Project Title: Modulation of nucleotide sugar biosynthesis to enhance the plant defence response and inhibit fungal growth.

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The current annual losses to fungal pathogens in the Australian wheat and barley industry are calculated at over $1 billion, approaching 20% of the average annual value of both crops over the past decade. The cell wall is crucial to the growth, morphogenesis and survival of both plants and fungi presenting strong targets for enhancing disease control.

When a fungal conidia lands on a plant a cell wall synthesis race begins. The fungi must initiate growth and penetrate the plant cell wall before the plant can respond. As a defence strategy, plants reinforce the cell wall near the site of penetration by producing a dome-shaped apposition, called a papilla, between the epidermal wall and the plasma membrane. Papillae provide mechanical and chemical barriers to halt penetration of pathogens or to delay the infection process while the plant’s other defences become active.

In both cases there is a demand for a steady supply of nucleotide sugar donors used as substrates by glycosyltransferases to assemble polysaccharide components of the cell wall. Gene products involved in the *de novo* nucleotide-sugar biosynthesis and interconversion pathways have been identified and can be targeted to tip the balance in the favour of the plant by slowing fungal growth and/or enhancing the plant defensive structures.

The proposed research project will involve:

- Transcriptome analysis via RNA sequencing and quantitative PCR
- Spatial and temporal profiling of nucleotide sugar synthesis and interconversion during infection
- Analysis of plant and fungal cell wall composition using High performance liquid chromatography (HPLC) and fluorescence microscopy
- Transient-induced gene silencing/overexpression of plant and fungal genes

*The project can be tailored to meet the specific interests of the applicant.*