Protective bacteria in the infant gut have resourceful way of helping babies break down breast milk

August 13 2012, by Danielle Gutierrez

A research team at the University of California, Davis, has found that important and resourceful bacteria in the baby microbiome can ferret out nourishment from a previously unknown source, possibly helping at-risk infants break down components of breast milk.

Breast milk is amazingly intricate, providing all of the nutrients necessary to sustain and strengthen infants in the first months of life. Moreover, this natural source of nutrition provides protection from infections, allergies and many other illnesses.

Breast milk also promotes the growth of protective bacteria in an infant's intestine. Because breast milk contains glycans (complex sugars) that infants cannot breakdown, it promotes the growth a specific type of bacteria, called bifidobacteria, that can process these glycans. While it is known that bifidobacteria avail themselves of the free glycans in breast milk, it was not known whether these bacteria could also obtain glycans that were linked to proteins. Such proteins are called glycoproteins, and they are abundant in breast milk.

The research team led by David A. Mills at the UC-Davis investigated the ability of bifidobacteria to remove glycans from milk glycoproteins. Their work was recently published in the journal *Molecular & Cellular Proteomics*.

Mills' group found that specific strains of bifidobacteria possessed enzymes capable of removing glycan groups from glycoproteins, enabling them to use these glycans as an additional food source. Surprisingly, one of the enzymes, EndoBI-1, was able to remove any type of N-linked glycan (glycans attached to proteins by the amino acid asparagine). This is unique among enzymes of this type and may provide a growth advantage for bifidobacteria in the infant intestine because the glycoproteins in breast milk have complex glycans attached.

Mills explains that the ability of EndBI-1 to remove a variety of complex N-linked glycans combined with its unusual heat stability make "this potentially a very useful tool in both food processing and proteomics/pharmaceutical research."

The team's work suggests that bifidobacteria do not primarily feed on the glycans from milk glycoproteins. However, the study did show that under the proper conditions bidfidobacteria can grow when protein -linked glycans are the only energy source.

"One obvious goal of this research is to find ways to translate the benefits provided by milk and bifidobacteria to at risk populations such as premature infants, malnourished children, among many others," Mills says.

More information: "Endo-β-N-acetylglucosaminidases from infant-gut associated bifidobacteria release complex N-glycans from human milk glycoproteins" by Daniel Garrido, Charles Nwosu, Santiago Ruiz-Moyano, Danielle Aldredge, J. Bruce German, Carlito B. Lebrilla and David A. Mills.

Provided by American Society for Biochemistry and Molecular Biology