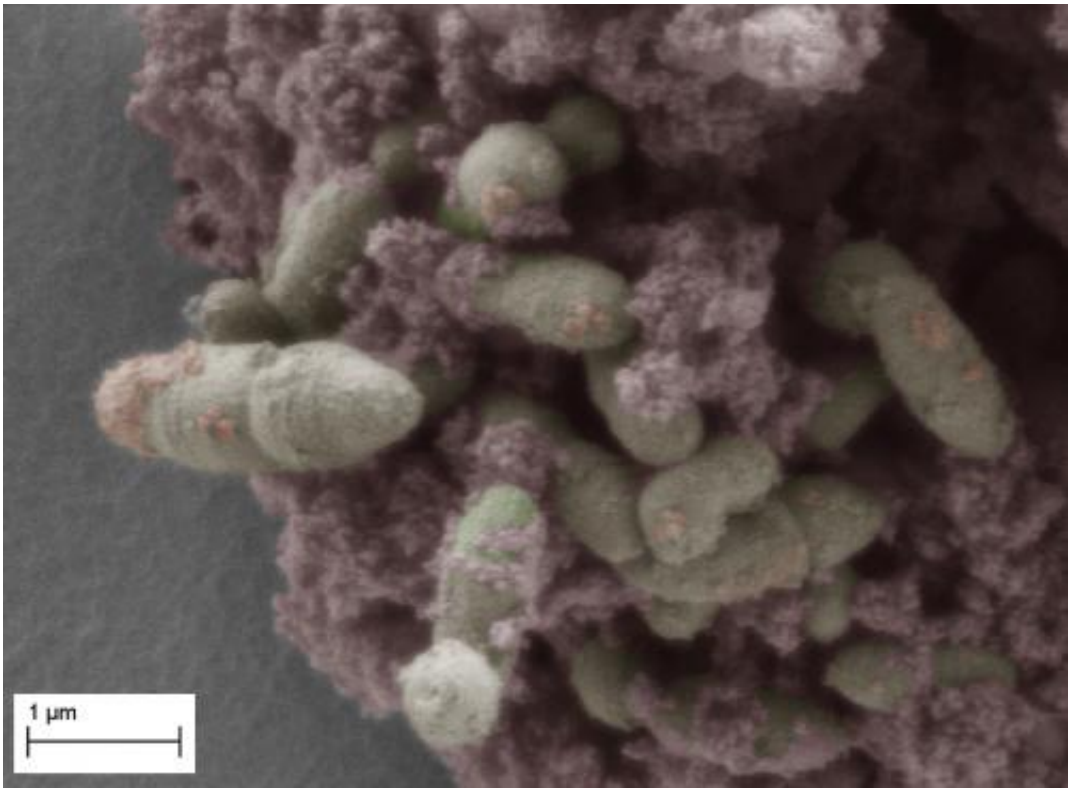
How bacteria with a sweet tooth may keep us healthy

October 25 2013



This is a false color image of *Ruminococcus gnavus* bacteria feeding on mucus. Credit: Kathryn Cross, Institute of Food Research

Some gut bacterial strains are specifically adapted to use sugars in our gut lining to aid colonisation, potentially giving them a major influence over our gut health.

We live in a symbiotic relationship with trillions of bacteria in our gut. They help us digest food, prime our immune system and keep out pathogens. In return we provide a suitable environment for them to grow, including a layer of mucus that coats the gut lining. Mucus is formed from proteins called mucins that have sugars associated with them. These form a diverse and complex range of structures. Mucins provide attachment sites and a source of nutrition for some bacteria, but not all species are allowed to take advantage of this. The complexity of the sugar structures in the mucins is thought to be how our bodies specify which bacteria can set up home, but exactly how this works isn't yet known.

New findings from the Institute of Food Research, which is strategically funded by BBSRC, are providing insights into the interaction between bacteria and mucins, and how the specificity of these interactions affects health. Dr Nathalie Juge and her team at the IFR have shown that the ability to use mucins in the human gut varies between different gut bacteria strains. Their study was published in the journal *PLOS ONE*.

The IFR researchers looked at *Ruminococcus gnavus*. This is a common species of gut bacteria found in over 90% of people, including infants just a few days old. It has also been implicated in gut-related health conditions. A number of studies have shown that patients suffering from Inflammatory Bowel Diseases have a disproportionate representation of *R. gnavus*.

This study looked at two different *R. gnavus* strains. Although both *R. gnavus* strains can use mucins, only one had the ability to survive when mucins were the sole source of food.

Comparing the genomes of the *R. gnavus* strains identified gene clusters used to breakdown mucins. Differences in these genes explain the different abilities of the strains to use mucins. The mucin sugar

structures change in different parts of the gut and over time, suggesting the strains may be adapted for different environments or to colonise us at different times. For example, the *R. gnavus* strain adapted to survive solely on mucins may give it the ability to colonise the guts of newborn babies, when mucins represent the only sources of sugars for bacteria. In adults, the strains of bacteria that degrade mucins are the ones most likely to contact the cells underneath the mucus and so these strains are the ones most likely to influence health.

A better understanding of which strains use mucins and exactly how they do this will give us new insights into what makes a healthy gut bacteria population, and how fluctuations from this might link to gut diseases like Crohn's disease and ulcerative colitis.

More information: 'Utilisation of mucin glycans by the human gut symbiont Ruminococcus gnavus is strain-dependent' Crost, E. H. et al DOI: 10.1371/journal.pone.0076341 will be published by *PLOS ONE* on Friday October 25th 2013

Provided by Norwich BioScience Institutes