PI: Bacon, Charles **PI's E-mail: cbacon@saa.ars.usda.gov**
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PROJECT 1 ABSTRACT
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Scab or head blight of wheat affects grain yield and quality. This disease has caused billion dollar losses to U.S. growers and millers within past decades, and losses to this disease are expected for this decade. The disease is caused primarily by strains within the *Fusarium graminearum* (lineage group 7, teleomorph *Gibberella zeae)* and its 7 other lineages, although *F. pseudograminearum* is also involved, especially outside the U.S. The interaction of this fungus with wheat initially is biotrophic, although it becomes saprophytic during the final expression of the disease and production of the mycotoxin and virulence factor deoxynivalenol (DON). We propose to use natural endophytic bacterial strains with novel properties for preventing the colonization of wheat, resulting in a reduction of mycotoxins in the grain.

The bacterium proposed for this purpose is *Bacillus mojavensis* that we have characterized as endophytic, plant friendly, and antagonistic to fungal pathogens of plants, especially corn and wheat. We have patented a strain of *B. mojavensis* as an endophyte for the control of diseases caused by fungi, and have established that it reduces the fumonisin mycotoxin content in corn that is produced by *F. moniliforme*. We have established that this strain can be used for the suppression of *F. graminearum* induced seedling blight in greenhouse culture. This strain persists during the entire growing season and has potential as a biocontrol for scab of wheat. We have also established that all strains of this species are natural plant endophytes, producing compatible symptomless infections with growth promoting effects. This is the first report of using an endophytic bacterium as a biocontrol for scab and mycotoxin reduction, representing new technology.

The major goal of this proposal is to determine if this bacterium can as an endophyte protect wheat from scab thereby reducing the level of DON, and related mycotoxins. The specific objective is to establish the best bacterial strain and application time for use on wheat for the control of *F. graminearum* for reducing floret infections, thereby reducing scab development, and to determine levels of DON in wheat infected by bacterial endophytes, regardless of scab control. The long range goal of this research is to establish new technology based on a new group of endophytic bacteria that will control scab and reduce mycotoxin levels that pose a health threat to livestock, poultry and humans. Thus, these goals are relevant to the goals of the U.S. Wheat and Barley Scab Initiative