

Vol.20, November 2017



“Okayama University supports the Sustainable Development Goals”

■ Contents

Feature

Okayama University: Getting ready for the SDGs

News

- President Makino visits Leiden University in the Netherlands to strengthen inter-university partnership and promotion of Okayama University's international competitiveness
- Delegation of the European Union to Japan visited Okayama University
- Okayama University Hospital succeeds in the world's first transplant that combines parts of the left and right lung to make one lung
- Okayama University Hospital accredited by Japan Medical Services Accreditation for International Patients (JMIP)
- Professor Ma and Associate Professor Yamaji receive the Highly Cited Researchers Award for the second consecutive year!
- Former president of the Socialist Republic of Vietnam makes a courtesy visit to President Makino
- Educators from Senegal start training program at Okayama University

Research Highlights

- *Wolbachia* bacterium density changes seasonally in butterflies
- “Intrahyphal Hyphae and Dead Hyphae”, Aberrant Hyphae Triggered by Host Immune Responses to Plant Pathogenic Fungus
- Medaka fish use faces to identify different individuals
- The secrets of straight growth of plant cells, NEK6 protein aligns cytoskeleton.

Topics

Introduction to student activities

Further information

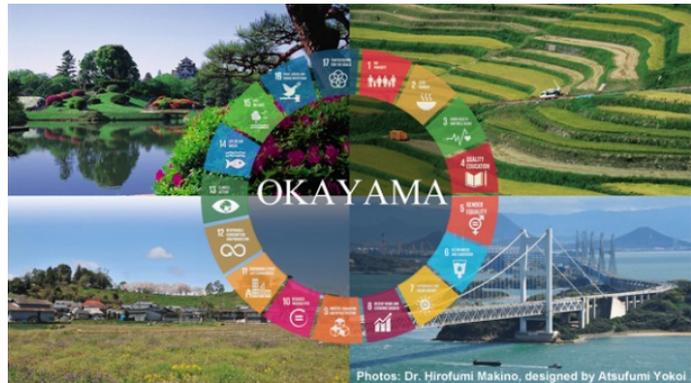
About Okayama University

■ Feature

Okayama University: Getting ready for the SDGs

Okayama's growing reputation for education for sustainable development

Okayama City (Okayama) is the location for the 'Regional Centres of Expertise on Education for Sustainable Development (ESD)' (called 'RCE Okayama') —a multi-stakeholder platform including Okayama University, which collaborates to empower people to change the way they think and work towards a sustainable future in



Photos: Dr. Hirofumi Makino, designed by Atsufumi Yokoi

Okayama. Acknowledged first in the world as one of the 'Initial Seven' RCEs on ESD by United Nations University (UNU) in 2005 among 156 RCEs around the world and the UNESCO Chair on ESD in 2007, RCE Okayama and Okayama University have been forming a vanguard of early movers in this field of ESD for more than a decade. Recently, the RCE Okayama and Okayama City received prestigious global awards and recognition from UNESCO, including the UNESCO-Japan Prize on ESD 2016 and the UNESCO Learning City Award 2017. Okayama, with this history and reputation, is recognized as one of the leading cities in the world for ESD to nurture people who will undertake the responsibility of building a sustainable society and contribute to an emerging global agenda with strong buy-in and adoption among world leaders for 'The UN's Sustainable Development Goals (SDGs)' towards a better, sustainable future for all.

'Makino Vision' towards achieving the SDGs

With these tangible awards and achievements, Okayama University launched the President's Vision in April 2017, 'Makino Vision: Heading Further, To a Fruitful Academic Capital' for sustainable development. As a new breed of university for the SDGs as well as ESD, which makes Okayama one of the best places in the world for integrating sustainability thinking and practice, Okayama University will be developing a strategic framework and a systemic approach to complex problems of sustainable development on a global scale and will also be promoting educational and research initiatives into the SDGs in an ongoing and scalable way. However, how can we champion the SDGs? More precisely, do the SDGs have a positive effect on our research and education, and vice versa? Does this global agenda work at a local level? Together we need to find out what the SDGs means in our minds and on a local and global scale through dialogue and discussion in a triple-helix manner between governments, industries, and academia.

First step in understanding the SDGs

To rethink and align our university's role and function to the SDGs based on the Makino Vision, Okayama University is making an effort to familiarize itself with the SDGs through dialogue and consultation with internal and external stakeholders. First, Okayama University organized a symposium and workshop entitled, 'How Universities as Members of Society Should be Thinking: Through the UN Sustainable Development Goals (SDGs)', from 31st August to 1st September 2017, in association with the Young Academy of Japan, Science Council Japan. Throughout the two-day event, participants discussed how science and academic knowledge can contribute to SDGs and how the advancement of SDGs should be pursued based on diverse local contexts including that of Okayama. In short, as an outcome the workshop adopted a recommendation that included the following four central issues:

- Acknowledgement of the roles of science and local culture in the advancement of SDGs
- The need to increase the spaces for dialogue among experts with diverse backgrounds
- The necessity for academic society to appreciate and value the contribution of academics to research and other actions to contribute to the SDGs
- The restructuring of educational programs based on the SDGs

Over 190 people from universities, high schools, prefectural and city offices, businesses, and civil society organizations attended the symposium. Meanwhile, more than 50 researchers, university and high school teachers and students, officers from prefectural and city authorities, and members of the Young Academy of Japan, Science Council Japan participated in the workshop, making this a truly successful event.

Following the conference and workshop, RCE Okayama, Okayama University and the United Nations University Institute for the Advanced Study of Sustainability (UNU-IAS) will be co-hosting 'First RCE Thematic Conference: Towards Achieving the SDGs' to be held in Okayama, Japan from 5-7 December 2017 in order to exchange ideas for SDGs with greater impact and reach. The conference will discuss and launch strategies and activities in the fields of biodiversity, climate change and sustainable consumption, and production to identify and make substantial contributions and tangible commitments by RCE on the SDGs and the Global Action Programme (GAP) on ESD.

During the conference, RCEs are encouraged to submit summaries of their best practices and challenges in these areas, to be shared with a rich mixture of participants from international organizations, governments, academia, industry, NGOs, and NPOs from across the world. At the Okayama Session on the SDGs, in particular, we hope to encourage higher education institutions to make a much broader contribution to the SDGs through excellence research and education with multi-stakeholder partnerships, and other voluntary initiatives. The conference will also offer capacity building workshops, poster sessions,



Symposium
(Okayama University 50th Anniversary Hall)



Participants discussing in the workshop

and field trips for RCEs to learn what UN organizations and other international partners are doing in these areas, and to discuss how RCEs can accelerate their actions by engaging and working with local communities.

Okayama University helps the SDGs/ The SDGs helps Okayama University

With the understanding of the SDGs in a university-wide level and our solid foundation and reputation of ESD, Okayama University actively seeks the opportunities of the SDGs beyond academic disciplines and institutional boundaries: connecting research and education to society, and engaging stakeholders beyond the university. In other words, the SDGs will be a major influencer and driver for mobilizing our knowledge and solutions for sustainable development while transforming our organizational behavior and culture, which makes us more distinct and attractive than ever before for a higher education destination for sustainable development. We enthusiastically invite like-minded people and organizations to join us on this journey towards achieving the SDGs.

Reference:

Authors

Mitsunobu R. Kano and Atsufumi Yokoi

Further information

1. First RCE Thematic Conference: Towards Achieving the SDGs
http://www.okayama-u.ac.jp/eng/events/index_id2041.html



2. Reconsidering the Sustainable Development Goals (SDGs) in Okayama:Symposium and Workshop Held
http://www.okayama-u.ac.jp/eng/news/index_id6964.html



3. Okayama University
http://www.okayama-u.ac.jp/index_e.html



“Okayama University supports the Sustainable Development Goals”

■ News

President Makino visits Leiden University in the Netherlands to strengthen inter-university partnership and promotion of Okayama University’s international competitiveness

On May 12 2017, President Hirofumi Makino paid a courtesy visit to Professor Carl J.J.M.Stolker, Rector Magnificus and Chairman of the Executive Board of Leiden University in the Netherlands to strengthen inter-university partnership and promote Okayama University’s international competitiveness.

In December 2016, Leiden University’s Faculty of Humanities and Okayama University’s Center for Global Partnerships and Education signed a faculty level exchange agreement. In April 2018, Okayama University plans to host 20 Leiden University students for three months from the Faculty of Humanities, Department of Japanese Studies.

The Consortium of Six National Universities in Japan (SUN/SixERS)—of which Okayama University is a member— views the Netherlands as a strategic region. Effective use of the Consortium’s framework makes it possible to cover a wide range of academic disciplines and allows education and research exchange with the world’s top universities as equals.

President Makino was also accompanied by personnel from other universities in the Consortium for this trip.



Commemorative photo



Exchange of views taking place

Further information

Okayama University (English page)
http://www.okayama-u.ac.jp/eng/news/index_id6837.html



Okayama University (Japanese page)
http://www.okayama-u.ac.jp/tp/news/news_id6735.html



■ News

Delegation of the European Union to Japan visited Okayama University

The members from the EU Delegation to Japan visited Okayama University and co-hosted an EU event on June 27th 2017. The visitors included Dr. Leo Karapiperis Minister-Counsellor, Head of Science and Technology Section, Tom Kuczynski S&T Section, Richard Kelner Press, Public and Cultural Affairs Section, Matthieu Py Euraxess Japan, Naomichi Yamada National Contact Point Horizon 2020 in Japan.

Dr. Karapiperis exchanged views with President Hirofumi Makino regarding European support for Research and Education. During the meeting, Dr. Karapiperis explained details about ‘The EU Framework Program for Research and Innovation’ (also known as Horizon 2020), which combines the strengths of researchers and facilities from a total of 39 countries in the EU and beyond, with the aim of promoting cooperative international research. The program also supports dispatching and receiving young researchers from around the world, with the goal of generating international research exchange. President Makino talked about the efforts of Okayama University to achieve an international profile based on its strong assets in research and education.

On the same day, the Okayama URA office held a full day EU event to strengthen relationships between European research and education and Japanese universities in collaboration with Delegation of the European Union to Japan, National Contact Point for Horizon 2020 in Japan, and EURAXESS Links Japan.

The delegates from Tokyo explained their missions and desire to strengthen relationships between European research and education and Japanese universities. In the meeting, recent projects and proposals of Okayama University in the field of H2020 and ERASMUS were presented. At the end of the meeting six masters students currently performing research internships and a Japanese ERASMUS student gave a short summary of their experiences at Okayama University and Europe.

At the end of the event, an individual consultation session was organized. Approximately 16 applicants were welcomed and they all received detailed information from the EU delegation members.



The Delegates from EU Delegation to Tokyo (Center : Dr. Leo Karapiperis Minister-Counsellor, Head of Science and Technology Section)



Dr. Leo Karapiperis Minister-Counsellor, Head of Science and Technology Section gave opening address at the EU event

The visit and the related event were attended by a large audience. More than 80 attendees followed the presentations all over the meeting.

Further information

Okayama University (English page)
http://www.okayama-u.ac.jp/eng/news/index_id6916.html



■ News

Okayama University Hospital succeeds in the world's first transplant that combines parts of the left and right lung to make one lung

Surgeons at Okayama University Hospital performed the world's first successful transplant that combined the upper lobes of the left and right lung from a brain-dead donor into one to create a left lung for a brain-dead donor lung transplant. The surgical operation was performed by Professor Takahiro Oto from the Transplantation Center and started at 1:25 p.m. on July 1 and lasted for approximately 9 hours. A double-lung transplant was initially considered, but the lower lobes of the donor's lungs were not in a good condition, so a decision was made to create one left lung out of the upper lobes from both lungs which were functioning sufficiently.

At the press conference held on the 2nd of July, Professor Oto said, "Japan has a low rate of organ donation from brain-dead patients and not a single organ can be wasted. We need to use the precious organs that are donated and decrease the number of transplants that we must forgo."



Professor Takahiro Oto and others



Okayama University Hospital

Further information

Okayama University (English page)
http://www.okayama-u.ac.jp/eng/news/index_id6914.html



Okayama University (Japanese page)
http://www.okayama-u.ac.jp/tp/news/news_id6823.html



Reference (Okayama University e-Bulletin) : lung transplant

e-Bulletin vol.2 :
 Okayama University Hospital surgeons perform a record 100 lung transplants exceeding any other hospital in Japan.
http://www.okayama-u.ac.jp/user/kouhou/ebulletin/news/vol2/news_001.html



e-Bulletin vol.4 :

World's first successful living donor transplant of the middle lobe of a lung: Mother's lung saves the life of her three year old son

http://www.okayama-u.ac.jp/user/kouhou/ebulletin/news/vol4/news_001.html



e-Bulletin vol.9 :

Successful completion of a contralateral lung transplant using a donor lung from a brain-dead donor: a first in Japan

http://www.okayama-u.ac.jp/user/kouhou/ebulletin/news/vol9/news_001.html



e-Bulletin vol.12 :

World's first hybrid lung transplant: Simultaneous lung transplants from both brain-dead and living donors

http://www.okayama-u.ac.jp/user/kouhou/ebulletin/news/vol12/news_004.html



e-Bulletin vol.17 :

Surgeons at Okayama University Medical Hospital succeed in world's second hybrid lung transplant operation: Simultaneous lung transplants from both brain-dead and living donors

http://www.okayama-u.ac.jp/user/kouhou/ebulletin/news/vol17/news_002.html



e-Bulletin vol.19 :

Okayama University Hospital successfully conducts lung transplant surgery from brain-dead donor to Japan's youngest recipient

http://www.okayama-u.ac.jp/user/kouhou/ebulletin/news/vol19/news_001.html



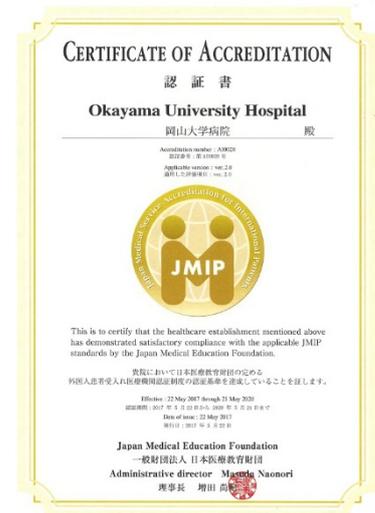
■ News

Okayama University Hospital accredited by Japan Medical Services Accreditation for International Patients (JMIP)

Okayama University Hospital applied for accreditation to the Japan Medical Services Accreditation for International Patients (JMIP), issued by the Japan Medical Education Foundation, and was certified on 22 May 2017.

JMIP is an accreditation system for medical institutions accepting international patients, which evaluates institutions in the following five areas: patient acceptance, service for patients, management of the provision of medical services, organizational framework and management, and activities for improvement. Okayama University Hospital is the third national university hospital in Japan to receive accreditation and the first to be certified in the Chugoku and Shikoku Region.

The Okayama University Hospital International Patient Support Center staff will continue to build the infrastructure for accepting international patients by preparing materials such as manuals for medical staff, conversation booklets, and updating signs within the hospital.



Certificate of accreditation



Okayama University Hospital

Further information

Okayama University (English page)
http://www.okayama-u.ac.jp/eng/news/index_id6844.html



Okayama University (Japanese page)
http://www.okayama-u.ac.jp/tp/news/news_id6761.html



■ News

Professor Ma and Associate Professor Yamaji receive the Highly Cited Researchers Award for the second consecutive year!

Clarivate Analytics listed Professor Jian-Feng Ma and Associate Professor Naoki Yamaji from Plant Stress Science Group, Institute of Plant Science and Resources, as recipients for the Highly Cited Researchers 2016. An award ceremony was held on July 25 at the facility to commemorate the award. This is the second year in a row for the two Okayama University scientists to be selected. According to Clarivate Analytics, this is a rare occurrence.

Professor Ma and Associate Professor Yamaji study at the genetic level, the mechanism that plants use to acquire nutrients, remove poisonous metals of their toxicity, and accumulate poisonous metals. The contribution of the two scientist over many years to conducting global cutting edge research was recognized and led to the award in the Plant and Animal Science category.

Professor Ma said, “I am honored to be selected two years in a row at a time when recipients from Japan are decreasing. I will continue with my research and do my best to be selected again next year.”

Citation analysis is used to identify authors whose scientific and scholarly papers wield major influence globally.



Commemorative photo



Professor Jian-Feng Ma and Associate Professor Naoki Yamaji (L)

Further information

Okayama University (English page)
http://www.okayama-u.ac.jp/eng/news/index_id6921.html



Okayama University (Japanese page)
http://www.okayama-u.ac.jp/tp/news/news_id6869.html

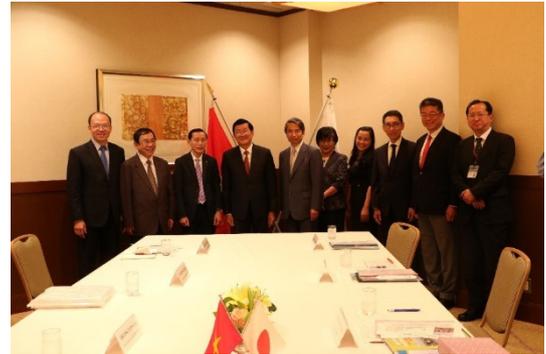


■ News

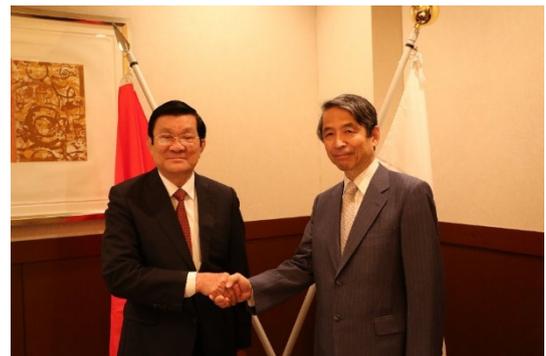
Former president of the Socialist Republic of Vietnam makes a courtesy visit to President Makino

On 31 May 2017, the former President of the Socialist Republic of Vietnam Truong Tan Sang visited President Makino at Okayama University.

During the visit, President Makino explained how Okayama University opened its first overseas office on the campus of Vietnam’s Hue University in April 2007, and has since been actively pursuing academic and educational exchange with Vietnam. He also said that as a result of these efforts, there has been a huge increase in the number of Vietnamese students in recent years and that they make up the largest group of international students after Chinese students studying at Okayama University. The number of Vietnamese students pursuing a doctoral degree is high, which contributes to the development of highly skilled experts and researchers. Former President Sang stated, “Japan is an important partner and I hope that opportunities for young students and researchers to be accepted into more faculties at Okayama University will continue to expand. I look forward to exchange taking place in the areas of agriculture and medicine in the future with Vietnam.”



Commemorative photo



Former President of the Socialist Republic of Vietnam Truong Tan Sang and President Makino shake hands

Okayama University will continue to build an even stronger partnership with Vietnam in many areas such as academic exchange and human resource development.

Further information

Okayama University (English page)
http://www.okayama-u.ac.jp/eng/news/index_id6842.html



Okayama University (Japanese page)
http://www.okayama-u.ac.jp/tp/news/news_id6734.html



■ News

Educators from Senegal start training program at Okayama University

On 27 June 2017, ten educators from Senegal started their training program with instruction given by Okayama University teachers, to improve basic math skills within elementary education and raise the quality of learning and school performance of children. This training program ran until July 14 through the Japan International Cooperation Agency (JICA) as a regional program for Senegal to introduce ‘Effective Approach for Improving the Learning of Mathematics in Primary Education’. The program took place at Okayama University Faculty of Education and also at elementary schools in and around the city.

The opening ceremony was held on June 27 and attendees included Executive Vice President for International Affairs Hiroshi Kanzaki, Dean of Graduate School of Education Shigenobu Takatsuka. Executive Vice President Kanzaki gave a speech, stating, ‘It is my hope that the experience gained here in Okayama will be used in many schools throughout Senegal’.

This is the 5th time Okayama University has hosted this program.

Further information

Okayama University (English page)
http://www.okayama-u.ac.jp/eng/news/index_id6913.html



Okayama University (Japanese page)
http://www.okayama-u.ac.jp/tp/news/news_id6820.html



Commemorative photo



Educators from Senegal being introduced.

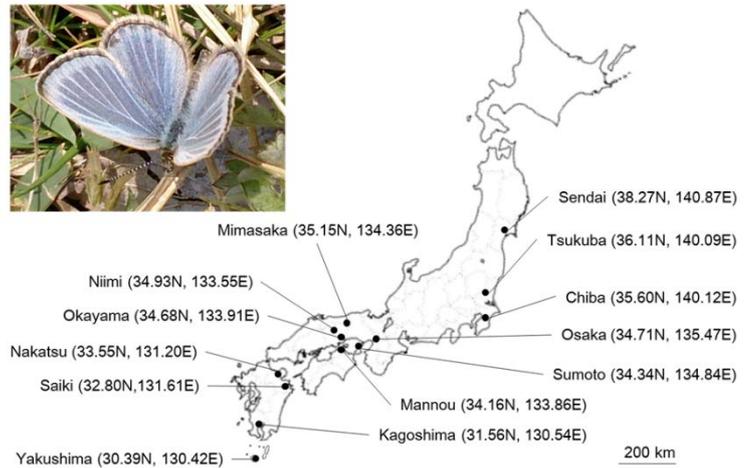


■ Research Highlights

Wolbachia bacterium density changes seasonally in butterflies

The survival rate of *Wolbachia*—a common bacterium—decreases under high temperature in incubators. However, few studies have examined the density of *Wolbachia* in hosts in the field.

Here, Takuto Sumi and colleagues at Okayama University focus on *Wolbachia* infection of the pale grass blue butterfly that is found throughout the Japanese archipelago.



Collection points (filled circles) of *Z. maha* in Japan

The researchers examined the rate and density of *Wolbachia* infection in the bodies of butterflies at thirteen locations in Japan. At seven of these places, the scientists collected butterflies in different seasons to determine seasonal differences in the infection rate and density and found the *Wolbachia* density to exhibit seasonal differences within the same population.

Moreover, to determine whether *Wolbachia* density had a geographical cline, the team compared the infection density of *Wolbachia* amongst all geographical populations. In addition, they determined the sequences of *Wolbachia* *wsp* and host mtDNA CO1 haplotypes of all populations.

The results showed the *Wolbachia* density to increase in early summer and decrease in autumn.

Further, the density of *Wolbachia* infecting the same strain of *Z. maha* varied amongst populations, although no tendency in geographical cline was observed.

Reference:

Authors

Takuto Sumi, Kazuki Miura, and Takahisa Miyatake.

Title of original paper

Wolbachia density changes seasonally amongst populations of the pale grass blue butterfly, *Zizeeria maha* (Lepidoptera: Lycaenidae).

Journal

PLOS ONE, April 12 (2017).

Digital Object Identifier (DOI)
10.1371/journal.pone.0175373

Journal website
<http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0175373>



Affiliations
Graduate School of Environmental and Life Science, Okayama University.

Department website
http://www.gels.okayama-u.ac.jp/index_e.html



Research Highlights

“Intrahyphal Hyphae and Dead Hyphae”, Aberrant Hyphae Triggered by Host Immune Responses to Plant Pathogenic Fungus

Ascochyta (*Mycosphaerella*) blight of pea, caused by *Mycosphaerella pinodes* (Berk. et Blox.) Vestergren [syn. *Peyronellaea pinodes* (Berk. & A. Bloxam) Aveskamp, Gruyter & Verkley], is one of the most important diseases of grain legumes worldwide. Despite the economic impact and numerous studies on this disease, little is known about the cytological features during infection by *M. pinodes*, especially in resistant interactions. One reason is due to the lack of resistant cultivars of pea (*Pisum sativum* L.) as well as the available resources in the *Pisum* germplasm collection with strong resistance to this disease.

Kazuhiro Toyoda and colleagues at Okayama University examined the histology and ultrastructure of early infection events and fungal development including penetration by appressoria, vegetative growth of infection hyphae and host responses, using a recently developed model pathosystem involving *Medicago truncatula* and *M. pinodes* strain OMP-1 (Toyoda *et al.*, 2013).

On the susceptible ecotype R108-1, pycnospores germinated and grew over the surface of the epidermis, then formed an appressoria and penetrated the cuticle. Beneath the cuticle, the infection peg expanded into a hyphae that grew within the outer wall of the epidermis. Subsequently, the hyphae penetrated down within mesophyll cells and proliferated vigorously, eventually, forming asexual fruiting bodies (pycnidia) (Fig. 1). In contrast, successful penetration and subsequent growth of infection

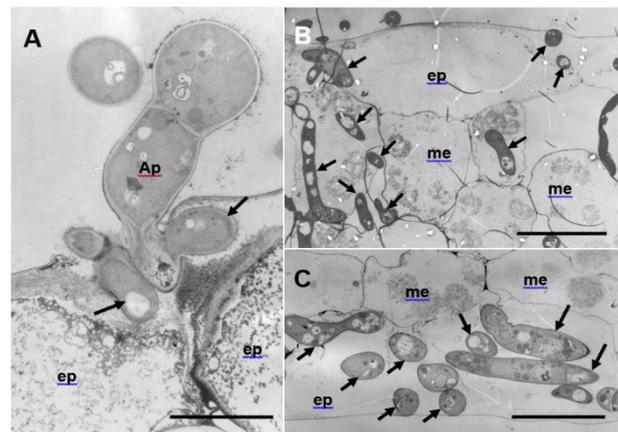


Figure 1 Transmission electron microscopy (TEM) images of susceptible R108-1 leaves at 3 days after inoculation with *M. pinodes*. (A) Infection hyphae (arrows) that look like infection vesicles formed in the cell wall of the adaxial epidermal (ep) cell. Appressorium (Ap). Bar = 5 μ m. (B) Adaxial epidermis and mesophyll cells (me) invaded by hyphae. Host cell organelles were degraded. Bar = 20 μ m. (C) Extensive hyphae in abaxial epidermal cells. Bar = 20 μ m.

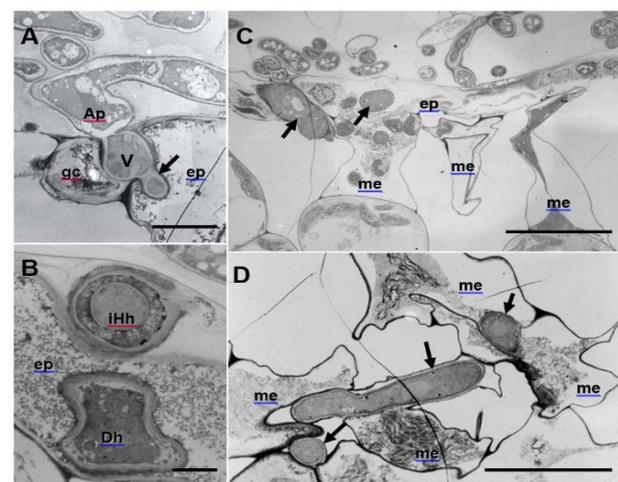


Figure 2 TEM images of resistant Caliph leaves at 3 days after inoculation with *M. pinodes*. (A) Infection vesicle (V) emerged from the tip of an appressorium (Ap) to cell walls between guard cell (gc) and epidermal cell (ep), and infection hyphae extended into epidermal cell (ep). Bar = 5 μ m. (B) Aberrant hyphae in epidermal cell; intrahyphal hyphae (iHh) and dead hypha (Dh). Bar = 2 μ m. (C) Epidermis invaded by hyphae and adjoining mesophyll cells had shrunk. Bar = 20 μ m. (D) Mesophyll cells in contact with the hyphae had shrunk. Bar = 10 μ m.

hyphae were considerably restricted in the ecotype Caliph (Fig. 2). Interestingly, aberrant hyphae such as intrahyphal hyphae and dead hyphae, due to a local defense elicited by the fungus, were abundant in Caliph but not in R108-1. Detected by its reaction with cerium chloride (CeCl_3) to generate electron-dense cerium perhydroxides in transmission electron micrographs, hydrogen peroxide (H_2O_2) accumulated in epidermal and mesophyll cells of Caliph challenged with pycnospores of *M. pinodes*. This intracellular localization was confirmed by energy-dispersive X-ray (EDX) spectroscopy (Fig. 3). These observations thus indicate that the oxidative burst reaction leading to the generation of reactive oxygen species is associated with a local host defense response in Caliph, since no clear H_2O_2 accumulation was detectable in susceptible R108-1.

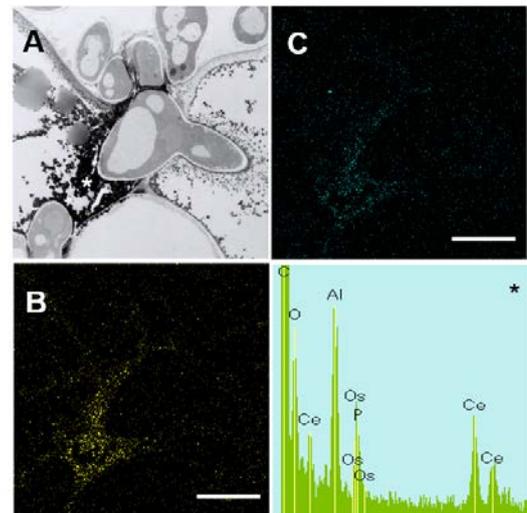


Figure 3 Elemental mapping and EDX spectrum showing the deposition of cerium perhydroxides at fungal invasion sites in Caliph epidermis. (A) TEM image. Analytical point is shown by asterisk. Ce (B) and O (C) mapping images.

The researchers conclude that the structural aberrations are likely common mechanisms of fungi to be protected from a hostile environment in a resistant host by being enclosed by another hyphae. The structural differences between susceptible and resistant interactions as well as the host responses will assist in better understanding pathogenesis of the fungus on pea, thus providing information on the breeding of the resistant cultivars of pea.

Reference

Authors

Tomoko Suzuki, Aya Maeda, Masaya Hirose, Yuki Ichinose, Tomonori Shiraishi and Kazuhiro Toyoda

Title of original paper

Ultrastructural and cytological studies on *Mycosphaerella pinodes* infection of the model legume *Medicago truncatula*

Journal

Frontiers in Plant Science 8, 1132 (2017)

Digital Object Identifier (DOI)

10.3389/fpls.2017.01132

Journal website

<http://journal.frontiersin.org/article/10.3389/fpls.2017.01132/full>



Affiliations

Laboratory of Plant Pathology, Graduate School of Environmental and Life Science, Okayama University

Department website (Japanese page)

http://www.okayama-u.ac.jp/user/agr/profile/nougaku02_3.html



■ Research Highlights

Medaka fish use faces to identify different individuals

For many animals including humans, the ability to identify different individuals among their own kind is an essential ability for everyday living. Face is the most important body part for individual recognition in many animals, and faces are special in many ways. For example, in human and some other mammals, we not only look at the parts of a face (such as eyes and nose), but read the face as a whole. When we see an upside-down face, it is more difficult to recognize it because our ability to ‘read the face as a whole’ is interrupted (Face inversion effect). This special ability only occurs in faces and not in other objects.



An illustration of right-side up and upside-down medaka face (Photo by Eiji FUJIWARA Documentary Channel Co. Ltd.)

Some fish, such as medaka (also called Japanese rice fish), can identify one individual from others. For example, female medaka like the males she has seen before.

However, we do not know how they distinguish a certain male from many others.

Mu-yun Wang and her colleagues (at the University of Tokyo and Okayama University) have found that medaka use faces for individual recognition, and how fish recognizing faces may be different from non-face objects.

The researchers tested whether medaka use vision, odor or both cues to recognize mates. Moreover, the group studied which body part is used for identifying a familiar male. They also compared how fish separate two fish or two objects, in both right-side up and upside-down positions. If faces are “special” for medaka, they may not be able to recognize the upside-down faces equally well, but should show no difference between right-side up and upside-down objects. They found that medaka use both vision and olfaction to distinguish between fish, but only vision is enough. More specifically, they use faces for individual recognition. Even when they added some spots on their faces, the fish could still recognize the face-painted fish without difficulty. Fish can discriminate between two fish faces and two objects equally well, but when the faces are upside-down, it becomes more difficult to tell them apart. When discriminating between two non-face objects, medaka can perform equally good in the right-side up and the upside-down positions. This suggests that faces might be special for fish, just as humans.

This is the first study showing animals other than mammals may have special ability to recognize faces. Even with their small brain, the fish can separate different individuals apart. The findings can be important to understand how animals, including humans, recognizing faces and its evolutionary origins. We have a powerful genetic toolbox for medaka, thus we may be able to find the genes and neurons relative to face recognition.

Reference

Author

Mu-Yun Wang* and Hideaki Takeuchi

Title of original paper

Individual recognition and the “face inversion effect” in medaka fish (*Oryzias latipes*)

Journal

eLife 2017;6:e24728

Digital Object Identifier (DOI)

<https://doi.org/10.7554/eLife.24728>

Journal website

<https://elifesciences.org/articles/24728>



Podcast provided by *eLife*

<https://elifesciences.org/podcast/episode41>



Affiliations

The University of Tokyo and Okayama University

Department website

http://www.biol.okayama-u.ac.jp/index_e.html



■ Research Highlights

The secrets of straight growth of plant cells, NEK6 protein aligns cytoskeleton.

Plants continuously generate various kinds of organs such as roots, leaves, and flowers. The growth morphology of each organ is achieved by the directional growth of plant cells. Prior to cell growth, an intracellular cytoskeleton called “microtubule” aligns perpendicular to the growth axis to determine growth direction of plant cells (Fig. 1). Various proteins have been shown to regulate the dynamic behavior of microtubules, however, the mechanism of microtubule alignment remains to be resolved.

Now, Hiroyasu Motose, Shogo Takatani, Taku Takahashi, and their colleagues at Okayama University and NAIST have revealed the function of NIMA-related kinase 6 (NEK6) in the straight growth of plant cells. They employed live cell imaging to investigate dynamic behavior of microtubules and NEK6 proteins in combination with the advantage of genetic analyses in the model plant *Arabidopsis thaliana*.

The results showed that NEK6 protein removes aberrant microtubules to align them before directional cell growth (Fig. 2). NEK6 phosphorylates specific amino-acid residues of tubulin proteins—the building blocks of microtubules—and eliminates abnormal microtubules. In the absence of NEK6, microtubules are crooked and plant cells cannot grow straight (Fig. 3). This study clearly demonstrates novel regulatory mechanism of microtubule organization and directional growth in plants. Since microtubules and NEK proteins are well conserved in most organisms and participate in the essential cellular processes (e.g. cell division) and various diseases (e.g. cancers and ciliopathy), our findings shed new lights on the principles in these biological phenomena.

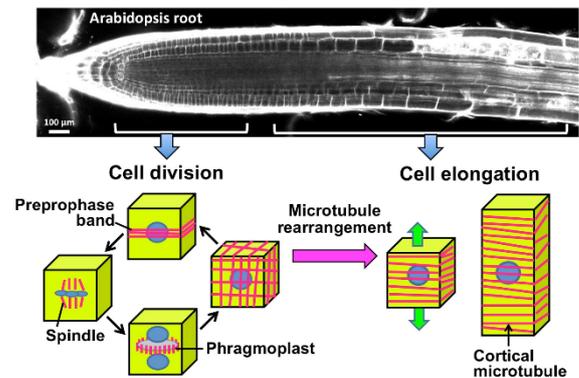


Figure 1. Microtubules (red lines) regulate cell division and expansion.

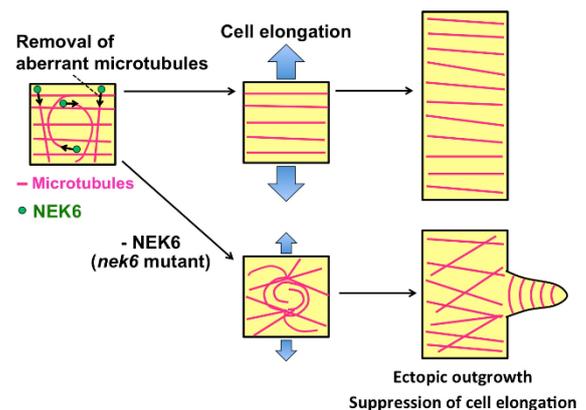


Figure 2. NEK6 removes aberrant microtubules to align microtubules.

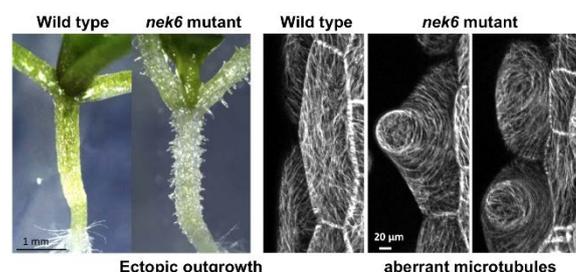


Figure 3. *Arabidopsis nek6* mutant exhibits ectopic outgrowth and aberrant microtubules.

Reference

Authors

Shogo Takatani, Shinichiro Ozawa, Noriyoshi Yagi, Takashi Hotta, Takashi Hashimoto, Yuichiro Takahasi, Taku Takahashi, Hiroyasu Motose

Title of original paper

Directional cell expansion requires NIMA-related kinase 6 (NEK6)-mediated cortical microtubule destabilization

Journal

Scientific Reports

Digital Object Identifier (DOI)

10.1038/s41598-017-08453-5

Journal website

<http://www.nature.com/articles/s41598-017-08453-5>



Affiliations

Department of Biological Science, Graduate School of Natural Science and Technology, Okayama University



■ Topics

Introduction to student activities

The Shogi Club's Hani wins second place in the Shogi Student Master Championship!

Yutaka Hani, a third-year student in the Faculty of Law who belongs to Okayama University Shogi Club, won second place in the 2017 Student Master Championship hosted by the All Japan Student Shogi Association held in a hotel in Tokyo from May 27-28.

Thirty-two student amateurs who qualified through regional competitions participated in the championship. There was fierce competition throughout the tournament. Despite it being his first time to participate, Hani advanced to the final game. Unfortunately, he came in second after losing to Hayata Fujioka from University of Tokyo, who recently was in the news for playing against the youngest professional shogi player in Japan, Sota Fujii (fourth-dan).

Afterwards, Hani looked back on the results and was fired up for the next competition, saying, "I would like to win the Team Tournament that will be held next September and seek my revenge there."



Practice at the club room



Students from both universities going on a campus tour.

International exchange held between University of Arkansas and Okayama University students

On 27 May 2017, 13 students from the University of Arkansas visited Okayama University to hold an exchange with Okayama University students.

House of Representatives member Takashi Yamashita, an alumni of Junior High School attached to Okayama University, attended the group and gave the opening remarks as a representative of Japan to

welcome the group. Executive Vice President for International Affairs Hiroshi Kanzaki also welcomed the group by stating, "Please learn the local dialect such as "Bo-ke," enjoy your time here, and come again."

During the exchange, students from both universities made self-introductions and held discussions, as well as explored the campus together to deepen their friendship.



◆Further information

Okayama University
1-1-1 Tsushima-naka, Kita-ku, Okayama 700-8530, Japan

Public Relations and Information Strategy
E-mail: www-adm@adm.okayama-u.ac.jp
Website: http://www.okayama-u.ac.jp/index_e.html

Okayama University e-Bulletin
<http://www.okayama-u.ac.jp/user/kouhou/ebulletin/>

Okayama University Medical Research Updates (OU-MRU)
http://www.okayama-u.ac.jp/eng/research_highlights/index_id60.html

About Okayama University (YouTube 1)
<https://www.youtube.com/watch?v=iDL1coqPRYI>

Okayama University Image Movie (YouTube 2)
<https://www.youtube.com/watch?v=KU3h0IXS5kk>



Website



e-Bulletin



OU-MRU



YouTube 1



YouTube 2

◆About Okayama University

Okayama University is one of the largest comprehensive universities in Japan with roots going back to the Medical Training Place sponsored by the Lord of Okayama and established in 1870. Now with 1,300 faculty and 13,000 students, the University offers courses in specialties ranging from medicine and pharmacy to humanities and physical sciences. Okayama University is located in the heart of Japan approximately 3 hours west of Tokyo by Shinkansen.



Hirofumi Makino, M.D., Ph.D.
President, Okayama University



SUSTAINABLE DEVELOPMENT GOALS



“Okayama University supports the Sustainable Development Goals”