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Alpha-gal

Galactose-alpha-1,3-galactose is popularly known as alpha-gal. It is a carbohydrate found in the meat of mammals – exceptions being primates (which includes humans) and other African and Asian apes.

Galactose is a simple carbohydrate that is found in mammal milk. Alpha-gal is formed from a combination of two galactose molecules.

When our immune system recognise a foreign entity, it create antibodies an attempt to destroy the invader. There are five classes of antibodies found blood serum: IgG, IgM, IgA, IgE and IgD. IgG antibodies to alpha-gal are very common in humans as a result of continuous consumption of alpha-gal via red meat.

Since the early 2000s, severe allergic reaction has been observed several hours after the consumption of red meat. Several deaths have occurred. This is associated with IgE (not IgG) antibodies to alpha-gal as a result of the patients been bitten by ticks. This has occurred in eastern Australia, south-east USA and Sweden.

Alpha-gal is similar to the blood group B antigen. As a result, there is an association with the patients with B blood group and red meat allergy.

The fact that we produce IgG antibodies to alpha-gal is an indication that red meat is recognised as an intruder in our bodies – it is not food. ^{1 2 3 4}

Neu5Gc

Neu5Gc (an abbreviation for N-Glycolylneuraminic acid), is a carbohydrate found in all mammals, including primates, except for humans.

It is a sialic acid, a group of 43 sugars that contain nine carbon atoms. Mammals have both Neu5Gc and Neu5Ac but humans lost the ability to create Neu5Gc 2-3 million years ago, which is before the time that humans emerged.

Our immune system recognises it as an antigen – a foreign body – and it produces an immune response in an effort to fight the invader, which is convincing evidence that red meat is not a natural part of the human diet.

Neu5Gc occurs in many human tumours and it can only be found in humans if we eat red meat. ⁵

Human propensity to develop diet-related carcinomas is contributed to by local chronic inflammation, resulting from interaction of metabolically-accumulated dietary Neu5Gc with circulating anti-Neu5Gc antibodies. ⁶

Taken together, our [Neu5Gc] data provide an unusual mechanistic explanation for the epidemiological association between red meat consumption and carcinoma risk. ⁷

Human carcinomas can metabolically incorporate and present the dietary non-human sialic acid Neu5Gc. [...] Tumor-associated Neu5Gc can interact with low levels of circulating anti-Neu5Gc antibodies, thereby facilitating tumor progression on via chronic inflammation in a human-like Neu5Gc-deficient mouse model. ⁸

As dietary Neu5Gc is primarily found in red meat and milk products, we suggest that this ongoing antigen-antibody reaction may generate chronic inflammation, possibly contributing to the high frequency of diet-related carcinomas and other diseases in humans. ⁹

Footnotes

1. Apostolovic, D. et al. (2015) Red meat allergic patients have a selective IgE response to the α -Gal glycan. *Allergy*. 70 (11), 1497-1500.
2. Apostolovic, D. et al. (2016) The red meat allergy syndrome in Sweden. *Allergo Journal*. 25 (2), 29-34.
3. Larsson, S. C. & Orsini, N. (2014) Red Meat and Processed Meat Consumption and All-Cause Mortality: A Meta-Analysis. *American Journal of Epidemiology*. 179 (3), 282-289.
4. Steinke, J. W. et al. (2015) The alpha-gal story: Lessons learned from connecting the dots. *Journal of Allergy and Clinical Immunology*. 135 (3), 589-596.
5. Malykh, Y. N. et al. (2001) N-Glycolylneuraminic acid in human tumours. *Biochimie*. 83 (7), 623-634.
6. Hedlund, M. et al. (2008) Evidence for a human-specific mechanism for diet and antibody-mediated inflammation in carcinoma progression. *Proceedings of the National Academy of Sciences*. 105 (48), 18936-18941.

7. Samraj, A. N. et al. (2015) A red meat-derived glycan promotes inflammation and cancer progression. *Proceedings of the National Academy of Sciences*. 112 (2), 542-547.
8. Padler-Karavani, V. et al. (2011) Human Xeno-Autoantibodies against a Non-Human Sialic Acid Serve as Novel Serum Biomarkers and Immunotherapeutics in Cancer. *Cancer Research*. 71 (9), 3352-3363.
9. Padler-Karavani, V. et al. (2008) Diversity in specificity, abundance, and composition of anti-Neu5Gc antibodies in normal humans: Potential implications for disease. *Glycobiology*. 18 (10), 818-830.