

# Eating Red Meat Sets Up Target for Disease-Causing Bacteria

29 October 2008, By Debra Kain

Offering another reason why eating red meat could be bad for you, an international research team, including University of California, San Diego School of Medicine professor Ajit Varki, M.D., has uncovered the first example of a bacterium that causes food poisoning in humans when it targets a non-human molecule absorbed into the body through red meats such as lamb, pork and beef.

In findings to be published on line October 29th in advance of print in the journal *Nature*, the scientists discovered that a potent bacterial toxin called subtilase cytotoxin specifically targets human cells that have a non-human, cellular molecule on their surface. The molecule –N-glycolylneuraminic acid (Neu5Gc) – is a type of glycan, or sugar molecule, that humans don't naturally produce.

Subtilase cytotoxin is produced by certain kinds of *E. coli* bacteria, causing bloody diarrhea and a potentially fatal disease called haemolytic uraemic syndrome (HUS) in humans. Humans usually become infected after eating contaminated red meat, which is why this is also known as "hamburger" disease.

Varki, UC San Diego School of Medicine distinguished professor of medicine and cellular and molecular medicine, and co-director of the UCSD Glycobiology Research and Training Center, previously discovered that humans don't produce Neu5Gc because they lack the gene responsible for its production. Therefore, it was thought that humans should be resistant to the toxin.

"Ironically, humans may set themselves up for an increased risk of illness from this kind of *E. coli* bacteria present in contaminated red meat or dairy, because these very same products have high-levels of Neu5Gc," Varki explained. "The Neu5Gc molecule is absorbed into the body, making it a target for the toxin produced by *E. coli*."

In the *Nature* study, the researchers discovered that sites where the Neu5Gc has been incorporated into the human body coincide with toxin binding. "When the toxin binds to the non-human Neu5Gc receptors, it can result in serious food-poisoning and other symptoms in humans," said Varki. The research emphasizes the need for people to eat only well-cook meat or pasteurized dairy products, processes that destroy contaminating bacteria.

Five years ago, Varki and his colleagues at the UC San Diego School of Medicine published a paper in the Proceedings of the National Academy of Sciences describing how Neu5Gc is absorbed into human tissues – including the surface of cells lining the intestines and blood vessels – as a result of eating red meat and milk products. At the time, the researchers also showed that this foreign molecule generates an immune response that could potentially lead to inflammation in human tissues. The UC San Diego study was the first to investigate human dietary absorption of the Neu5Gc glycans which, while not produced in humans, does occur naturally in red meats. Levels are very low or undetectable in fruits, vegetables, eggs, poultry and fish. The researchers proved that people who ingest Neu5Gc incorporate some of it into their tissues, and demonstrated that many generated an immune response against the molecule, conjecturing that a lifetime of gradual incorporation of this glycan "invader" could result in disease.

Provided by University of California - San Diego

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