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Effect of Hfq on *Francisella tularensis* growth and stress resistance

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Aims: The goal of this research was to determine the impact of the RNA chaperone protein Hfq on *Francisella tularensis* growth and survival.
Methods: The Hfq protein has been shown to play an important role in small RNA-mediated regulation of gene expression in a wide range of bacteria. An *hfq* knockout mutant of *F. tularensis* subsp. *novicida* strain U112 was constructed and growth rates were monitored under a number of stress conditions including low pH, high salt content, and high temperature. Expression levels of *hfq* were analyzed via quantitative real-time PCR under these same conditions. Because *hfq* mutants in other bacteria have exhibited altered cell morphology, both the wild-type and mutant strain were viewed under transmission electron microscopy.
Results: The *hfq* mutant exhibited a slower growth rate compared to wild-type under all conditions tested, particularly at 42 °C. Data obtained from qRT-PCR analysis of the wild-type showed minor fluctuations in *hfq* expression during growth under both optimal and stress conditions. TEM images showed no distinct difference in cell morphology between wild-type U112 and the *hfq* mutant strain.
Conclusions: The Hfq protein appears to play an important role in *F. novicida* growth and survival under a variety of different stress conditions. The minor changes in *hfq* expression suggest that a certain concentration of Hfq is ideal for cell growth and survival. The lack of altered cell morphology in the *hfq* mutant of *F. novicida* is consistent with previous studies of *hfq* in *F. tularensis*. Hfq often assists regulation of gene expression by small RNAs in other bacteria and, though no small RNAs have been found to date in *F. tularensis*, a similar relationship could account for the observed impact of Hfq on cell growth.