Arch Microbiol. 2016 Sep 21. [Epub ahead of print]

Probiotic Enterococcus faecalis Symbioflor® down regulates virulence genes of EHEC in vitro and decrease pathogenicity in a Caenorhabditis elegans model.

Neuhaus K[1], Lamparter MC[2,3], Zölch B[1], Landstorfer R[1], Simon S[4], Spanier B[5], Ehrmann MA[2], Vogel RF[6].

Author information

Abstract

Enterohemorrhagic E. coli O157:H7 (EHEC) shorten the lifespan of Caenorhabditis elegans compared to avirulent bacteria. Co-feeding EHEC with Enterococcus faecalis Symbioflor® significantly increased the worms' lifespan. The transcriptome of EHEC grown in vitro with or without Symbioflor® was analyzed using RNA-seq. The analysis revealed downregulation of several virulence-associated genes in the presence of Symbioflor®, including virulence key genes (e.g., LEE, flagellum, quorum-sensing). The downregulation of the LEE genes was corroborated by lux-transposon mutants. Upregulated genes included acid response genes, due to a decrease in pH exerted by Symbioflor®. Further genes indicate cellular stress in EHEC (e.g. prophage/mobile elements involved in excision, cell lysis, and cell division inhibition). Thus, the observed protection of C. elegans during an EHEC infection by the probiotic Symbioflor® is suggested to be caused by triggering concomitant transcriptomic changes. To verify the biological relevance of this modulation, exemplary genes found to be influenced by Symbioflor® were knocked out (fliD, espB, Z3136, Z3917, and L7052). The lifespan of nematodes changed when using knock-outs as food source and the effect could be complemented in trans. In summary, Symbioflor® appears to be a protective probiotic in the nematode model.

KEYWORDS:

Caenorhabditis elegans; EHEC; Enterococcus faecalis Symbioflor®; Transcriptome; Virulence; lux transposons