Bitter taste receptors for Stevia sweeteners discovered

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Stevia is regarded as a healthy alternative to sugar. Yet there are drawbacks to the Stevia products recently approved as sweeteners by the European Union. One of these is a long-lasting bitter after-taste. Scientists at Technische Universitaet Muenchen and the German Institute of Human Nutrition Potsdam-Rehbruecke have now identified the receptors on the human tongue mediating the bitter sensation.

The human tongue has just one receptor type for detecting sweetness but about 25 different ones for bitter flavors. Scientists at Technische Universitaet Muenchen (TUM) and the German Institute of Human Nutrition Potsdam-Rehbruecke (DIfE) have now identified the two receptors, hTAS2R4 and hTAS2R14, that detect the bitter after taste of *Stevia*.

Extracts from the subtropical plants are up to 300 times sweeter than conventional sugar. They also contain almost no calories and are less harmful to teeth. Yet *Stevia*, or sweet leaf, as it is more commonly known, also has its disadvantages: At high concentrations, it elicits licorice-like aromas and a bitter after taste.

The scientists investigated nine Steviol glycosides responsible for the intensive sweet taste of *Stevia* plant extracts. They initially tested the bitterness or sweetness that each glycoside evokes in vitro, using cells that act as taste receptor cells and react to the glycoside molecules like an artificial tongue. The researchers were thus able to identify the receptors that are activated by *Stevia*.

They also tested the taste intensity of different concentrations of *Stevia* components with trained volunteers. The results of those sensory tests combined with the initial cell experiments revealed that the structure of glycoside molecules plays a key role in determining sweetness or bitterness in *Stevia*. "If a molecule has more glucose molecules attached to it, it is sweeter and less bitter," explains Prof. Thomas Hofmann, Chair of Food Chemistry and Molecular Sensory Science at TUM. The Steviol glycoside rebaudioside D, for example, comprises five glucose molecules and is around five times sweeter and two-thirds less bitter than dulcoside A, which has just two glucose molecules.

"Steviol glycosides activate two bitter receptors on the human tongue, and this elicits a bitter after taste in the mouth," confirms Anne Brockhoff at the German Institute of Human Nutrition. These new findings could help minimize the bitter taste of *Stevia* products at an early stage in production processes. "They could open the way for selective cultivation measures or targeted purification during the development of *Stevia* products, enabling manufacturers to focus on the sweetest candidates," confirms TUM scientist Thomas Hofmann.

Provided by Technical University Munich

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