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Variability in *Escherichia coli* serotype O157:H7 virulence and biofilm-forming properties generated by prophage-related genome alterations

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Shiga toxin-producing *Escherichia coli* (STEC) carry numerous prophage scattered throughout their genome; for instance, the Sakai reference strain encodes 18 prophage elements, many of which are degenerate. By definition, STEC carry 1 or more copies of Shiga toxin (*stx*) like genes on lambdoid prophage inserted at specific genomic sites. Prophage carrying stx2 often insert in *wrb*, while stx_1 often inhabits the proximal portion of the *mlrA* gene, an essential transcription factor for full expression of *csgD*, the central regulator of curli fimbriae and *E. coli* biofilms. UV light and DNA damaging chemicals can activate prophage genes and induce prophage elements to enter the lytic phase. As such, prophage elements can have a profound effect on both pathogenicity and stress resistance. These effects are mediated not only by additions to the bacterial gene complement, but also by imposing regulatory effects on the expression of genes encoded in the bacterial genome and other prophage, as well as through direct positional effects on the genes surrounding insertion sites. We have identified variants with increased biofilm-forming abilities that arise within growing serotype O157:H7 populations. Parent/variant comparisons have identified several favored mechanisms responsible for the phenotypic changes. Using WGS and transcriptomic analyses, we identified differentially-expressed prophage and genomic genes that accompany these changes. We have also mapped differences in prophage gene patterns associated with stress and virulence genes under varying concentrations of DNA damaging antimicrobial agents. Collectively, these studies have help define novel ways that STEC modulate their stress and virulence properties.

Biography

Gaylen A Uhlich has received his Doctor of Veterinary Medicine (DVM) degree from the University of Minnesota in 1981. After 8 years in mixed animal practice, he has joined FSIS/USDA as a Veterinary Medical Officer where he has worked in food safety for 4 years. He has completed a combined Residency/PhD program in Veterinary Pathology in 1998 and completed Postdoctoral research positions at the Meat Animal Research Center (MARC) in Clay Center, NE and at the Eastern Regional Research Center (ERRC) in Wyndmoor, PA before taking a Research Microbiologist position at ERRC.

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