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HU-ACE NEWS LETTER

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Activities of the Core

Apr. 18, 2024 The 133th Hiroshima University Biomass Project Center Symposium (co-organized by HU-ACE)

Apr. 18, 2024 The 90th HU-ACE Steering Committee Meeting

Biomass Symposium was Held.

On March 7, 2024, we co-organized the Biomass Symposium “Workshop: Biofuels from the Basics” in a hybrid format. After the four lectures, there was lively discussion on the future direction of biomass. The purpose of this symposium is to provide easy-to-understand information starting from the basics to those who are not specialized in biomass, those who are interested in the use of biomass, and those who have to think about introducing biomass in their work, and at the same time to provide the latest information about biomass （https://www.hiroshima-u.ac.jp/adse/news/82517）.
It is held in March every year, so if you are interested, please join next time.

Prof. Yutaka NAKASHIMADA
（The Graduate School of Integrated Sciences Hiroshima University）
「Biomethane 」

Prof. Yukihiko MATSUMURA
（The Graduate School of Advanced Science and Engineering, Hiroshima University ）
「Biodiesel」

Assoc. prof
Mitsuru AOYAGI
（ Faculty of Bioresource Sciences, Prefectural University of Hiroshima）
「Wood Pellets 」

Prof, Collaborative Research Laboratory
Takashi ENDO
（The Graduate School of Advanced Science and Engineering, Hiroshima University ）
「Nanocellulose」

Related Events

The 8th International Symposium on Fuels and Energy (ISFE2024) is scheduled on July 1-2, 2024.
We are calling for abstracts until May 28. Details can be found here. https://symposium2024.isfe.hiroshima-u.ac.jp/

We have constructed a roadmap for the development of energy utilization technologies leading up to 2050 and an integration scenario called the “Hiroshima Scenario”. Please feel free to share your thoughts with us.
https://hu-ace.hiroshima-u.ac.jp/wp/wp-content/uploads/2022/10/220921-brochure.pdf

Research consultation and joint research are welcome.

Issued by Advanced Core for Energetics, Hiroshima University
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Research Topics

Bacterial behavior as a target to control infectious plant diseases

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Research fields : Environmental Biotechnology

Keywords: Control of plant diseases, plant pathogen, bacterial chemotaxis

Abstract

Background

Motile bacteria can sense the concentration gradient of chemicals, move to favorable environments and swim away from unfavorable environments. These behavioral responses are called chemotaxis. Most plant pathogenic bacteria show chemotaxis. It is believed that chemotaxis supports pathogens to target their host plants. Therefore, it is expected that disturbance of chemotaxis involved in targeting host plants leads to control of bacterial plant infection. Our study aims to develop a novel technology to control bacterial plant infection by controlling bacterial behaviors. We believe this technology will contribute to establishing sustainable agriculture which does not rely on biocide (pesticide), and to increased production of plant biomass.

Methods

We demonstrated that chemotaxis to L-malate contributes to targeting host plants by bacterial wilt pathogen *Ralstonia solanacearum*. This result enabled us to come up with the idea that spraying DL-malate, food additive, could suppress plant infection by *R. solanacearum*. Plant infection experiments supported the idea. After that , we accidentally found chemotaxis to boric acid in *R. solanacearum*. Boric acid is an indispensable ingredient of higher plants and a component of plant cell walls. Therefore, we consider that boric acid sensing (boric acid chemotaxis) contributes to recognition of plants by plant pathogens and supports their plant infection. We genetically and physiologically evaluated this idea.

Results

Motile bacteria possess many chemotaxis sensors. Molecular genetic investigation enabled us to identify chemotaxis sensors for boric acid in *R. solanacearum*. We conducted a homology search against a gene data bank using an amino acid sequence of a boric acid chemotaxis sensor as a probe. Interestingly, homologs of the boric acid chemotaxis sensor are distributed only among plant pathogenic species. This result suggests that boric acid chemotaxis is a common strategy of plant pathogens to target host plants. If this speculation is correct, it is expected that we can develop a novel method to control many infectious plant diseases by focusing on boric acid chemotaxis as a target. *Pseudomonas syringae* is a causative bacterium of tobacco wildfire and shows boric acid chemotaxis. We constructed its mutant defective in boric acid chemotaxis and measured the intrusion rate of wild-type and mutant strains into tobacco leaves. The intrusion rate of the mutant is significantly lower than that of the wild type strain. And, the strain in which the boric acid sensor was over-expressed showed a much higher intrusion rate than the wild–type did, suggesting that boric acid chemotaxis really contributes to intrusion of *P. syringae* into leaves. We are now evaluating boric acid chemotaxis in plant infection by *R. solanaxearum*.

Fig. Bacterial wilt (left) and tobacco wildfire (right).

Referencesboric acid

1. A. Hida et al. Sci. Rep. 7, 8609 (2017).