Show and Tell : cell biology of pathogen invasion

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The powdery mildews are obligate biotrophic fungi and are one of the most economically important groups of plant pathogens (Agrios, 1997). As a family, the powdery mildews infect a broad range of plant species including barley, wheat, pea, apple, sugar beet, and grape (Braun, 1987). Powdery mildew pathogens uptake nutrients by forming a feeding structure, the haustorium, within 12-18 hours after infection (hai) in their respective host plants. Because of the initial stages of these plant pathogen invasion are mostly confined to a limited number of host cells, it's often too late to find out till the infections widely spread out. To identify the earliest and often transient responses to pathogen attack, there is considerable interest in monitoring the subcellular events that occur specifically in living host cells. Recent improvements in live cell imaging using fluorescent-tagged markers have expanded the scope of experiments that can be performed. Changes in the subcellular distribution of organelles as well as fluorescently tagged proteins can be monitored in real time in living tissues during pathogen attack, and the dynamic nature of such changes across space and over time can be determined. The application of these sensitive imaging methods has extended earlier observations made with Nomarski microscopy or inferred from static transmission electron micrographs about the focal accumulation of subcellular organelles at sites of pathogen attack. In addition, recent experiments have demonstrated the focused accumulation and interaction of specific plant proteins at penetration sites, opening a new window on early host responses and raising questions about the underlying plant processes that sense and direct this marshalling of host resources to block pathogen entry.