

Research on intracellular bacteria and their hosts

Kenta Watanabe

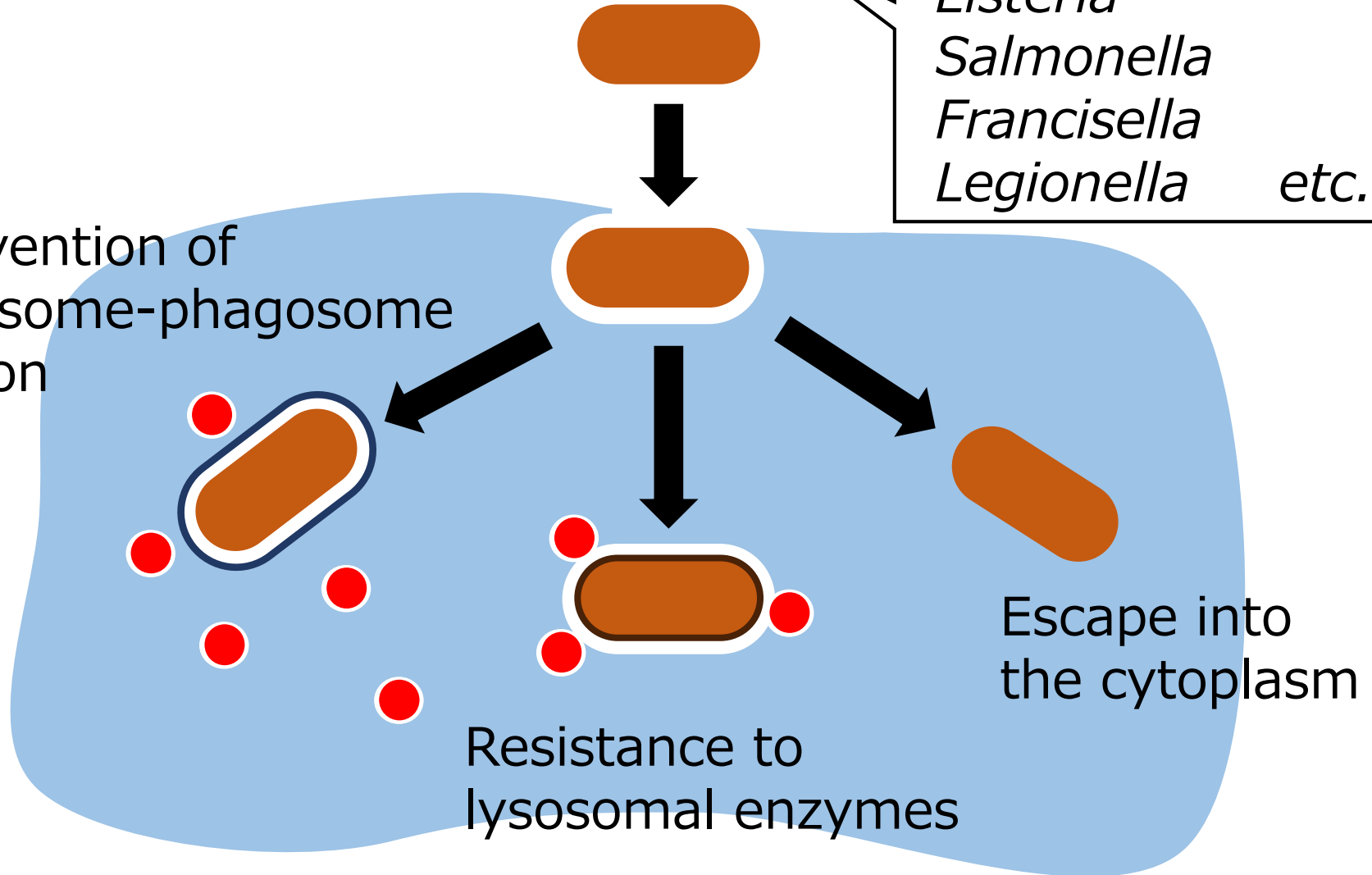
Laboratory of Veterinary Public Health
Joint Faculty of Veterinary Medicine
Yamaguchi University

Outline of study

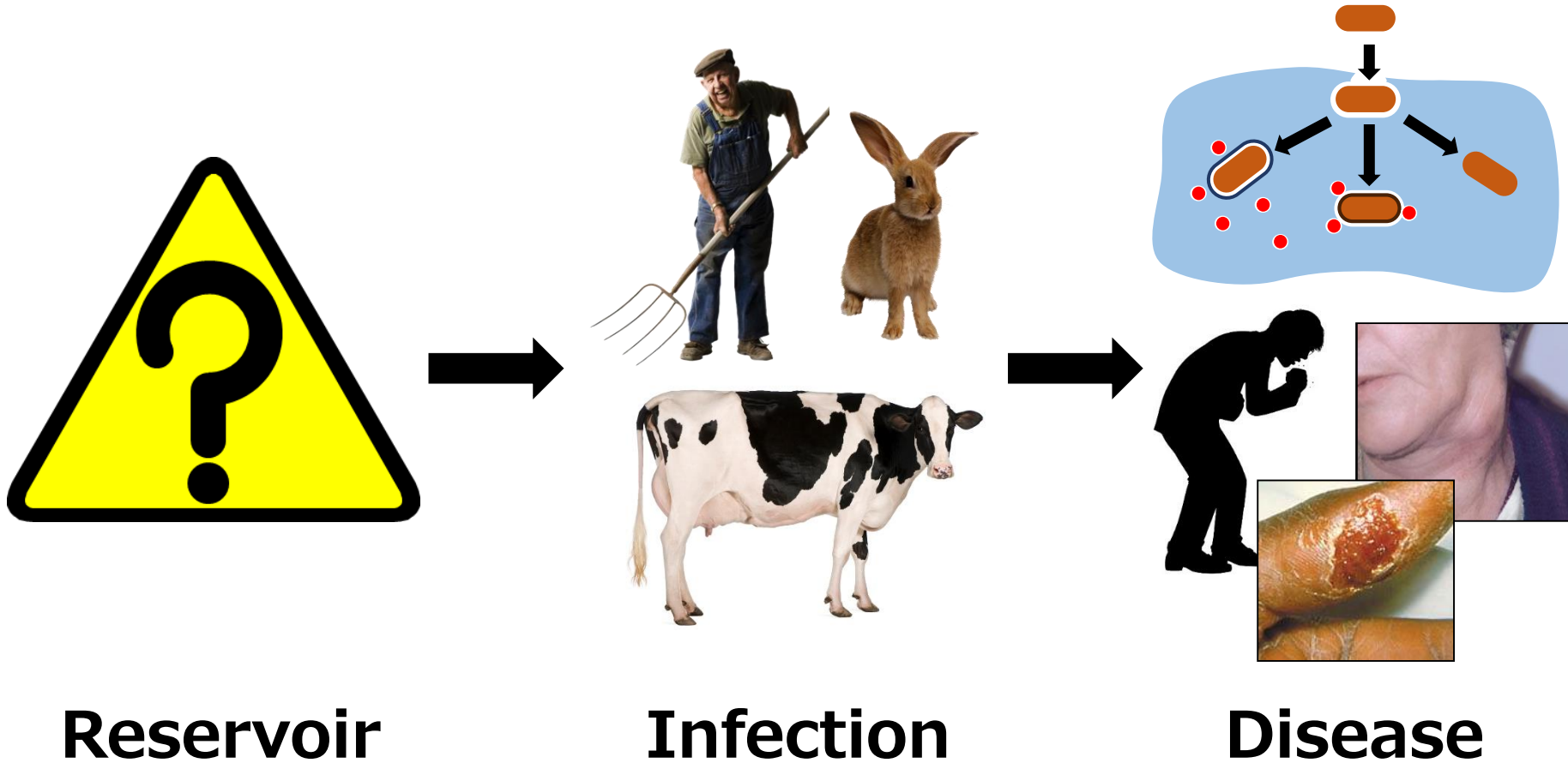
Intracellular bacteria

Brucella
Listeria
Salmonella
Francisella
Legionella *etc.*

Prevention of
lysosome-phagosome
fusion

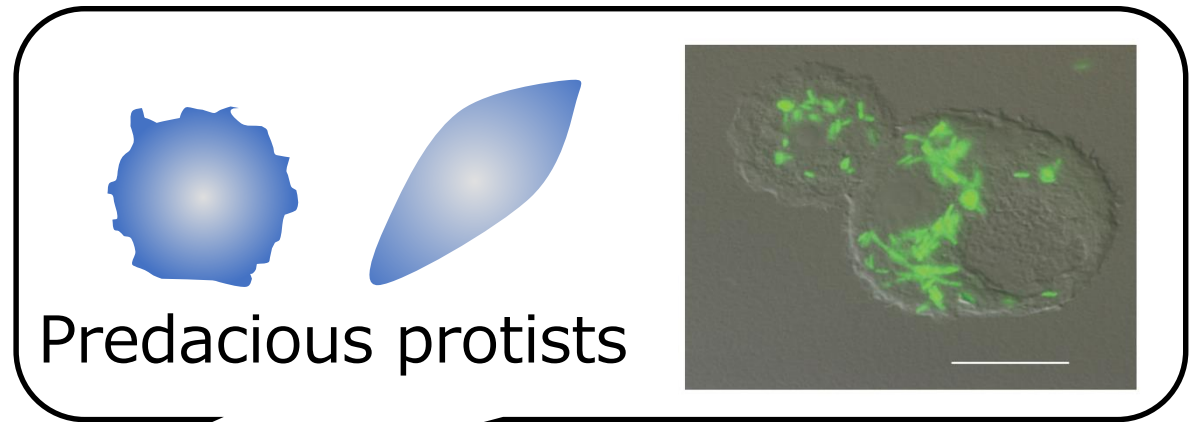


Outline of study

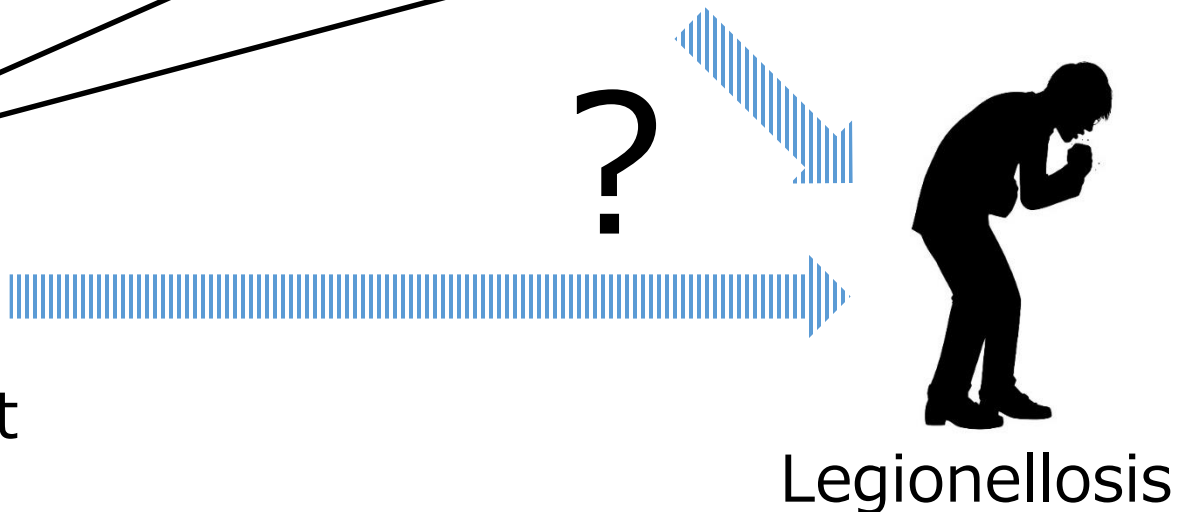


Legionella and protist hosts

The mechanisms of infection and endosymbiosis in protistan hosts are not fully understood.



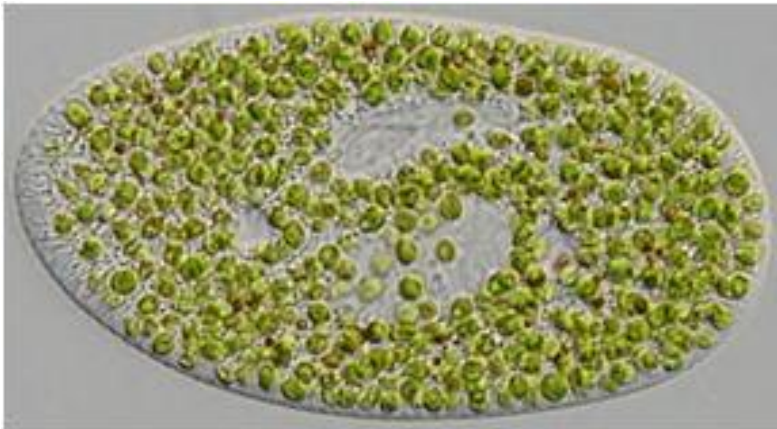
Nature environment



Paramecium /slipper animalcule

Paramecium spp.

- ◆ Free-living, single-celled, freshwater ciliate.
- ◆ Feeding on bacteria, and found widely in environmental water.
- ◆ The cell body is 100–300μm, and roughly cigar-shaped.



Chlorella and *P. bursaria*



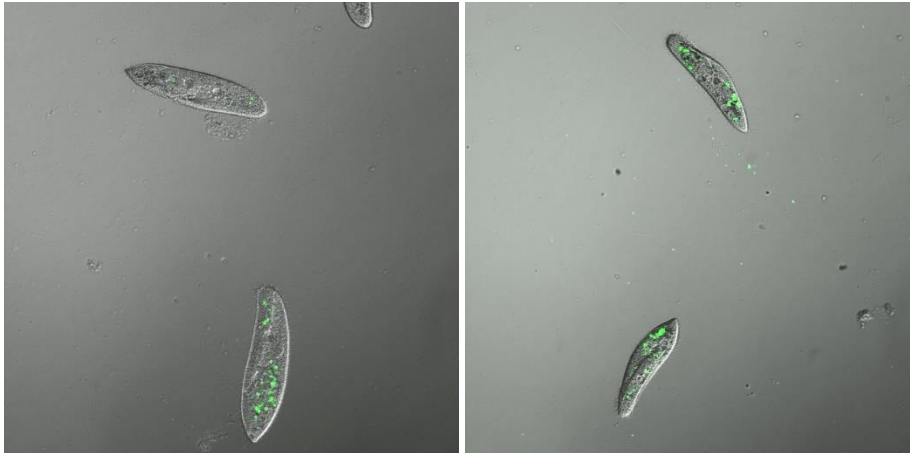
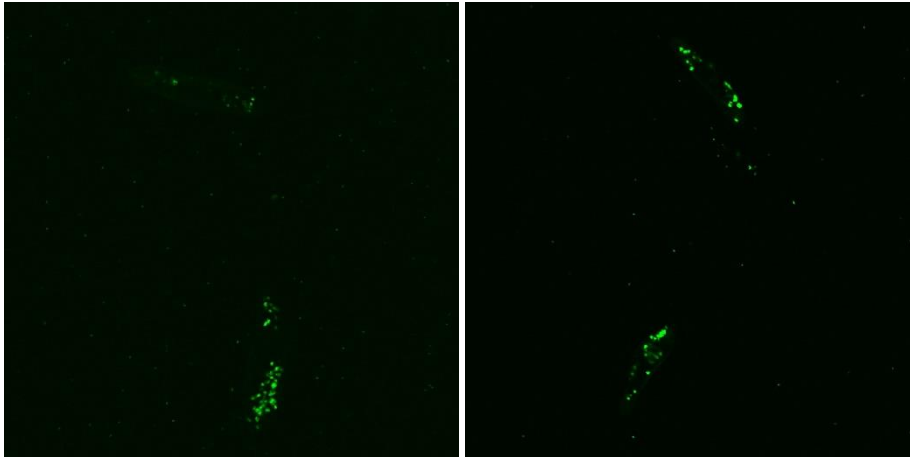
Holospora spp. and *P. caudatum*

Legionella within *Paramecium*

L. pneumophila philadelphia1-GFP

30m

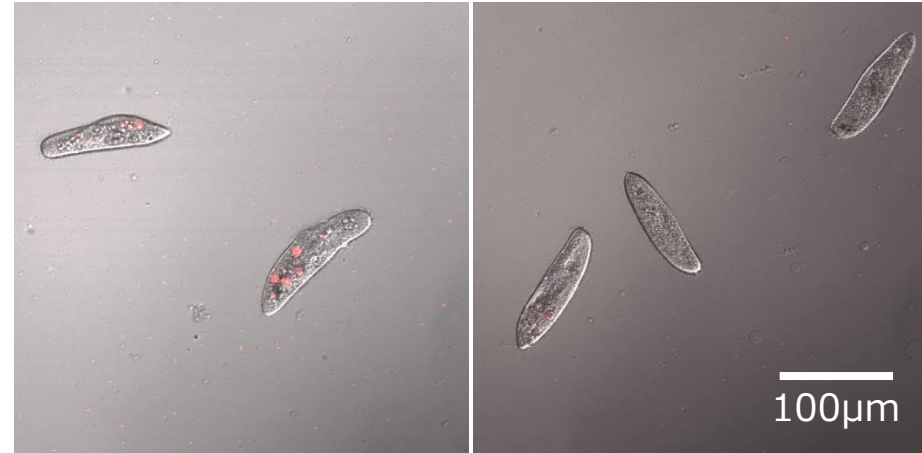
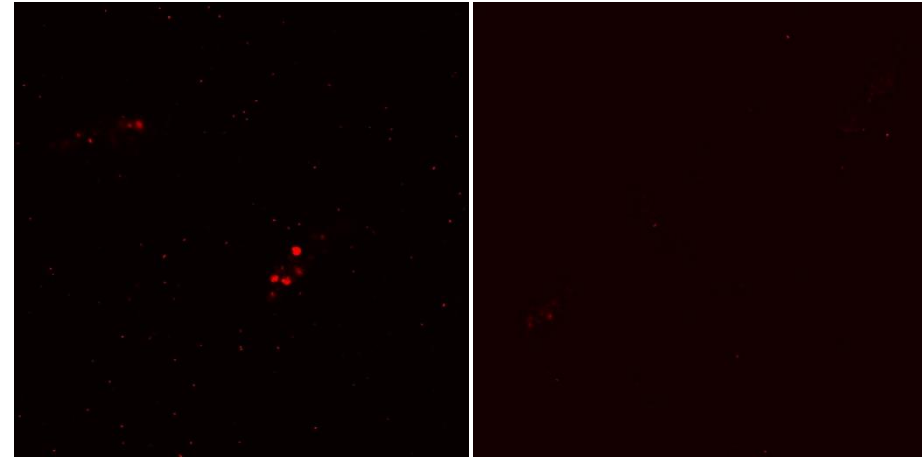
48h



E. coli-AsRed

30m

48h

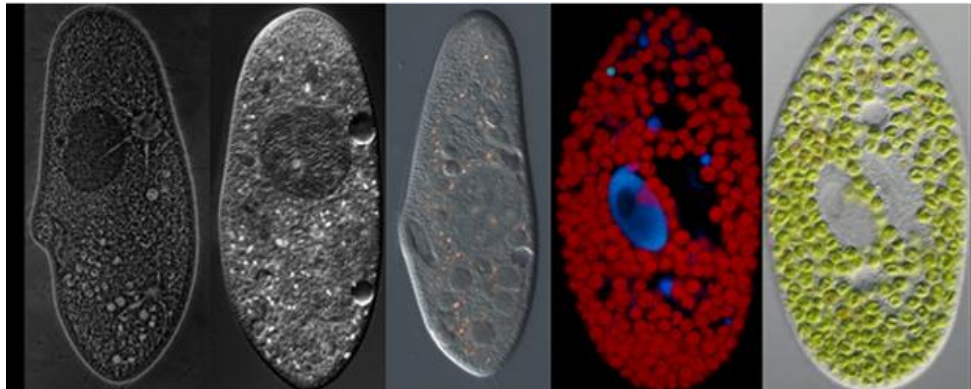


(Watanabe *et al.* Sci Rep, 2016)

Legionella within *Paramecium*



BioResource of *Paramecium*



ナショナルバイオリソースプロジェクト



NBRP



Paramecium species, Holospora species, symbiotic Chlorella, and these antibodies

National BioResource Project **Paramecium**

日本語 English

Home About Organization Strain Distribution / Deposition Achievements Member Collaboration Link

Methods

Home

Objectives

The ciliate *Paramecium* species are model organisms widely used for various researches on eukaryotes. Yamaguchi University has been acting as the core facility for *Paramecium* resources in the world under the National BioResource Project (NBRP) of the MEXT to distribute various *Paramecium* strains worldwide. [more](#)

Left photo: *Paramecium caudatum* with symbiotic bacteria *Holospora obtusa* in the macronucleus.
Center: *P. bursaria* with *Chlorella variabilis* in the cytoplasm (Kodama and Fujishima, 2010)
Right: Autofluorescence of chlorophyll within chloroplast. Fluorescence of nucleus is DAPI.

Contents

Request for distribution
We distribute strains kept in the core facility. ([Request for paramecia used for juvenile fishes is here.](#)) [more](#)

Request for deposit
Request to deposit newly obtained or developed strains. [more](#)

Browse strain data
We focus on collecting strains that are maintained locally. [more](#)

Research Result
[more](#)

What's new!

11th-17th, August 2020
Notice of summer holidays
During the above period, shipment of *Paramecium* cells will be suspended. We apologize for your inconvenience, and thank you for your kind understanding.

18th November 2019
Created Methods page.

30th August 2018
We began offering a *Paramecium* strain suitable for feed of juveniles such as medaka and zebrafish.
Please click on the blue letters of "request for distribution" in the Contents column.

5th August 2014
The list of strains available for distribution was updated.
The MTA was updated.

7th April 2014
Prices of resources were revised.

2nd October 2013
Publications and Invited Lectures were added to the Achievements page.

[Activity](#)

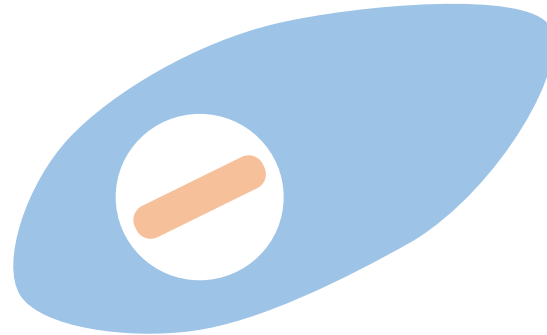
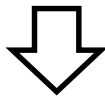
Contact Us

NBRP
Paramecium
Yamaguchi Univ.

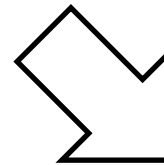
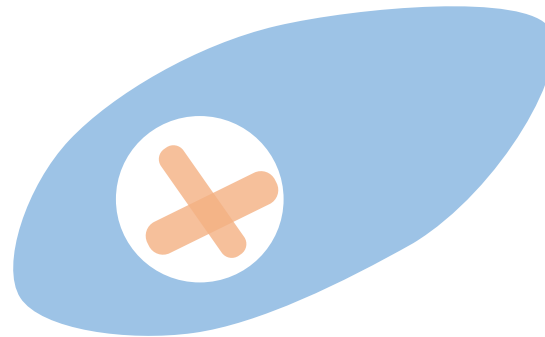
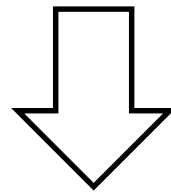
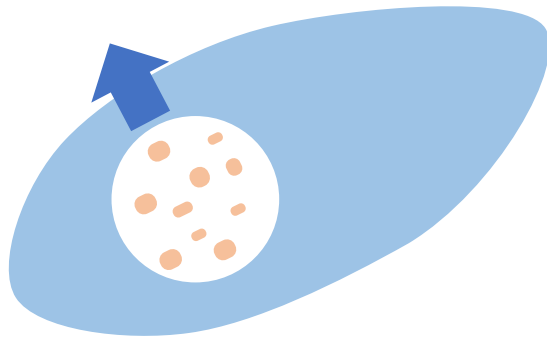
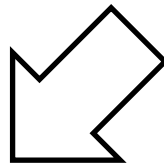


Legionella

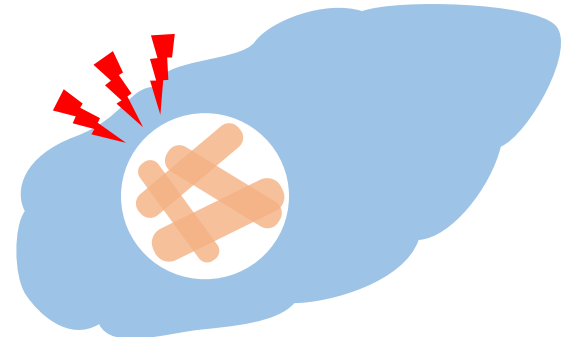
Uptake



Egestion



Cytotoxic
Effect



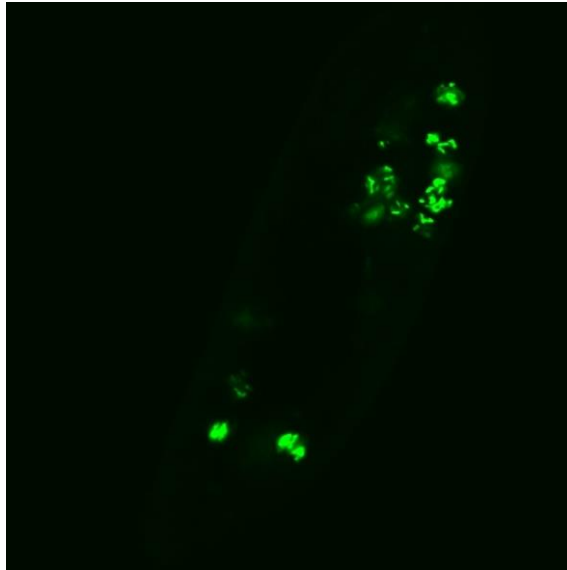
Digestion Type

Symbiosis Type

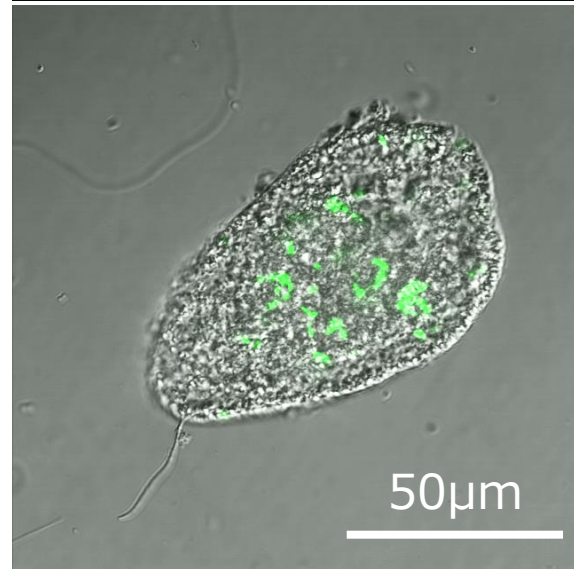
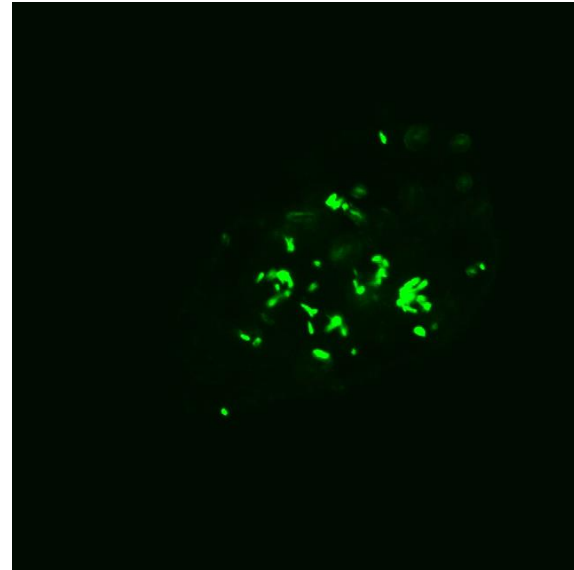
Cytotoxic Type

Cytotoxic type relationship

Philadelphia-1



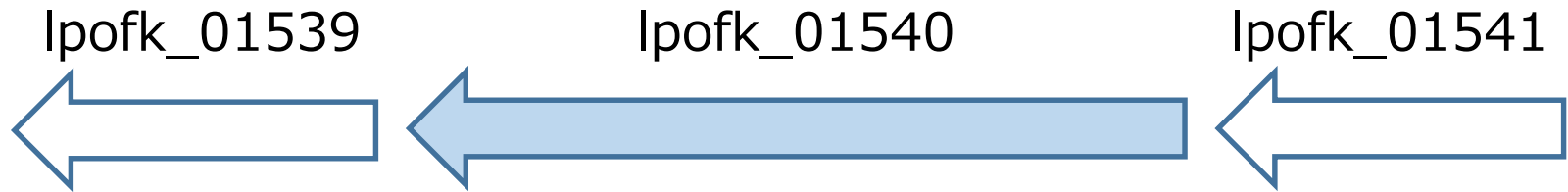
Ofk308



Identification of disrupted gene

Identification of transposon-inserted locus in the mutant

Ofk308



Mutant strain



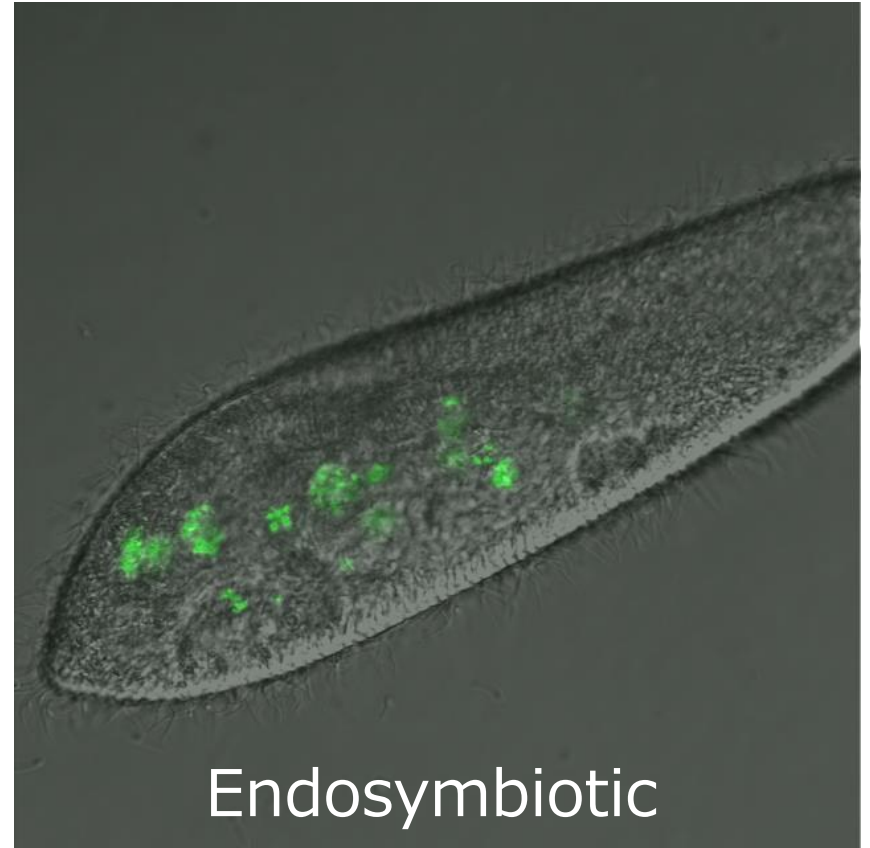
lefA

Legionella endosymbiosis-modulating factor A

Identification of cytotoxic factor



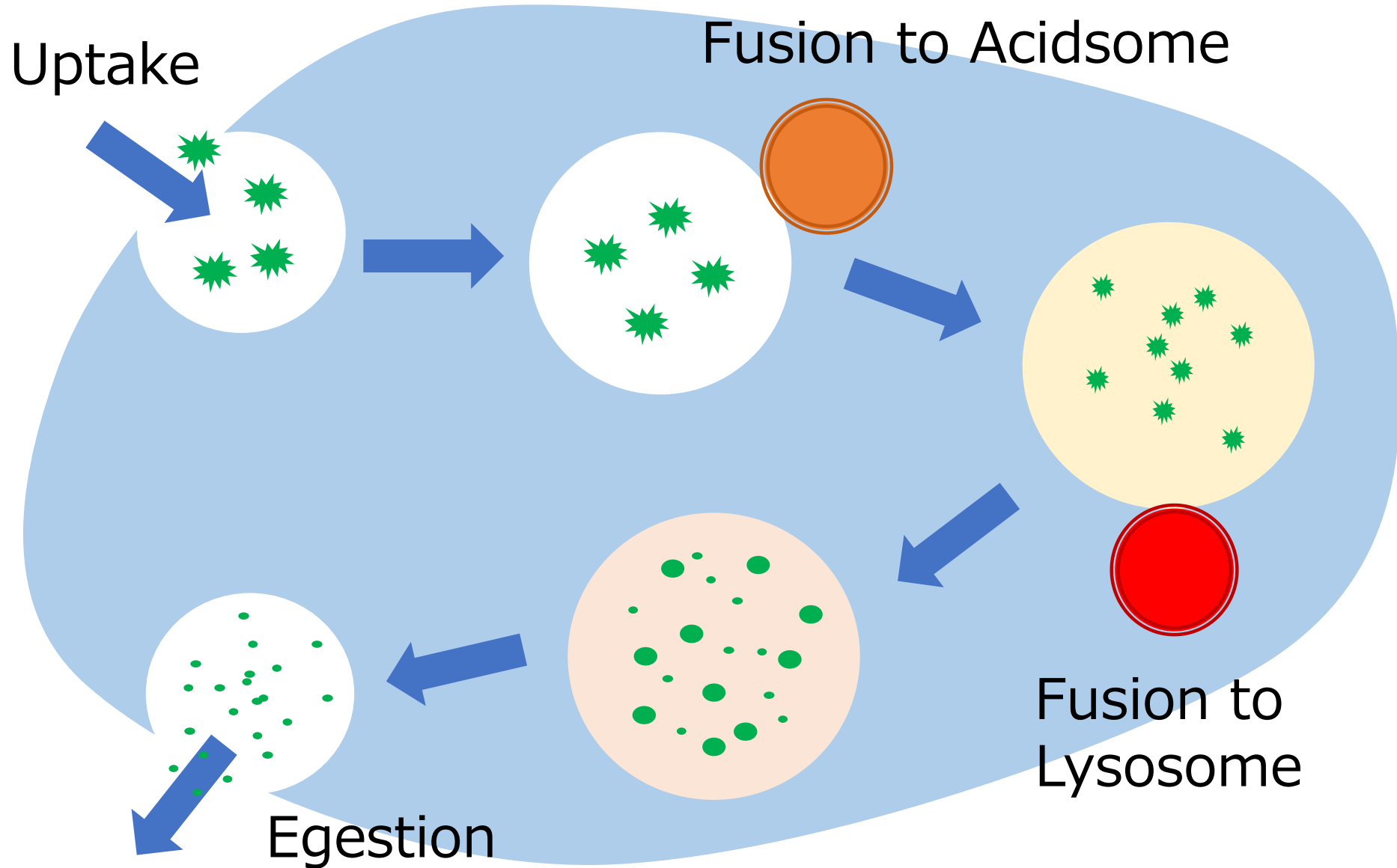
Legionella pneumophila Ofk308
(Cytotoxic type strain)

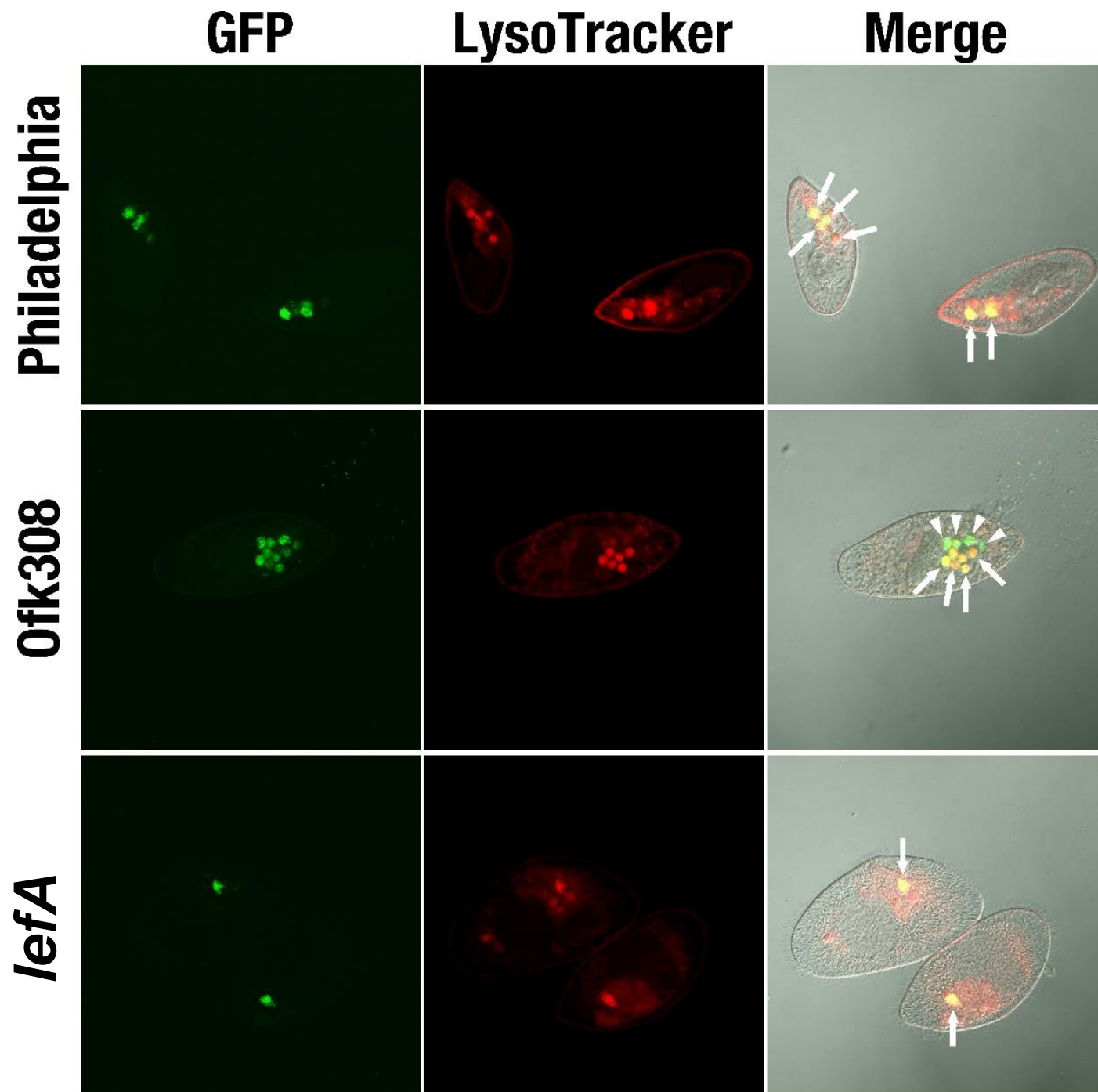


Legionella pneumophila Ofk308
lefA mutant

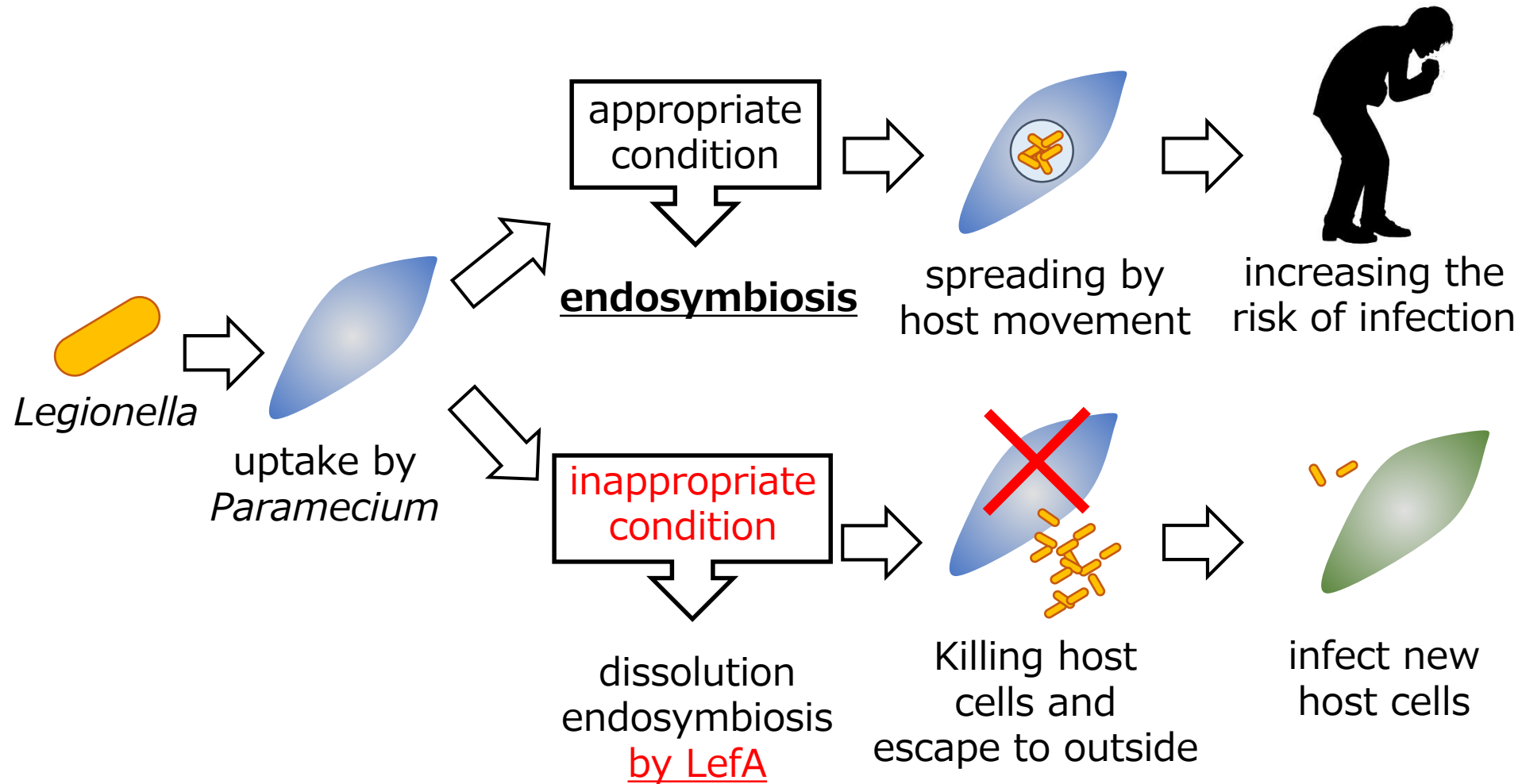
Transposon insertion into *lefA* gene

Digestion system of *Paramecium*

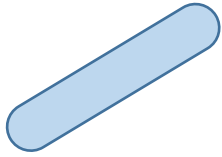




Conclusion



pathogenic
Legionella



endosymbiosis
in protist host



Legionellosis

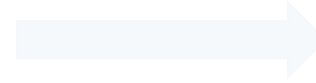
Non-pathogenic
Legionella



not succeed at
endosymbiosis



low pathogenicity



mutated
Legionella



succeed at
endosymbiosis



high pathogenicity

- digested
- killing the host cell

pathogenic
Legionella

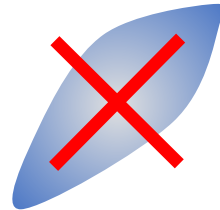
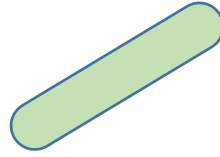


endosymbiosis
in protist host



Legionellosis

Non-pathogenic
Legionella



- digested
- killing the host cell

not succeed at
endosymbiosis



low pathogenicity

mutated
Legionella



succeed at
endosymbiosis



high pathogenicity

pathogenic
Legionella

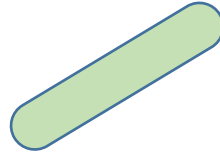


endosymbiosis
in protist host



Legionellosis

Non-pathogenic
Legionella



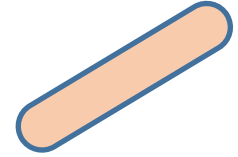
not succeed at
endosymbiosis



low pathogenicity



mutated
Legionella



succeed at
endosymbiosis



high pathogenicity

- digested
- killing the host cell