Design and redesign of a plant immune receptor complex

Fact Sheet

Project Information

ImmunityByPairDesign

Grant agreement ID: 669926

Project website

DOI
10.3030/669926

Project closed

EC signature date
30 September 2015

Start date
1 October 2015

End date
30 September 2021

Funded under
EXCELLENT SCIENCE - European Research Council (ERC)

Total cost
€ 2 499 978,00

EU contribution
€ 2 499 978,00

Coordinated by
THE SAINSBURY LABORATORY
United Kingdom

Objective

This project will (1) reveal design principles of paired immune receptor complexes and (2) elevate plant disease resistance by enabling design of immune receptors with new recognition capacities.

Plant immunity is triggered upon pathogen detection by dedicated immune receptors. Like animal Nod-like receptors (NLRs), plant immune receptors have a modular structure and can work in pairs, both of which are required for defence activation upon recognition of specific pathogen proteins. How such intracellular immune receptor complexes activate defence solely upon recognition of microbial molecules

is poorly understood.

Using novel high risk/high gain methods such as domain/domain cross-linking with mass spectrometry (XL-MS) and cryo-electron microscopy, as well as X-ray crystallography, genetics and cell biology, we will define at a structural level the domain/domain interactions within an immune receptor complex, and how these change upon pathogen perception. The Arabidopsis RPS4/RRS1 immune receptor acts in the cell nucleus to detect when pathogen effectors target WRKY transcription factors, converting effector interactions with the RRS1 WRKY domain into defence activation via RPS4. We will reveal the intra-molecular reconfigurations required for signalling and thus tackle a problem of broad significance, both for immune receptors, and for other intracellular receptors that are activated by ligand-dependent release from negative regulation.

We will also create and test derivatives of RPS4/RRS1 or related complexes that are designed to respond to effectors that target other host protein domains. As Richard Feynman said, “What I cannot create, I do not understand”. By designing immune receptors to recognize other pathogen effectors, we will test models of how plant immune receptors activate defence, but only upon effector recognition. This second objective is ambitious and high risk/high gain, but potentially game-changing for crop disease control.

Fields of science (EuroSciVoc)

agricultural sciences > agriculture, forestry, and fisheries > agriculture > **sustainable agriculture**

natural sciences > earth and related environmental sciences > geology > mineralogy > **crystallography**

natural sciences > biological sciences > biochemistry > biomolecules > **proteins**

natural sciences > chemical sciences > analytical chemistry > **mass spectrometry**

natural sciences > biological sciences > molecular biology > **structural biology**

Programme(s)

H2020-EU.1.1. - EXCELLENT SCIENCE - European Research Council (ERC) MAIN PROGRAMME

Topic(s)

ERC-ADG-2014 - ERC Advanced Grant

Call for proposal

ERC-2014-ADG

See other projects for this call

Funding Scheme

ERC-ADG - Advanced Grant

Host institution

THE SAINSBURY LABORATORY

Net EU contribution

€ 1 972 649,00

Total cost

€ 1 972 649,00

Address

Norwich Research Park, Colney Lane
NR47UH Norwich
United Kingdom

Activity type

Research Organisations

Links

Contact the organisation Website
Participation in EU R&I programmes
HORIZON collaboration network

Beneficiaries (2)

THE SAINSBURY LABORATORY

United Kingdom

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€ 1 972 649,00

JOHN INNES CENTRE

United Kingdom

Net EU contribution

€ 527 329,00

Address

NORWICH RESEARCH PARK COLNEY
NR4 7UH Norwich

Region

East of England > East Anglia > Breckland and South Norfolk

Activity type

Research Organisations

Links

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