

Taste Receptors Where?!

© by D. Eric Walters

We all know about taste buds on the tongue. But recently scientists have discovered taste receptors in an unexpected location: the lining of the small intestine.

Yes, sweet taste receptors have been found on intestinal epithelial cells. Fortunately, they aren't connected to our sense of taste. They are sensing the contents of the digestive system, in order to control and assist in the absorption process.

Glucose is absorbed in the intestine by a transporter called SGLT1. But when the sweet receptors in the intestine sense a high level of sweetness, they trigger the movement of a second transporter, GLUT2, to the cell surface. This doubles or triples the rate of sugar absorption [1]. The effect is seen with sugar and with the high potency sweeteners sucralose and acesulfame-K. In earlier times, when calories were scarce, this mechanism undoubtedly increased the efficiency of the digestive system. It made sure that sugar absorption was maximized. But now, when we have excessive calories available in our diet, it may contribute to obesity.

Think about the stereotypical "dieter" who has a diet soft drink with the french fries. The starch in the fries is broken down to glucose, and the artificial sweetener increases the supply of transporters, so that the glucose is more efficiently moved into the body!

There is another problem that arises with overconsumption of sweets. In experiments with mice, Margolskee and his colleagues showed that a diet high in carbohydrates will, over time, double the amount of the SGLT1 transporter that is present in the intestinal cells [2]. The artificial sweeteners acesulfame-K and saccharin also increased SGLT1 levels, suggesting that the taste receptors control the amount of transporter. Aspartame did not do this, but rodents cannot taste aspartame. Besides, aspartame is rapidly digested, so it would probably not affect glucose absorption, even in humans.

References

[1] Mace et al., J. Physiology (London) 582:379, 2007.

[2] Margolskee et al., Proc. Natl. Acad. Sci. USA 104:15075, 2007.