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Nestle taste research may benefit salt reduction

By Stephen Daniells

4/23/2007- **Scientists at the Nestle Research Center have identified a network of molecules behind our ability to taste salt, research that could aid in the push to reduce salt levels in foods without affecting taste.**

The research, published in the *Journal of Comparative Neurology*, appears to show that sodium-specific claudins, molecules that seal the contact between cells in layer of cells (epithelium), surround a subset of taste bud cells.

Such results could have major implications for the design of reduced salt foods, since successful salt reduction is reliant on providing a salty taste without sodium. By understanding the molecular basis of salty taste, ingredients could be produced that mimic these effects, without containing sodium.

Numerous scientists are convinced that high salt intake is responsible for increasing blood pressure (hypertension), a major risk factor for cardiovascular disease (CVD) - a disease that causes almost 50 per cent of deaths in Europe, and reported to cost the EU economy an estimated € 169bn ($202bn) per year.

"This adds a totally new dimension to the long standing question of taste coding," said lead researcher Dr. Johannes le Coutre. *"So far, we thought that individual taste cells are uniquely equipped with specific receptors sensitive to sweet, bitter, sour or umami molecules only. Our findings suggest that specific tastants may stimulate different cell groups, depending on the surrounding network of claudin molecules."*

"We cannot anymore only study the cell activity in taste signal coding, but we also have to understand the regulation of the cell environment," she added.

Previous research into taste has revealed that the human tongue has about 10,000 taste buds with five taste sensations: sweet, bitter, and umami, which work with a signal through a G-protein coupled receptor; salty and sour which work with ion channels.

Contrary to popular understanding, taste is not experienced on different parts of the tongue. Though there are small differences in sensation, which can be measured with highly specific instruments, all taste buds, essentially clusters of 50 to 100 cells, can respond to all types of taste.

Taste buds (or lingual papillae) are small structures on the upper surface of the tongue that provide information about the taste of food being eaten.

The researchers investigated the matrix between the cells using mouse taste buds and human taste buds (fungiform papillae).

The area between two adjoining cells in a membrane is called a tight junction and claudins are reported to be the most important components of these tight junctions. The molecules control the flow of molecules in intercellular spaces.

They report that 12 claudins are expressed in the mouse tissue, while five were found in the human tissue. By looking at the mouse taste buds, le Coutre and her coworkers report that a subset was found uniquely in taste buds. Claudin 4 was found high abundance around the taste pore, claudin 6 was found inside the pore, and claudin 7 was found at the base and side of taste cells.

"With the ion permeability features of the different claudins, a highly specific permeability pattern for paracellular diffusion is apparent, which indicates a peripheral mechanism for taste coding," wrote the researchers.

And this research could have significant implications for the designing of ingredients as salt replacers.

In the UK, Ireland and the USA, over 80 per cent of salt intake comes from processed food, with 20 per cent of salt intake coming from meat and meat products, and about 35 per cent from cereal and cereal products.

Source: *Journal of Comparative Neurology*
April 2007, Volume 502, Issue 6, Pages 1003-1011
"Claudin based permeability barriers in taste buds"
Authors : S. Michlig, S. Damak, J. Le Coutre