

Joint news release issued by TUM and DIfE

Freising-Weihenstephan / Potsdam-Rehbruecke - 2012/05/31

Explaining Stevia's bitter side:

Bitter taste receptors for Stevia sweeteners discovered

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 (TUM) and the German Institute of Human Nutrition Potsdam-Rehbruecke (DIfE) have now identified the receptors on the human tongue mediating the bitter sensation (*Journal of Agricultural and Food Chemistry*).

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.

Technische Universitaet Muenchen Corporate Communications Center 80290 Muenchen www.tum.de

Dr. Ulrich Marsch
Undine Ziller

Head of Corporate Communications
Media Relations

+49.89.289.22778
+49.8161.71.5403

marsch@zv.tum.de
ziller@zv.tum.de

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.

Publication:

Caroline Hellfritsch, Anne Brockhoff, Frauke Stähler, Wolfgang Meyerhof, Thomas Hofmann: Human Psychometric and Taste Receptor Responses to Steviol Glycosides, Journal of Agricultural and Food Chemistry, May 2012

<http://pubs.acs.org/doi/abs/10.1021/jf301297n>

Contact:

Technische Universität München
Chair of Food Chemistry and Molecular Sensory Science
Prof. Thomas Hofmann
Phone: +49(0)8161 71 2902 / 5403
E-mail: thomas.hofmann@wzw.tum.de
<http://www.molekulare-sensorik.de>

German Institute of Human Nutrition Potsdam-Rehbrücke (DIfE)
Department of Molecular Genetics
Dr. Anne Brockhoff
Phone: +49(0)33200 88 2669
E-mail: brockhoff@dife.de
<http://www.dife.de/en/index.php>

Printed version of press release:

http://portal.mytum.de/pressestelle/pressemitteilungen/NewsArticle_20120524_115358/Druckversion.pdf

Technische Universität München (TUM) is one of Europe's leading technical universities. It has roughly 480 professors, 9,000 academic and non-academic staff, and 31,500 students. It focuses on the engineering sciences, natural sciences, life sciences, medicine, and economic sciences. After winning numerous awards, it was selected as an "Elite University" in 2006 by the Science Council (Wissenschaftsrat) and the German Research Foundation (DFG). The university's global network includes an outpost with a research campus in Singapore. TUM is dedicated to the ideal of a top-level research based entrepreneurial university.
<http://www.tum.de>