### What can be expected from this technology

Control infectious disease risk and solve the problem of infectious disease in areas with poor sanitary conditions

<table>
<thead>
<tr>
<th>Threat of viruses throughout the year</th>
<th>Pandemics caused by the movement of people and goods</th>
<th>Limitations of medical treatment and vaccines</th>
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<tbody>
<tr>
<td>Risk of new viruses emerging</td>
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<td>Novel coronaviruses</td>
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<td>Pharyngoconjunctival fever</td>
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<td>Rotaviruses</td>
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<td>Dengue fever</td>
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<td>Influenza</td>
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<td>Noroviruses</td>
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It is increasingly important to strengthen **the body's natural immunity** to fight viruses in the course of daily life.
What is immunity?

A mechanism for eliminating viruses, bacteria and other pathogens through both innate and acquired immunity

**First type of immunity: innate immunity**
- An immune response mechanism that people are born with
- Relays information on the enemy to acquired immune cells
- Its offensive power is weak, but its response is immediate (several hours)
- The innate immune system does not retain any memory of its targets, and simply attacks the enemy at hand

**Second type of immunity: acquired immunity**
- Acquired immune response
- Attacks enemies that breach innate immunity
- Is powerful but takes a few days to kick in
- Retains memory of the target (response is immediate from the second time onwards)

Macrophages, neutrophils, etc.  
NK cells  
Killer T cells  
Helper T cells  
B cells  

Pathogens and infected cells  
Antibody production  

Only acquired immunity can produce antibodies
Immunity and food

Dietary habits greatly affect immunity
Lactic acid bacteria are known to be closely linked to immunity

Relationship between immunity and daily life

- Aging
- Stress
- Nutrition

Immune system
- Poor performance
- Imbalances
  - Infectious disease, cancer, etc
  - Allergies, autoimmune diseases, etc

Food ingredients known to be associated with immunity

- Oligo-saccharides
- Dietary fiber
- Lactic acid bacteria
- Vitamins

Immunity
- etc...
In the past, the accepted knowledge in immunology was that lactic acid bacteria activate only some immune cells (NK cells).

**Accepted knowledge in immunology**

Common lactic acid bacteria

"Command center" of immune cells
- Plasmacytoid dendritic cells

NK cells - Killer T cells - B cells - Helper T cells

- Attack and eliminate viruses

**Kirin’s idea**

Unknown lactic acid bacteria

- The pivotal leaders of immune cells
  - Plasmacytoid dendritic cells

- Activate
  - NK cells
  - Killer T cells
  - B cells
  - Helper T cells

- Attack and eliminate viruses

Activates all immune cells

**Is it possible that there may be lactic acid bacteria capable of activating the control tower?**

*Blood 2009;113:4232-4239. Human plasmacytoid dendritic cells are unresponsive to bacterial stimulation and require a novel type of cooperation with myeloid dendritic cells for maturation*
By questioning accepted knowledge and studying large numbers of lactic acid bacteria, we discovered "Lactococcus lactis strain Plasma" — a type of bacteria that activates the control tower

Studied large numbers of lactic acid bacteria in the microbial strain bank

*Presentation: The 48th Annual Meeting of the Japanese Society for Pediatric Infectious Diseases
About this technology

Ingestion of "Lactococcus lactis strain Plasma" reduced the risk of influenza and colds. We asked 200 people to consume either a milk-based drink containing "Lactococcus lactis strain Plasma" or a milk-based drink without "Lactococcus lactis strain Plasma" every day for 10 weeks, and investigated the effects on their physical condition.
Uniqueness of this technique

*Lactococcus lactis* strain Plasma are highly rated by experts for their unique ability to activate the "control tower," with numerous scientific papers published.

Common lactic acid bacteria

"Command center" of immune cells
Plasmacytoid dendritic cells

- NK cells
- Killer T cells
- B cells
- Helper T cells

- Attack and eliminate viruses

**Activate only some cells**

*Lactococcus lactis* strain Plasma

The pivotal leaders of immune cells
Plasmacytoid dendritic cells

- NK cells
- Killer T cells
- B cells
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- Attack and eliminate viruses

**Activates all immune cells**

32 papers published in total!
Future potential

Since *Lactococcus lactis* strain Plasma activate the "control tower," they can be expected to be effective against various viruses.

A model of rotavirus infection was used to evaluate the effects of *Lactococcus lactis* strain Plasma. Compared to the physiological saline group, the *Lactococcus lactis* strain Plasma group showed an improvement in fecal rotavirus levels.

Dentritic cell supernatant stimulated with *Lactococcus lactis* strain Plasma was added to cultured cells infected with dengue virus. This was found to limit virus growth.

If you would like to find out more: