Mycoplasma Promoter Sequences for Synthetic Biology and Other Applications

APPLICATION AREAS
Synthetic Biology; Recombinant Protein Expression

ABSTRACT
Mycoplasmas are a group of unusual bacteria with some of the smallest known genomes of free-living organisms. These organisms—which include important human and agricultural pathogens—have attracted significant scientific interest in terms of understanding the minimum genetic requirements for autonomous life, and more recently, in the emerging field of synthetic biology as the basis for constructing artificial organisms. Expression of mycoplasma genes in heterologous hosts for protein characterization and analysis has proven to be challenging since mycoplasmas use UGA as a tryptophan codon rather than the stop codon found in the universal genetic code. Thus, expression of mycoplasma genes in host cells such as E. coli can lead to the production of truncated proteins if steps are not taken to accommodate the uniqueness of the mycoplasma genetic code. In addition, regulatory sequences in mycoplasmas are often not properly recognized in heterologous hosts because of the high A+T content of the mycoplasma genome, making expression of mycoplasma proteins and analysis of mycoplasma regulatory regions difficult using conventional hosts such as E. coli. To overcome these obstacles, ISU researchers have identified regulatory sequences in mycoplasmas and developed a recombinant expression system that can be used to direct the synthesis of foreign or mycoplasma proteins in mycoplasma hosts. In addition, a reporter gene system has been constructed that allows identification of additional regulatory elements in mycoplasmas. This system may thus have utility for synthetic biology applications for gene expression in artificial organisms through the use and/or optimization of mycoplasma regulatory cassettes, as well as for expression of mycoplasma proteins that may be used in diagnostics, vaccine development or other applications.

BENEFITS
- Enables production of recombinant non-mycoplasma proteins in mycoplasma hosts for a variety of applications
- Facilitates production of recombinant mycoplasma proteins for vaccine development, diagnostics, and other uses
- Allows identification of additional mycoplasma regulatory sequences

INVENTORS
Drs. F. Chris Minion and Kevin L. Knudtson

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CONTACT INFORMATION
Dario Valenzuela, Ph.D., M.B.A.
dariov@iastate.edu
Phone: (515) 294-4470 (Direct Line)