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Research Category: **GDER** **Duration of Award: 1 Year**

Project Title: A Rapid Assay System for Transgenes that Confer Resistance to DON and FHB.

PROJECT 1 ABSTRACT

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We have developed the Physcomitrella rapid assay system to identify a number of genes that confer enhanced resistance to FHB and FHB-derived toxins. These studies reveal distinct cellular mechanisms that can enhance resistance to FHB and suggest that effective field resistance in crop plants may require the introduction of multiple genes acting in concert at different points in the infection pathway.

Effective resistance against FHB can be conferred through the application of chitosan, which induces a battery of defense responses in the host plant. The plant receptor for chitin has recently been isolated and shown to be essential for the induction of immunity by chitin oligomers. This receptor, which is highly conserved, forms part of an ancient and broadly acting defense mechanism that is well suited to counter disease caused by broad host-range pathogens such as *Fusarium graminearum*. In this proposal, we will functionally characterize the chitin receptor from barley and establish the molecular tools to manipulate this pathway to enhance basal immunity against FHB.

Specific goals and approaches of this project:

(i) Isolate and characterize barley homologs of the chitin receptor.

(ii) Identify the authentic barley chitin receptor through functional complementation of defined mutants in Physcomitrella and Arabidopsis.

(iii) Create constructs for the suppression of the chitin receptor in transgenic barley.

Expected outcomes: These experiments will establish the identity of the barley chitosan receptor, and define its contribution to induced resistance to FHB in barley. These studies will provide a foundation for defining downstream components of induced resistance in barley and will provide new options and new gene targets for manipulating resistance to FHB in cereal crops.

These approaches will identify novel homologous barley and wheat genes whose expression can be enhanced through transgenic or selective breeding approaches. These studies fulfill the goal of the Gene Discovery and Engineering Resistance (GDER) research area (RA) to identify candidate genes for resistance from wheat, barley and other plants and to develop effective FHB resistance through transgenic strategies.