



ICAR-National Rice Research Institute (ICAR-NRRI)
(An ISO9001:2015 Certified Institute)
Cuttack - 753006



Azadi ka Amrit Mahotsav - Celebration of 75 Years of India's Independence at ICAR-National Rice Research Institute, Cuttack, India

Special Talk - “Investigating the cell biology of plant infection by the rice blast fungus *Magnaporthe oryzae*”

The ICAR-National Rice Research Institute, Cuttack is conducting a Special Talk series to celebrate 75 years of India's independence as *Azadi ka Amrit Mahotsav* (AKAM). The 9th Special Talk in the series – “Investigating the cell biology of plant infection by the rice blast fungus *Magnaporthe oryzae*” was delivered by **Prof (Dr) Nicholas J Talbot, FRS, Executive Director and Group Leader, The Sainsbury Laboratory (TSL), Norwich, UK** on 9 June 2022 at 02:00 PM IST (09:30 AM GMT) on virtual mode.

Prof Nicholas J Talbot is the Executive Director and Group Leader of The Sainsbury Laboratory (TSL), Norwich, UK. TSL is a world-leading institute for the study of plant-microbe interactions. Nick’s research is focused on understanding plant infection by the rice blast fungus, which causes the most serious disease of cultivated rice. He is particularly interested in how *Magnaporthe oryzae* uses specialised infection cells called appressoria to infect rice plants. His research has contributed to understanding how appressorial turgor is generated and how autophagic programmed cell death is necessary for plant infection. He has identified many of the essential signaling pathways required for appressorium morphogenesis. Nick’s research group also studies how rice tissue is invaded using special structures called transpressoria and how *M. oryzae* uses effector proteins to suppress plant immunity. He has been elected a Fellow of the Royal Society of Biology, a member of European Molecular Biology Organization, a member of Academia Europaea, and a Fellow of The Royal Society.

The screenshot shows a virtual meeting interface with several panels:

- Top Left:** Twitter handle @talbotTSL and The Sainsbury Laboratory TSL logo.
- Top Center:** Presentation slide titled "Investigating the cell biology of plant infection by the blast fungus *Magnaporthe oryzae*" by Nick Talbot. It mentions "Azadi ka Amrit Mahotsav Celebration of 75 Years of India's Independence at ICAR-National Rice Research Institute, Cuttack, India June 9th 2022".
- Top Right:** Diagram titled "Magnaporthe oryzae exists in multiple host-limited forms that can infect many grass species". It shows a phylogenetic tree with host plants: *M. grisea*, *M. pennisetigena*, *Brachiana Stenotaphrum*, *Eragrostis*, *Eleusine*, *Lolium*, *Triticum*, *Oryza*, *Oryza Sativa*, and *Oryza Hordeum*. *M. oryzae* is shown infecting *Oryza*.
- Bottom Left:** Video of wheat blast in Meherpur, Bangladesh, February 2019. Text: "Breaking news: Wheat blast has made the intercontinental jump to Africa, with a confirmed first appearance in Zambia. The outbreak of this fast-spreading devastating fungus threatens wheat production in Zambia and raises the alarm for surrounding regions and countries." Credit: Patrick Heugens, CIMMYT.
- Bottom Center:** Microscopic image of a rice blast fungus with a 10 µm scale bar. Credit: Lauren Ryder, Kim Findlay.
- Right Side:** A vertical list of participant names in a video call grid, including Soumya Saha, Dr Sushanta Dash, Tushar Dutta, P. ALAKSHMI, P., P. ALAKSHMI PRASAN, Andrei Ichim, Basavaprabhu P., Basavaprabhu Pall, Dr Dinesh Prasad, Dr Dinesh Prasad Sr., Dr. A.K. Nayak, Dr. A.K. Nayak, and Koushik Chakraborty.

Prof Talbot described how *Magnaporthe oryzae* (syn. *Pyricularia oryzae*) uses specialised infection cells called appressoria to infect rice plants. Appressoria generate immense pressure to breach the tough outer layer of plants (up to 40 times the pressure of a car tyre). He pointed out that rice tissue is invaded by *M. oryzae* using special structures called transpressoria that enable the fungus to move between rice cells. Fungal morphogenetic proteins, called septins, are essential for rice blast disease and septins are pivotal to the function of appressoria as well as transpressoria. *M. oryzae* uses effector proteins to suppress plant immunity. Pmk1 (a MAPK) is the central hub in a cascade of regulators that all need to act in concert. Only then can the blast fungus infect plants.

The image is a composite of four main parts:

- Top Left:** A diagram titled "The Pmk1 MAPK pathway and cAMP-dependent protein kinase A pathway regulate appressorium morphogenesis and function". It shows a cell membrane with receptors (Pho11, Slm1, Slm2) and signaling molecules (Ras2, Raf1, MEK1, ERK1, Pmk1) leading to "Surface receptor target generation", "Appressorium formation", "Penetration peg", and "Invasive growth".
- Top Right:** A microscopy image titled "Appressorium turgor generation by *M. oryzae*". It shows a spherical structure with arrows pointing to H₂O and a central label "[Glycerol] 8.0 MPa". A scale bar indicates 5 μm.
- Middle Left:** A "Summary" slide with a green background. It lists:
 - The rice blast fungus makes a specialized appressorium to infect rice plants
 - Appressorium penetration is a septin-dependent process
 - A sensor kinase, Slm1, senses when a threshold of turgor has been reached and controls the re-establishment of polarity
 - Tissue invasion requires deployment of a battery of fungal effector proteins to suppress plant immunity
 - Magnaporthe* makes an infection structure called a transpressorium to move between rice cells
 - Pmk1 MAPK regulates both appressorium and transpressorium formation
- Right and Bottom:** A virtual meeting interface showing a grid of participants' video feeds. The main feed shows a man with glasses speaking. Other participants include Dr. Sudhamoy Mandal, Dr. PC Rath, Dr. Padmini Swain, and others.

The captivating talk by Prof Talbot on “Investigating the cell biology of plant infection by the rice blast fungus *Magnaporthe oryzae*” elicited a flurry of questions from the audience. Taking keen interest in the talk, more than 100 participants attended the special talk in virtual mode from across the country.

The special talk was presided by Dr Padmini Swain, Director (A), ICAR-NRRI. Dr PC Rath, Head (A), CPTD & Chairman, AKAM Committee at NRRI welcomed the Guest Speaker. Dr Sudhamoy Mandal, Principal Scientist, CPTD & Convener, AKAM introduced Prof Nicholas J Talbot to the august virtual gathering. The program was beautifully moderated by Dr Nabaneeta Basak, Scientist, CPBD. Dr Somnath Roy, Senior Scientist, CRURRS, Hazaribagh designed the flyer and coordinated the virtual program. ARIS Cell of the institute hosted the program on virtual mode.