Isolator (Pictured), iseptic filtration equipment, CIP/SIP equipment

#### CIP (Cleaning in Place)

A system which automatically cleans devices without disassembling them.

#### SIP (Sterilization in Place)

A system which automatically sterilizes devices without disassembling them.

Explained in detail on the next page!



## How the Influenza Vaccine is Made

# The Safe Influenza HA Vaccine Made from Eggs

Following various processes, the influenza vaccine is shipped and delivered to people. Here, we will introduce Denka's one-year production cycle using the Influenza HA Vaccine as an example.

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**January – March**  
Selecting the virus strains used for influenza vaccine production

**WHO**  
(World Health Organization)

The WHO's Global Influenza Surveillance and Response System (GISRS) monitors the global influenza epidemic status with a network of over 150 research institutes in 127 countries. Each year, a meeting of WHO experts decides on the recommended virus strain for the influenza vaccine.

**Ministry of Health, Labour and Welfare**  
National Institute of Infectious Diseases

Taking into account the WHO's recommendation, the Ministry of Health, Labour and Welfare and the National Institute of Infectious Diseases examine the epidemic status domestically and abroad, then decide on the production strain based on factors that include the presence of antibodies, productivity of candidate strains, vaccine effectiveness, and projected number of supplied doses.

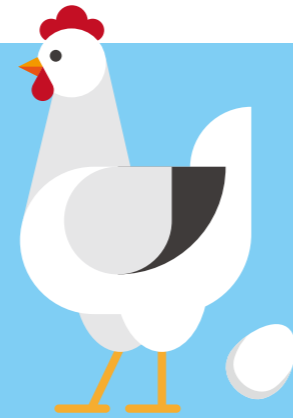
**Productivity evaluations by the four domestic vaccine manufacturers**

The National Institute of Infectious Diseases distributes candidate strains to the four domestic vaccine manufacturers (Denka is one of them). The manufacturers perform productivity evaluations on those strains and report back to the Institute. Once a likely candidate strain emerges, manufacture begins.

**The vaccine manufacturing process at the Gosen Site**

**Influenza HA Vaccine Production Method – the “Chicken Egg Method”**

The manufacturing process for Denka's Influenza HA vaccine begins with the rearing of chicks to adult chickens which produce fertilized eggs. The vaccine stock solution, made using cultivated virus strains and managed according to strict national standards, mixes four different strains (two A-type and two B-type) and is separated into vials. Afterward, quality tests are performed, and the vials are submitted for national certification. The qualifying products are packaged and shipped sequentially.



### Chicken

Ordinary chickens are used, but precautions are taken to ensure cleanliness and disinfection at vendors' poultry farms.

**March – September**  
Manufacturing stock solution

The start times of vaccine production may differ by year.

**Egg (fertilized)**  
Eggs sold at grocery stores are unfertilized, but vaccine manufacture requires fertilized eggs. Before injecting them with the virus, we make sure they are developing normally.

**Virus injection**  
A hole is opened in the egg, and the virus is injected.

**Growing viruses in the egg (cultivation)**  
The viruses multiply through cultivation at around 34°C for two days.

**Virus collection**  
The multiplied viruses are collected from the egg.

**Virus concentration/purification**  
The culture medium is filtered to remove impurities such as egg pieces and bacteria, and the sucrose density-gradient centrifugation method is used to purify and concentrate the viruses.

**Splitting**  
Mixing in ether with the viruses decomposes the virus particles and removes lipids, making the viruses inactive. This makes vaccine side effects less frequent. Vaccines which have undergone this process are called HA vaccines.

**Stock solution**  
Per-strain stock solution is produced. After rendering the viruses inactive, it is adjusted to the specified concentration.

**October – December**  
Vaccination

**Vaccination**  
People get vaccinated at medical institutions.

**To hospitals**  
Pharmaceutical wholesalers deliver the vaccines to medical institutions.

**Distributors**  
Supply vaccines to pharmaceutical companies which sell them.

**September – December**  
Packaging/shipment

**Shipment**  
The vaccines are shipped to distributors. Denka's logistics department handles the shipping while managing temperature and delivery schedules.

**Labeling/Packaging**  
Labeling and packaging are performed in preparation for shipment.

**August – November**  
National certifications

**Quality tests/National certifications**  
After inhouse quality testing, samples are submitted to the National Institute of Infectious Diseases for examination.

**July – October**  
Formulation

**Filling/Formulation**  
Manufacturing the final bulk (prior to filling) and filling/formulation are performed in a sterile environment to prevent contamination.

**Final bulk**  
The four types of stock solution are mixed at a fixed concentration, and the final bulk is adjusted through dilution and the addition of stabilizers.

## What is an Influenza Vaccine?

Influenza viruses keep mutating. Therefore, it is necessary to manufacture vaccines according to the projected epidemic virus strain each year. Japanese domestic quadrivalent vaccines are a mix of four virus types – two A types (H1N1 and

H3N2) and two B types (Yamagata and Victoria). They provide protection against infection with the influenza virus and protect against aggravation if infected.

## What is a Vaccine?

After infection, the body becomes immune to the virus, making it more difficult to get reinfected and suffering from milder symptoms in case of reinfection. Vaccines utilize this mechanism. Pathogens, the source of disease, are inserted into the body to create immunity, and the body

memorizes the shape of these pathogens so that its immune response can attack them if they enter it again. This makes it more difficult to become infected and results in milder symptoms in case of infection.

The Main Vaccine Ingredient, Antigens, are Prepared Beforehand and Administered into the Body.

## Live Vaccine

(Attenuated live vaccine)

Multiplied viruses and bacteria are weakened (their pathogenicity is attenuated as much as possible) and used for this vaccine.

**Characteristics** They confer an immunity similar to that gained in the case of natural infection. Side effects akin to a mild version of the disease may appear.

**Examples** MR (measles, rubella) vaccine, varicella vaccine, BCG (tuberculosis) vaccine, mumps vaccine, etc.

## Inactivated Vaccine

A vaccine which uses viruses grown within cells and bacteria grown in a medium that are then deactivated (their infectivity is removed).

**Characteristics** They are very safe. Several doses are required to gain immunity.

**Examples** The 4-in-1 diphtheria/tetanus/pertussis/polio vaccine, the influenza HA vaccine, the pneumococcal vaccine, etc.

## Recombinant Protein Vaccine

The vaccine components are synthesized by inserting viral genetic information into cells and producing virus-like particles (VLPs) and virus parts.

**Characteristics** Viruses which do not or barely multiply in cells utilized for vaccine manufacture can be used. These vaccines have a high relative safety.

**Examples** Hepatitis B vaccine (yeast origin), Influenza vaccine (non-Japanese-made), COVID-19 vaccine (under development)



# What are the six types of Vaccine?

## Researching Humanity's Weapon in the Fight against Disease

Vaccines are generally produced by cultivating viruses and bacteria in a medium and using them as components, but new types are also under development, as the now-famous COVID-19 mRNA vaccine shows. Currently, there are six main types of vaccines available.

Supervision: Vaccines Dept., Denka Company Limited.  
Illustration: COVID-19 Q&A page, Ministry of Health, Labour and Welfare

Amazing the World with Innovation



Administering Genetic Information, the "Antigen Blueprint," into the Human Body to Make Cells Create Antigens.

## Viral Vector Vaccine

A vaccine that administers viral vectors which are not pathogenic to humans, but have been genetically modified using the target virus' genes, into the body. The viruses enter human cells, and antigen proteins are made to give the person immunity.

**Characteristics** They are effective because they function similarly to actual infection with the disease. When multiple doses are administered, the vector virus may be eliminated by the immune system, which can reduce effectiveness.

**Examples** COVID-19 vaccine, Ebola virus disease vaccine (non-Japanese-made)

## DNA Vaccine

A vaccine that directly administers circular DNA containing the target virus' genes, making the body produce antigen proteins. No such vaccines have been approved as of yet.

**Characteristics** DNA can be synthesized easily, and thus these vaccines can be developed quickly. However, the effects of inserting DNA into the body are not yet fully known.

**Examples** COVID-19 vaccine (under development)

## mRNA Vaccine

Administering mRNA, the "template" cells use to create proteins.

**Characteristics** mRNA can be synthesized easily, and thus these vaccines can be developed quickly. Antigen proteins can be directly created, in contrast to DNA vaccines. They are cheap and relatively easy to manufacture.

**Examples** COVID-19 vaccine

Interview with the Deputy General Manager of the Vaccines and Diagnostics Business Headquarters

# Protecting People's Priceless Health is Denka's Mission

What is the significance of Denka's manufacture of influenza vaccines?

What is the aim behind the new vaccine stock solution manufacturing facility? Deputy General Manager Otsuka, who has been involved with the influenza vaccine business, will introduce his own experience while explaining the future prospects.



## Go Otsuka

Deputy General Manager, Vaccines and Diagnostics Business Headquarters, Life Innovation

### PROFILE

Joined the former Denka Seiken Co., Ltd. in 1981. After working at the Niigata Factory, he was assigned to the Osaka Medical Branch before assuming his current post in April 2020. He enjoys walking his dog on his days off.

## Ensuring Denka fulfills its duty as a vaccine provider

Denka began producing influenza vaccines in 1951. The business was started by Toshiba Chemical Corporation, the predecessor of Denka Seiken, with which Denka merged in 2020. The company received an approval for the manufacture of the current influenza HA vaccine in 1972 and began selling it. At the time, yearly production amounted to 3.3 million vaccines. The revision to the Preventive Vaccination Act in 1994 resulted in the suspension of regular vaccinations, and the entire domestic production slumped to just 300,000 vaccines, with Denka manufacturing only a few tens of thousands.

Due to the large drop in the number of vaccinated people caused by this revision, many care facilities experienced influenza outbreaks, resulting in an increase in deaths of elderly people due to lung inflammation in addition to cases of influenza-associated encephalopathy in children. Later on, with the help of data related to vaccine effectiveness, the importance of vaccinations was recognized. Regular vaccinations were introduced for high-risk individuals, such as the elderly, in 2001. This resulted in a steady growth in demand. To meet this demand, Denka increased its investment into vaccines and strengthened production capacity in addition to expanding its sales channels.

There are only four domestic influenza vaccine

manufacturers, including Denka. These four companies are responsible for the entire domestic supply, which means that if just one of them fails to achieve its targets, there will not be enough to meet demand. Denka has a serious obligation to supply vaccines.

Vaccines are capable of preventing infections and aggravation in case of infection, to an extent. Thus, providing vaccines to protect people's health means respecting life and becoming a company that contributes to and is trusted by society. That is what makes the vaccine business so significant.

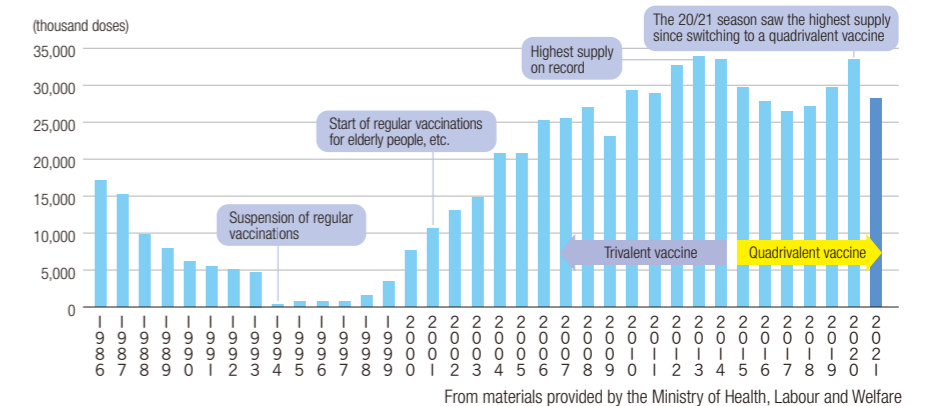
## The vaccine business is facing various difficulties

The influenza vaccine business faces unique difficulties. First of all, it is not easy to manufacture vaccines. The vaccine strain for the following season is chosen based on epidemic prognoses, and vaccines are produced by cultivating and growing viruses using fertilized eggs. This is fine when the selected virus strain multiplies easily, but when it does not, production volumes decrease.

Denka would like to provide more vaccines to those that want them, but since production volumes change according to the selected strain, they can only be known with certainty no earlier than June or July each year. Despite making every effort to enhance manufacturing at the Niigata Plant, unfortunately there were years when demand could not be met. The 2021/2022 season has also been affected by an unproductive strain, resulting in a decreased volume compared to the previous year.

Additionally, the manufacturing process needs to abide by the Pharmaceutical and Medical Device Act (Act on Securing Quality, Efficacy and Safety of Products Including Pharmaceuticals and Medical Devices) and be conducted under the standards of the certificate of approval for the manufacture and sale of pharmaceutical products. It takes a long time, and the chicken eggs used in the process are produced by

Changes in the supply of influenza vaccines (figures are in thousands of doses)



specialist poultry farmers who require over a year to prepare the parent chickens.

There are difficulties on the sales side, as well. Even after supplying the vaccines to the market, sometimes a mismatch between the vaccine strain and the epidemic strain occurs, which results in reduced vaccine effectiveness. Side effects may also occur after vaccinations.

For the vaccine business, it is very important to sustain a balance between supply and demand. Due to the COVID-19 pandemic, many people wanted to get an influenza vaccine during the 2020/2021 season, and the four manufacturers' yearly production exceeded 30 million vaccines, most of which were used.

Despite predictions for a similar demand in the 2021/2022 season, actual demand slumped toward the end of the season. The Ministry of Health, Labour and Welfare announced that production volumes would decrease, which caused medical institutions to restrict the number of vaccinations and wholesale distributors to limit the number of vaccines delivered. The planned third dose of the COVID-19 vaccine also affected demand.

## Contributing to a stable supply with the new facility

Due to the COVID-19 pandemic, society's

awareness of the importance of infectious disease prevention has increased, and influenza vaccinations are becoming essential. The launch of Denka's new stock solution manufacturing facility No. 42 will contribute to a stable supply of influenza vaccines and enable us to meet demand. This will result in more people being able to get vaccinated when they need to. Medical institutions will also be able to proactively promote vaccinations, which will help the market expand.

Production for the 2022/2023 season, when the new stock solution facility will be operational, is estimated at 10 million vaccines, and from the following season, Denka plans to produce over 12 million. Meeting these targets will allow us to obtain the No. 1 share domestically.

In addition to expanding production volume with the launch of the new stock solution facility, Denka is making efforts to improve vaccine manufacturing efficiency and vaccine effectiveness/safety at the plant. The company's aim is to expand the entire vaccine business by utilizing these influenza vaccines.

New types of vaccines are being developed to combat the spread of COVID-19. By combining novel methods with the company's technology, cultivated over a period of 70 years, Denka will aim to become a manufacturer with the potential to develop new vaccines and contribute to disease prevention in Japan and abroad.

## History / 1945

The Niigata branch of Tokyo Shibaura Electric Co., Ltd (currently, Toshiba)'s Physical and Chemical Research Institute was established. It would later become Denka Seiken and merge with Denka. It contributed to infectious disease prevention in the post-war period.



The Niigata Plant in 1947

## 1972

Successfully commercialized the influenza HA vaccine, which has reduced side effects. Sales began in September of the same year.



Manufacturing influenza HA vaccines in the 1970s

## 2022

The new stock solution manufacturing facility No. 42 begins operations at the Niigata Factory. Manufacturing capacity for the influenza HA vaccine is increased.



Niigata Plant facility No. 42

No. 11

## Spreading Culture and Happiness to People with the Scent of Spices

Culinary spice researcher/  
 TV personality



**Indo Curry-Ko**

She is the CEO of Korinkan Co., Ltd., a shop for beginners in the world of spices. Under the motto of easily making spicy curry at home, she develops and sells original spice sets for beginners in addition to writing cookery books and being involved in product development, marketing, and consulting. She graduated from the Graduate School of Agricultural and Life Sciences, Faculty of Agriculture at the University of Tokyo in March 2021 and is a member of JAPAN MENSA.

### Starting my career as Indo Curry-Ko with unshakeable confidence in the possibilities of spices

I first noticed the charm of spices when I started making authentic spicy curry without commercially prepared packages for my older sister, who loves curry, at the age of 19. Generally, spicy curry has an image as a time-consuming meal people may not be motivated to make at home. They especially feel that blending spices is difficult. However, once you try making it, you will notice how easy it really is. You basically just have three spices to blend: turmeric, cumin, and coriander, which are mixed in a 1:1:1 ratio. All you need is a frying pan. You don't need to use a lot of oil, so it is surprisingly healthy. You can change the ratio or combination of spices for an infinite number of arrangements. And it just tastes so good! When I discovered this, I felt like I had stumbled upon a diamond in the rough. I was convinced that honing these curry-making skills would bring about wonderful results. Home meals would become more fun and enjoyable, and Japan's cuisine would be enriched.



This revelation marked the start my career as Indo Curry-Ko.

At the age of 21, I established Korinkan Co., Ltd. and became its manager. People sometimes tell me that I must be very daring to start my own business at such a young age. However, becoming an entrepreneur was not my goal – producing and selling my own spice sets was simply the fastest way to spread the charm of spices.

My core business idea is to minimize food loss during the production of the spice sets. To be honest, I need to procure multiple kilograms of various spices to make the sets, and it is not easy to use them all up. I

am aware that food loss is an important social issue that must be addressed, and I can't let ingredients go to waste. Devising ways to avoid food loss has always been my policy.

My spice sets are manufactured at the social welfare corporation Harakara, which supports the independent lives of people with disabilities. However, I'm not using this fact to promote my products to consumers. Once again, my goal is to spread the charm of spices across Japan. We are working together to achieve our objectives.

### People will definitely be buying spices at convenience stores in the future

I met a nurse at my book signing last year. She told me that many patients cannot finish their hospital meals because of their low salt content and bland taste. However, she added with a smile that when her hospital implemented mildly spicy curry into the meals, food waste was considerably reduced. I was so happy to hear that! My aim is to spread the charm of spices by improving people's dietary habits, and I will consider my goals achieved once spices are on sale in

convenience stores. I have also heard that spices have positive health effects. I would like to share more scientific data on spices with consumers as it becomes available.

The number of healthy people in Japan may increase as spicy curry becomes more commonplace. Also, more Japanese people may become interested in southern Asian countries like India, allowing for mutual cultural development. I believe spices have the power to spread happiness.

Indo Curry-Ko's official website: <https://indocurryko.net/>

## Challengers for Denka Value-Up



# On the Frontline of the Threefold Value-Up

No. 03

## Gosen Site

In this segment, we focus on the worksites that are striving to realize the threefold growth vision "Denka Value-Up." In this third edition, we will introduce the Gosen Site.



Recently constructed office building (Facility No. 45, Niigata Plant, Gosen Site)



## Business Value-Up



**Spot Light**  
**Gosen Site**

An office building to serve as a future hub

Manufacture of safe and quality products with united efforts by all employees

### Supporting people's health with the three pillars of prevention, diagnosis, and treatment

The Gosen Site was established in Gosen City, Niigata Prefecture in 1950. Its main purpose was the manufacture and sale of vaccines, serums, etc. Later on, the site started selling reagents for bacteria and viruses. Currently, it houses two factories, Niigata and Kagamida. The former develops and manufactures vaccines, while the latter tests reagents. The site has been meeting diverse customer needs for more than 70 years in the prevention and diagnosis domains through influenza HA vaccines and QuickNaviTM-COVID-19 Ag. In recent years, it has started developing and manufacturing the DELYTACT® Injection G47Δ virus preparation, which is part of the treatment domain. The site is determined to further strengthen the three pillars of prevention, diagnosis and treatment, as exemplified by the construction of a new G47Δ plant (Facility No.

41, Niigata Plant). The newly built office building (Facility No. 45, Niigata Plant) will indeed contribute to the above-mentioned concept. While helping avoid contaminations and other risks by directly connecting to the manufacturing facility for vaccine stock solutions, the building will assemble manufacturing staff members who used to be separated, which will invigorate communication. In order to establish a sense of presence as a pharmaceutical manufacturer and further expand the business, it will develop and manufacture safe and quality products and enable all employees to work together and have productive discussions. Countermeasures for infectious diseases, including COVID-19 and others, are now entering a new stage. The Gosen Site will continue evolving in order to support people's health into the future.

#### VOICE

#### Always carrying a challenger's spirit

The site has come across difficulties and experienced some failures while trying to establish new pillars of treatment. However, the employees have managed to realize their dreams. Everyone continues to address challenges without being overcome by difficulties, and I believe this is the embodiment of the corporate slogan "Possibility of chemistry." I want to continue supporting people's health together with ambitious employees and address challenges one by one.

**Yasuo Nakatomi**  
Site Manager,  
Gosen Site



Offering new alternatives and possibilities for recovery in cancer treatment

## DELYTACT® Injection G47Δ virus preparation for cancer treatment

### Using a virus to develop and manufacture the world's first remedy for previously incurable cerebral tumors

13 years ago, the medical world considered treating cancer with viruses an unthinkable concept. Shattering this notion, Daiichi Sankyo launched the DELYTACT® Injection<sup>1</sup> G47Δ virus preparation for cancer treatment in November 2021. Denka is responsible for the DELYTACT® Injection.

In 2015, Denka (then Denka Seiken) acquired the manufacturing rights for G47Δ<sup>2</sup> from its inventor, Professor Tomoki Todo of the Institute of Medical Science, The University of Tokyo, ahead of its competitors. The company then worked on joint development of its manufacturing method. Cancer virotherapy is a mechanism that eliminates cancer cells by using viruses that only replicate in genetically-modified cancer cells. The pioneer, G47Δ, has been approved for malignant glioma<sup>3</sup> applications for the first time in the world. Conventional choices for cancer treatment used to be operations, pharmacotherapy (anticancer agents) and radiation therapy. However, these treatment methods could not

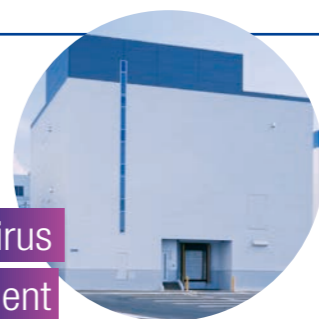
cure malignant glioma. The cancer virotherapy not only provides cancer patients with a new treatment option but is also expected to help them completely overcome the illness.

Manufacturing this product requires highly advanced technology, including large-scale virus cultivation. The Gosen Site has long developed such technologies through manufacturing vaccines and virus test reagents and was fully able address the manufacture of G47Δ. It is anticipated that needs will rapidly grow due to expanding overseas sales and a wider range of applications. In order to deliver this drug to as many cancer patients as possible both in Japan and overseas, Denka will study and build more efficient manufacturing methods for mass production.

\*1: DELYTACT® is a registered trademark of Daiichi Sankyo.

\*2: G47Δ is a triple-mutated, replication-conditional herpes simplex virus type 1 (third-generation oncolytic herpes simplex virus type 1), which is designed to exhibit replication capability only in cancer cells.

\*3: Type of malignant cerebral tumor that is classified in high-grade malignancies of grades III and IV. The number of newly diagnosed patients in Japan is estimated to be around 2,800 people per year.



Newly built manufacturing building for DELYTACT® Injection G47Δ virus preparation for cancer treatment (Facility No. 41, Niigata Plant, Gosen Site)

## Challengers for Denka Value-Up

#### VOICE

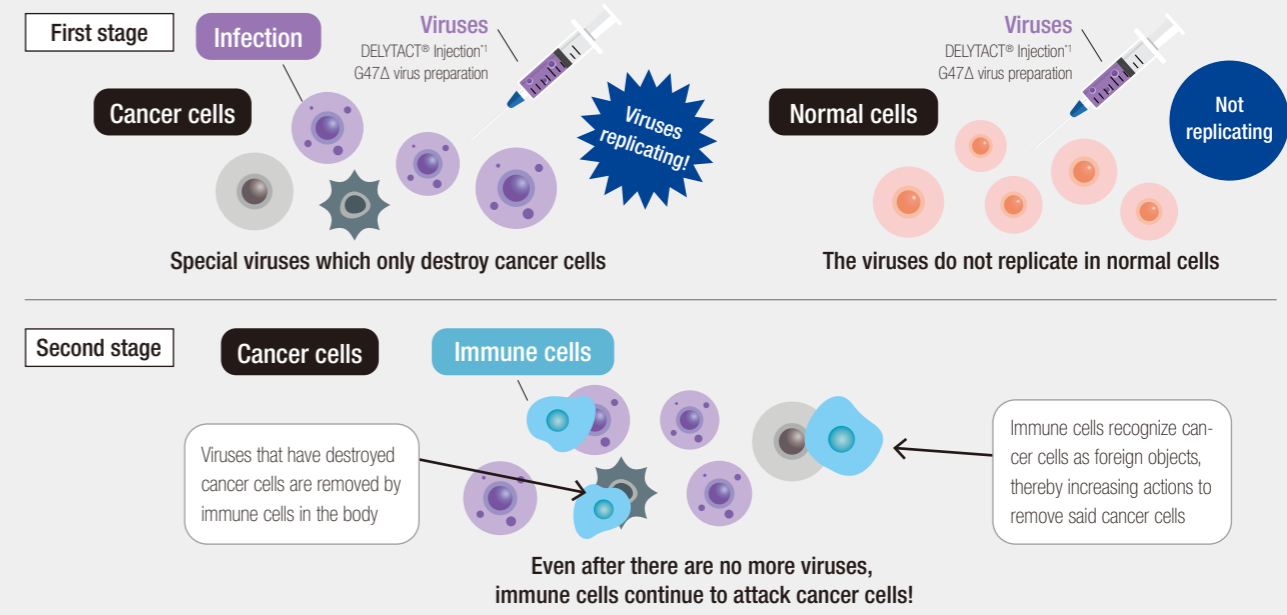
#### Tenaciously accomplishing unprecedented challenges

In 2009, I met Professor Todo for the first time while working for Daiichi Sankyo, my previous company. I was interested in cancer virotherapy even before that and was very moved by the possibility of G47Δ and the professor's aspirations as I continued to support development. The challenge was unprecedented and accompanied by numerous difficulties. However, due to the tenacious efforts of the approximately 100 G47Δ Unit members, sales started successfully, and I am very proud of that.

**Osamu Sato**  
G47Δ Unit Leader  
Life Innovation



### Two-stage effects of DELYTACT® Injection G47Δ virus preparation for cancer treatment





Annually, 700 tons of eggs and used Styrofoam are recycled

## Reducing CO<sub>2</sub> emissions via cooperation within the Denka Group

Based on a policy passed on from the former Denka Seiken, "respecting the dignity of life and protecting people's health to remain a company deserving of society's trust," the Gosen Site has established an Environment Policy which aims to reduce environmental burdens in the product life cycle in general, from design to raw material procurement and disposal, and co-exist with communities. In this context, the Gosen Site has placed a special importance on waste reduction in recent years. It is tackling challenges such as the recycling of eggs, about 700 tons of which are used every year, and volume reductions of Styrofoam and other packing materials.

A large number of eggs are used in the manufacturing process of influenza vaccines. Previously, they were incinerated, but as they contain a large amount of oil and eggshells, a plan was formulated to recycle them as fuel. At the same time, there was a plan to use them as fuel or raw materials at the recycling business of the cement plant, Omi Plant. In FY2020, 700 tons of eggs were brought to the plant. By using eggs as fuel, CO<sub>2</sub> can theoretically be reduced by around 800 tons. However, as eggs are perishable, managing them is a difficult task. In FY2021, only 370 tons were transported, but this recycling effort will continue with adjustments being made to transportation schedules between sites.

At the same time, disposing of Styrofoam, used for packing raw materials, and bottles has long been a challenge for the Gosen Site. Styrofoam, one ton of which is used annually, is so bulky that about ten 10-ton trucks are needed for transportation. To dispose of it, exhaust gas emissions and transportation costs are incurred. Therefore, the plant introduced a melting volume reduction machine around 2015. By compressing Styrofoam into bar-shaped ingots, it can be reduced to 1/50 of its original volume, thereby enabling transportation by just one two-ton truck. To check if the ingots can be used recycled materials for chemicals, they are delivered to the Laboratory of Toyo Styrene, a group company, thus disposing of excess Styrofoam. In addition, polypropylene bottles that contain chemicals were disposed of as-is in the past, but they are now turned into flakes with a crusher and delivered to a waste disposal contractor.

Also, the Gosen Site has long been engaged in community cleaning activities with a district association in addition to participating in local blood donation drives. By putting into practice "environmental load reduction" and "strengthening dialogue with local residents and supporting community activities," as set forth in the Environmental Policies, Denka will continue its initiatives in consideration of ESG together with local communities.



Waste eggs collected from the Gosen Site are taken to Denka Omi Plant and recycled as raw fuel for cement.



Using a melting machine to reduce the volume of Styrofoam to 1/50.



## Environment Value-Up

### VOICE Awareness of environmental load reductions across the entire company

To recycle Styrofoam, it must be cleansed on-site. As it used to be disposed of as-is, employees were initially not used to the cleansing work. However, I do believe that general awareness about waste reduction has been increasing gradually. Pharmaceuticals require special treatments, making them rather difficult to sort or recycle. However, the Gosen Site is addressing this challenge in a positive way as environmental load reductions across the entire supply chain increase in importance.

**Makoto Kanda**  
Environment and Safety Dept.  
Gosen Site



### Challengers for Denka Value-Up

Both the Niigata and Kagamida Factories of the Gosen Site have a high ratio of female employees, with about half of all employees being women. As the factories also employ people from overseas, they focus on making improvements to facilities and human resource education in order to create a pleasant working environment.

The Niigata Plant has installed ramps and accessible restrooms, incorporating a barrier-free design. It is also working on labor-saving. The transportation of eggs that used to be carried out manually is now conducted using automated guided vehicles (AGVs), enabling safer transportation of large volumes. In terms of liquid transportation, improvements have been made in the floor layout of the plant by installing pipes between fixed tanks for connections and automatically feeding liquid to locations as necessary in order to eliminate the need for heavy labor. Without being constrained by the notion that heavy work should be done by men, the plant established an environment where everyone can work in a safe and easy manner.

The plant also emphasizes human resource development. Educational training to observe GMP (Good Manufacturing Practices) and operational procedures take place at each department. Mr. Takaoka, General Manager, says, "Hardware is operated by people, and it is the cooperation between the two that enables the

manufacture and supply of quality pharmaceuticals."

The Kagamida Plant attaches great importance to cross-departmental exchange. Opportunities are arranged to enable employees to explain their products and the content of their work to colleagues engaged in other processes to share each other's work content in the plant, which tends to have a vertical division structure. Mr. Matsui, General Manager commented, "With pharmaceutical manufacturing, an important premise is that procedures are strictly observed. On the other hand, this may diminish employees' ability to think on their own, resulting in a reduced willingness to make or seek improvements." As employees learn about the difficulties others working in upstream and downstream processes experience, suggestions for improvements will start to be made. Such activities to heighten employee awareness of improvements will become increasingly important in the future.

The Kagamida Plant is now considering the construction of new facilities in an attempt to stimulate employees to review conventional approaches to work. In addition, the plant is also studying the possibility of increasing the number of females among supervisor and higher-level positions, with the anticipation that flexible ideas will come about as a result of assembling diverse human resources in the plant.

### Becoming a plant

where diverse human resources play active roles

## Human resource development to master operational excellence

### Human Resources Value-Up

To confirm work procedures and facilitate exchanges among groups, meetings and classroom training are being held. In addition, the factories also tackle other challenges such as workload reductions and automation as they aim to become places where everyone can work safely and easily.



\* Masks were only taken off for photos while ensuring sufficient protection against infectious diseases.



### VOICE

### Establishing new educational systems across departments

Both factories host educational programs for individual departments, while considering it necessary to have comprehensive education such as common programs for factories and the entire company. Engineer training is also a major theme. Cooperation with external research institutes and the creation of forums for engineers to address challenges will lead to a "Value-up" for human resources. The factories will continue to create education systems to enable employees to master operational excellence so they can question and consider a wider variety of topics.

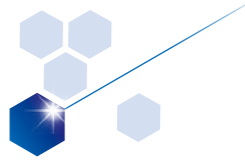
**Toshiyuki Takaoka**  
General Manager,  
Niigata Plant



**Hiroshi Matsui**  
General Manager,  
Kagamida Plant







## A Specialist's Perspective

Denka is striving to become a Specialty-Fusion Company. What do Denka's specialists foresee for the future?

### Safe and Quick. I Want to Continue Saving Lives.

POCT diagnostic reagents\* enable medical experts to quickly diagnose patients' health conditions. Mr. Hayashi is in charge of production planning, process management, and operation coordination for the reagents. Being involved in a wide range of work, including personnel distribution and machinery maintenance, which require making fine adjustments, he continues to address the ever-evolving production environment. Never missing signs of change, he has established a system capable of flexible responses even in unpredictable circumstances.

He is also engaged in the launch of the rapid infectious disease diagnostic kit Quick Navi™, utilizing process automation to increase production efficiency. His aim was to make the existing equipment easy to use, allowing employees to work safely and comfortably, commenting, "I am glad my improvements were effective at reducing burdens at our worksites." He plans to continue pursuing stable production through all-hands-on-deck initiatives. "Our products contribute to preventing infections and protecting people's lives. I will take on further challenges to innovate production and operation processes with a sense of pride."

\*POCT diagnostic reagents: Diagnostic reagents are used for health checkups as well as the diagnosis of infectious diseases

**Ryuma Hayashi**  
Assistant Manager, POCT Production Division,  
POCT Production Department  
Gosen Site, Kagamida Plant

Joined Denka in 2003. He is in charge of production and process management for the main packaging process of the Quick Navi™ series, which enables medical experts to quickly and easily diagnose infectious diseases such as the influenza A and B viruses and COVID-19.



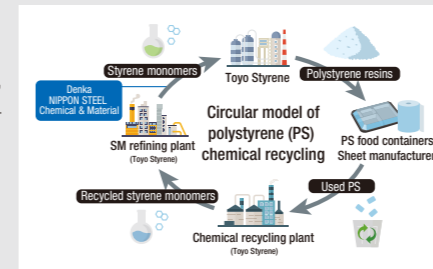
# DENKA TOPICS

Introducing Denka Group news topics from January to March 2022.

Jan.

### Denka and Toyo Styrene to build chemical recycling plant for used polyethylene resins

Denka and one of its equity method affiliates, Toyo Styrene Co., Ltd., will build a chemical recycling plant for used polyethylene (PS) resins (annual processing capacity: about 3,000 tons). It



will be built on the site of the Chiba Plant (Ichihara City, Chiba Prefecture) and is scheduled to start operating in the second half of FY2023. To accomplish its social responsibility as a manufacturing company of petrochemical products, Denka will aim to utilize chemical recycling across the styrene chain, contributing to the early establishment of a decarbonized recycling society.

Feb.

### Annual uniform partnership contract with ALBIREX NIIGATA to be extended

Denka has extended its annual uniform partnership agreement (covering the neck area) with ALBIREX NIIGATA in the J2 Soccer League. In the 2022 season (February 2022–January 2023), the company will continue to provide support to ARBIREX NIIGATA. While Denka tackles various challenges such as contributing to local communities in Niigata Prefecture, improving health and welfare and promoting sport, it will continue to support ARBIREX NIIGATA's return to the J1 League.



Mar.

### Concluded the "Mizuho Positive Impact Finance" financing contract with Mizuho Bank

Denka concluded the "Mizuho Positive Impact Finance" financing contract with Mizuho Bank, Ltd. Positive impact finance comprehensively analyzes and evaluates the impacts of corporate activities on the environment, society and economy (positive and negative influences). Whenever positive impacts are recognized and confirmed, financing will be made to support these activities. Denka is currently being evaluated for SDG-related items both qualitatively and quantitatively.



Jan.

### Joint proposal as a consortium adopted by the NEDO Green Innovation Fund Project

Forming a consortium jointly with Kajima Corporation and Takenaka Corporation, Denka submitted a proposal in response to an open call for applicants for the "Green Innovation Fund: Project for the Development of Technology for Producing Concrete and Cement Using CO<sub>2</sub>" by the New Energy and Industrial Technology Development Organization (NEDO). It was successfully adopted on January 24. The consortium targets the realization of general-purpose carbon negative concrete at an advanced level while also contributing to greenhouse gas reductions.



Feb.

### Establishment of the New Business Development Department and reorganization of corporate-wide research and new business development organizations

On April 1, Denka will establish the New Business Development Department, while at the same time reorganizing research and new business development organizations across the company. In light of the next management plan due to start in FY2023, the company will reinforce its R&D activities. The Denka Innovation Center, an organization that will consistently carry out a series of processes from business conception and concept studies to incubation and commercialization, will be deployed under the umbrella of the New Business Development Department, thereby clarifying responsibilities and operational systems for new business development. In addition, individual research departments that conventionally took charge of the specialization of existing businesses will be placed under the umbrella of individual business divisions, clarifying all responsibilities and accelerating the speed of development.



Mar.

### Crown sponsorship of playoff matches in the 23rd W League (2021–2022 Season)

Denka crown will sponsor the playoff matches in the 23rd (2021–2022 season) Women's Japan Basketball League (W League). These playoff matches involve a tournament with the top eight from the 13 W League teams to decide the winning team in the regular season between October 2021 and April 2022.



A "The Denka Way" reader survey is currently underway

For further details, please use the QR code



# With You, With Denka. With Society.



The whole team mowed the grass around the gymnasium they usually use



Itsuki Nakayama

Naomi Kitagawa



At the "Traffic Safety Campaign," a joint event with the local Agano Police Station  
© Niigata Albirex BB Rabbits

## Contributing to health promotion and regional development through sports

### Sponsoring the Niigata Albirex BB Rabbits at the W League (Women's Japan Basketball League)

The Denka Group has established the "Denka Group Social Contribution Policies" to proactively participate in society as a good corporate citizen and contribute to sound and sustainable development. One of these policies is "health and sports promotion." Denka is working to revitalize the region to improve people's quality of life while actively contributing to the promotion of sports and health.

In 2012, Denka began supporting the women's basketball team "Niigata Albirex BB Rabbits," which is based in Niigata Prefecture, as a uniform sponsor. This is because the Denka Group also operates a business based in Niigata and wanted to utilize the network it had established there to contribute to the region. For 10 years, Denka has been contributing to the revitalization of the region through sports while deepening ties and interaction with local residents.

In this section, we asked Naomi Kitagawa, captain of the Niigata Albirex BB Rabbits and an employee of the Denka Gosen Office, about her involvement with the local community.



#### INTERVIEW

### Naomi Kitagawa

General Affairs Division,  
Gosen Office, Denka Co., Ltd.  
/ Captain, Niigata Albirex BB Rabbits

#### PROFILE

Born in 1994. After graduating from the current Tokai University Suwa Senior High School and the Nippon Sport Science University, she joined the Niigata Albirex BB Rabbits in 2017. She has been the captain since the 2020 season. She started working for Denka in July 2020 and is currently involved in administrative work at the General Affairs Division. Her position is Power Forward.  
(As of March 31, 2022)

## Turning cheers from the community into motivation and returning the favor through work and play

As a member of the General Affairs Division, I am involved in various tasks, such as data collection and organization and internal and external postal correspondence. It took me some time to get used to the job, but a year and a half has passed since I joined the company, and I am now able to handle procedures more efficiently. What I am always conscious of is internal communication. As the General Affairs Division is involved with a variety of departments, I try to learn a lot from the people around me and apply them to my work. I have been able to come this far thanks to the understanding and cooperation of my colleagues, and I am very grateful to them. To further contribute to the company, I want to become more business-savvy.

From the perspective of a basketball player, my supervisors and colleagues are some of my most

valuable boosters (fans). The same goes for their families and acquaintances. Whether at work or at a game, I keep in mind that every moment is an opportunity to return the favor. That is how I approach both my job and basketball.

Over the past few years, the COVID-19 pandemic has resulted in fewer games and less interaction with boosters. This has led to significant changes in the women's basketball community. Despite this, our boosters continue to support us by coming to our games and cheering us on in front of their screens. By turning these cheers into our energy, we want to win as many games as possible and share the joy of victory. Furthermore, we would like to make the Niigata Albirex BB Rabbits known to more people and become worthy of their support.