IMMUNITY

Flagellin unmasked

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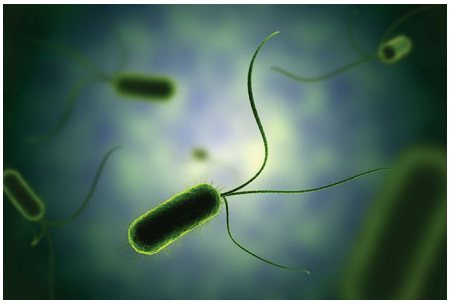

Credit: Shawn Hempel - Concepts / Alamy Stock Photo

Plants recognize whole classes of potentially dangerous microorganisms through the perception of common and rather unspecific non-self molecules. Fungal chitin and bacterial flagellin are two examples of these molecular patterns that lead to basal immune responses. FLAGELLIN-SENSING 2 (FLS2), discovered almost 20 years ago, is the conserved plasma membrane receptor kinase that perceives the commonly used immunogenic 22-amino acid-long flagellin fragment called flg22. A problem that has been puzzling researchers for a long time is that the flg22 epitope is deeply buried in the flagellum structure, which makes contacts between ligand and receptor highly unlikely, even in the case of random monomer escape during flagellum construction or collapse.

A study led by Renier van der Hoorn, from the University of Oxford, now shows that the hydrolytic release of flg22 is a highly controlled process depending on flagellin glycan decorations as well as a battleground between plant and bacteria. Working with *Nicotiana benthamiana*, the researchers discovered that a plant apoplastic galactosidase called BETA GALACTOSIDASE 1 (BGAL1) is inactivated by bacteria during infection and contributes to immunity. Through various elegant approaches, a novel signalling pathway emerges step by step. BGAL1 removes exposed glycans from the full-length flagellin. The naked flagellin becomes more sensitive to yet unidentified proteases, which can now hydrolyse the full length protein and release FLS2-dependent immunogenic fragments (such as flg22).

As with most pathways controlling immunity, plants and pathogens each try to tilt the balance in their favour: the plant produces BGAL1 to remove glycans and amplify the immune signal and response, and the bacteria try to inhibit BGAL1 to block this process, and can even use glycan polymorphism to evade it entirely. Focusing on events upstream of flg22 perception instead of the usual downstream signalling pathways shows that sometimes, turning the research approach on its head can lead to significant discoveries.

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