Salmonella Wins the War with Prebiotics and Probiotics during Infection

Narine Arabyan1, Prerak Desai1, Jigna Shah1, Reed N. Gann1, Hai Yu, Thao Ly Yang2, Yanhong Li2, Nguyet Kong1, Mai Lee Yang1, Janneth Pinzon1, Xi Chen1, and Bart C. Weimer1

1Department of Population Health and Reproduction, School of Veterinary Medicine, University of California, Davis, CA 95616, USA; 2Department of Chemistry, University of California, Davis, CA 95616, USA.

1Present address: Zoetis, 333 Portage Road, Kalamazoo, MI 49007, USA; 2Present address: MPI Research, 54943 North Main Street, Mattawan, MI 49071, USA;

1Present address: Air University, 501 LeMay Plaza North, Maxwell AFB, AL 36112, USA; 1Present address: Department of Clinical Laboratory and Pathology, Sutter Medical Center, 2825 Capitol Ave. Sacramento, CA 95816, USA; 1Present address: Department of Plant Sciences, University of California, Davis, CA 95616, USA.

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ABSTRACT

Prebiotics and probiotics reduce the ability of pathogens, including the gut microflora. Prebiotics promote beneficial gut bacteria while probiotics prevent the attachment and invasion of pathogens. However, the mechanisms of these two processes are not entirely understood that alter Salmonella adhesion/dynamics. This hypothesis that Salmonella digests prebiotics via glycosidases (GHs) and digests prebiotics function as decoys, anti-adhesives or anti-microbials? carbohydrates that cannot be digested by the human body.

We hypothesized that Salmonella digests prebiotics via its glycosidases (GHs) and defeats Bifidobacterium infantis by reducing inflammatory signal transduction pathways mediating host cell death.

EXPERIMENTAL DESIGN

Define the ability of pathogen to degrade OS as a carbon source (growth studies)

Determine prebiotic blocking changed the location of the pathogen (in vitro Adhesion and Invasion of A1) of Caco-2 cells

Genomic analysis of GH complement in Salmonella and Bifidobacterium (CAZY analysis)

Construct deletion mutants of GHs in Salmonella to examine the role of OS digesting enzymes during host association

Investigate pathogen exclusion potential of prebiotics

Determine host cell survival during A1 of Salmonella and Bifidobacterium (cytotoxicity assay)

Investigate how Salmonella adapts to the presence of Bifidobacterium in the host environment (gene expression)

Investigate extrinsic and intrinsic cell death pathways (caspase-8, caspase-9 and caspase-3/7)

RESULTS

Salmonella degrades and digests human milk oligosaccharides (HMOs)

Host cell death signaling pathway during infection of Caco-2 cells following microbial association

DISCUSSION

The aim of this study was to define specific oligosaccharides involved in protecting the gut and the inhibition of pathogens.

- By mining the genomes of several hundred gut bacteria, we found 8 genes encoding GHs that were significantly upregulated in Caco-2 cells compared to other bacteria.
- We hypothesized that these genes were involved in the degradation of prebiotics and that their expression in the gut could protect against Salmonella infection.
- To test this hypothesis, we constructed deletion mutants of these genes in Salmonella and Salmonella-infected Caco-2 cells were analyzed for growth and survival.

CONTACT INFORMATION AND FUNDING

Bart C. Weimer

Narine Arabyan

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