Project Abstract

Project Title:	Biodegradable Nanomaterial-based Non-GMO RNAi Delivery for Controlling FHB Disease	
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By using nanoparticle-mediated RNAi tools, we aim to post-transcriptionally silence target genes (that are vital for survival, establishment, and growth and pathogenicity of the *Fg*) and developing methods to control FHB disease in wheat and in a non-GMO fashion. While several researchers identified pathogenic genes in *Fg*, this knowledge has yet to be used as proof of concept for creating resistance against FHB. Our specific objectives are 1) Design and develop scalable production of core-shell dsRNA-chitosan nanostructures for sustained release of dsRNA over two weeks in the plant; 2) Integration of designed dsRNA into core shell nanoparticles with uniform spray application process; 3) Silencing of candidate genes with nanoparticle-coated siRNA in *Fg*; 4) Assays for siRNA delivery and effects of two or more siRNA in *Fg*; 5) Determine accumulative effects of simultaneously silencing of two or more genes in *Fg*; 6) Gene prioritization and dsRNA design for applications on wheat; and 7) Treating FHB inoculated susceptible varieties with coated dsRNA design, and characterizing the efficacy of non-GMO gene silencing strategy. This approach, if successful, will be a breakthrough in functional studies in *F. graminearum* and other fungal pathogens. This RNAi tool delivery approach, if successful, can lead to the development of a non-GMO and environmentally friendly method to control FHB, and later can be extended to other pests and pathogens, and can lessen the use of agrochemicals in the US. Our preliminary data showed that when *F. graminearum* conidia were treated with chitosan nanoparticles ChNP-siRNA oligos, conidium germination and germ tube growth were significantly inhibited in comparison with DDW control. When tested with snRNA oligos targeting *PMK1* in *M. oryzae*, ChNP-siRNA oligos did not inhibit conidium germination but affect appressorium formation and appressorial penetration of onion epidermal cells.