

# Additional Glycosyl Hydrolase is Critical to Bacteria's Ability to Consume HMOs

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## ABSTRACT

Researchers at the University of California, Davis have developed technology that enables enhanced growth and colonization of beneficial gut bacteria through bacterial expression of heterologous alpha-fucosidases which target human milk oligosaccharides (HMOs), promoting a healthy gut microbiome.

## FULL DESCRIPTION

This invention provides compositions and methods involving beneficial gut bacteria, particularly strains of Bifidobacterium and Lactobacillus, engineered or selected to express heterologous alpha-fucosidases from glycoside hydrolase families GH-29 and GH-95. These enzymes enable bacteria to efficiently hydrolyze and metabolize fucosylated human milk oligosaccharides and related complex sugars resistant to digestion by the host. The approach promotes growth of these beneficial microbes in the gastrointestinal tract by utilizing HMOs as a carbon source, offering potential therapeutic and nutritional benefits especially in infants. Formulations can include these bacteria, alone or combined with HMOs or structurally similar oligosaccharides, administered via oral or rectal routes. This technology also encompasses methods to isolate and engineer strains with these enzymatic capabilities to selectively promote a health-supporting gut microbiome.

## APPLICATIONS

- ▶ Probiotic dietary supplements enriched with alpha-fucosidase-expressing beneficial bacteria.
- ▶ Infant formula supplemented with prebiotic human milk oligosaccharides and engineered probiotics.
- ▶ Therapeutics for restoring healthy gut microbiota in infants, adults, and immunocompromised patients.
- ▶ Functional foods and beverages incorporating synbiotic combinations.
- ▶ Veterinary applications supporting gut health in livestock using tailored probiotic strains.
- ▶ Microbiome modulation products for managing digestive disorders, allergies, or metabolic diseases.
- ▶ Research tools for isolating and characterizing beneficial gut bacteria with enhanced carbohydrate. metabolism

## FEATURES/BENEFITS

- ▶ Enables selective growth of beneficial bacteria on complex oligosaccharides indigestible by the host.

## CONTACT

Victor Haroldsen  
[haroldsen@ucdavis.edu](mailto:haroldsen@ucdavis.edu)  
 tel: 530-752-7717.



## INVENTORS

- ▶ Garrido Cortes, Daniel A.
- ▶ German, Bruce
- ▶ Lebrilla, Carlito B.
- ▶ Mills, David A.
- ▶ Ruiz Moyano, Santiago

## OTHER INFORMATION

### KEYWORDS

alpha-fucosidase,  
 bifidobacterium breve,  
 beneficial gut bacteria,  
 fucosylated  
 oligosaccharides, human  
 milk oligosaccharides,  
 heterologous expression,  
 microbiome modulation,  
 prebiotic, probiotic, gut  
 health

### CATEGORIZED AS

- ▶ **Biotechnology**

- ▶ Supports establishment and maintenance of a healthy gut microbiota, particularly in breast-fed infants.
- ▶ Increases consumption and metabolism of fucosylated human milk oligosaccharides.
- ▶ Utilizes engineered or naturally occurring bacterial strains expressing GH-29 and/or GH-95 alpha-fucosidases.
- ▶ Compatible with oligosaccharide supplementation to synergistically promote gut health.
- ▶ Applicable to various delivery methods including oral and rectal administration.
- ▶ Potential to reduce pathogenic bacterial colonization by competitive exclusion.
- ▶ Broad applicability across Lactobacillus and Bifidobacterium strains with beneficial gut properties.

- ▶ [Food](#)
- ▶ [Health](#)

#### RELATED CASES

2013-877-0, 2009-110-0, 2012-346-0, 2015-193-0

#### PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	<a href="#">11,633,461</a>	04/25/2023	2012-346
United States Of America	Issued Patent	<a href="#">11,285,182</a>	03/29/2022	2015-193
United States Of America	Issued Patent	<a href="#">11,000,576</a>	05/11/2021	2012-346
United States Of America	Issued Patent	<a href="#">10,780,136</a>	09/22/2020	2015-193
United States Of America	Issued Patent	<a href="#">10,688,160</a>	06/23/2020	2012-346
United States Of America	Issued Patent	<a href="#">10,639,357</a>	05/05/2020	2012-346
United States Of America	Issued Patent	<a href="#">10,471,134</a>	11/12/2019	2012-346
United States Of America	Issued Patent	<a href="#">10,350,249</a>	07/16/2019	2015-193
United States Of America	Issued Patent	<a href="#">10,165,788</a>	01/01/2019	2013-877
United States Of America	Issued Patent	<a href="#">10,071,142</a>	09/11/2018	2012-346
United States Of America	Issued Patent	<a href="#">9,327,016</a>	05/03/2016	2012-346
United States Of America	Issued Patent	<a href="#">8,425,930</a>	04/23/2013	2009-110

#### RELATED TECHNOLOGIES

- ▶ [Prebiotic Oligosaccharides](#)
- ▶ [Glycoprotein Cleaving Enzyme Isolated from Bifidobacteria](#)
- ▶ [Reducing Free Milk Glycan Monomers Generated by the Neonate Gut Microbiota Eliminates Colonization by Dysbiotic Microbiome Members](#)

#### ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- ▶ [Prebiotic Oligosaccharides](#)
- ▶ [Diagnosis and Treatment of Inflammatory Disease by Glycan Profiling of High Density Lipoprotein \(HDL\)](#)
- ▶ [Bifidobacterial Probiotics for Nursing and Weaning](#)
- ▶ [Reducing Free Milk Glycan Monomers Generated by the Neonate Gut Microbiota Eliminates Colonization by Dysbiotic Microbiome Members](#)
- ▶ [Bifidobacterial Probiotic Supplements for Infants](#)
- ▶ [Increased Microorganism Alcohol Tolerance Via Transformation of its pntAB Locus](#)
- ▶ [Glycoprotein Cleaving Enzyme Isolated from Bifidobacteria](#)
- ▶ [Breast Milk as a Source, Incubation/Storage Medium, and Delivery System for Infant Mucosal Immunity Bacteriophage](#)

Davis, CA 95616

<https://research.ucdavis.edu/technology-transfer/>

Fax:

530.754.7620