

Publication

Clathrin-dependent endocytosis is required for immunity mediated by pattern recognition receptor kinases

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Sensing of potential pathogenic bacteria is of critical importance for immunity. In plants, this involves plasma membrane-resident pattern recognition receptors, one of which is the FLAGELLIN SENSING 2 (FLS2) receptor kinase. Ligand-activated FLS2 receptors are internalized into endosomes. However, the extent to which these spatiotemporal dynamics are generally present among pattern recognition receptors (PRRs) and their regulation remain elusive. Using live-cell imaging, we show that at least three other receptor kinases associated with plant immunity, PEP RECEPTOR 1/2 (PEPR1/2) and EF-TU RECEPTOR (EFR), internalize in a ligand-specific manner. In all cases, endocytosis requires the coreceptor BRI1-ASSOCIATED KINASE 1 (BAK1), and thus depends on receptor activation status. We also show the internalization of liganded FLS2, suggesting the transport of signaling competent receptors. Trafficking of activated PRRs requires clathrin and converges onto the same endosomal vesicles that are also shared with the hormone receptor BRASSINOSTEROID INSENSITIVE 1 (BRI1). Importantly, clathrin-dependent endocytosis participates in plant defense against bacterial infection involving FLS2-mediated stomatal closure and callose deposition, but is uncoupled from activation of the flagellin-induced oxidative burst and MAP kinase signaling. In conclusion, immunity mediated by pattern recognition receptors depends on clathrin, a critical component for the endocytosis of signaling competent receptors into a common endosomal pathway.

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