Monell Chemical Senses Center

Press Release

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LIVING TASTE CELLS PRODUCED OUTSIDE THE BODY

Breakthrough will lead to new insights about sense of taste

PHILADELPHIA (February 23, 2006) -- Researchers from the **Monell Chemical Senses Center** have succeeded in growing mature taste receptor cells outside the body and for the first time have been able to successfully keep the cells alive for a prolonged period of time. The establishment of a viable long-term model opens a range of new opportunities to increase scientists' understanding of the sense of taste and how it functions in nutrition, health and disease.

"We have an important new tool to help discover molecules that can enhance or block different kinds of tastes," explains principle investigator **Nancy Rawson**, PhD, a cellular biologist. "In addition, the success of this technique may provide hope for people who have lost their sense of taste due to radiation therapy or tissue damage, who typically lose weight and become malnourished. This system gives us a way to test for drugs that can promote recovery."

The findings are reported in an online issue of *Chemical Senses*.

Taste receptor cells are located in taste buds on the tongue and in the throat. These cells contain the receptors that detect taste stimuli: sweet, sour, salty, bitter, and umami (savory). Each taste receptor cell lives for only about 10-14 days, after which it is replaced. The new taste cells develop from a population of undifferentiated precursors known as basal cells.

Understanding of the process of taste cell differentiation, growth and turnover has been hampered by the inability of researchers to keep taste cells alive outside the body in controlled laboratory conditions.

To address this long-standing problem, the Monell researchers utilized a novel approach. Instead of starting with mature taste cells, they obtained basal cells from rat taste buds and placed these cells in a tissue culture system containing

nutrients and growth factors. In this environment, the basal cells divided and differentiated into functional taste cells.

The new cells, which were kept alive for up to two months, were similar to mature taste cells in several key respects. A variety of methods were used to show that the cultured cells contain unique marker proteins characteristic of mature functioning taste receptor cells. In addition, functional assays revealed that the cultured cells responded to either bitter or sweet taste stimuli with increases of intracellular calcium, another property characteristic of mature taste cells.

Lead author **Hakan Ozdener**, MD, PhD, observes, “Although scientists have tried for many years to maintain taste cells in a long-term culture system, it was commonly believed that these cells could not be kept alive for longer than about 10 days. Now, we have demonstrated that taste cells can be generated *in vitro* and maintained for a prolonged period of time.”

The taste cell culture system provides new insight into how basal cells turn into functional taste cells. Although previous dogma had held that induction was somehow dependent on interactions with the nervous system, the current findings suggest otherwise. Ozdener explains, “By producing new taste cells in an *in vitro* system, our results demonstrate that direct stimulation from nerves is not necessary to generate taste cells from precursors.”

By using the cultured taste cells, researchers now have more precise control over the cell's surrounding environment, as well as better access to subcellular mechanisms, allowing them to ask certain questions that could not previously be addressed.

For instance, cultured cells can be used to study how taste stimuli interact to enhance good tastes or suppress unpleasant tastes. Similarly, new molecules, including potential artificial sweeteners or bitter blockers, can be evaluated to see if they interact with taste receptors to activate the cell.

Another important avenue for research aims to help people who have lost their sense of taste from radiation or diseases. Identification of factors that promote taste cell regeneration and growth may provide new avenues of treatment for these patients.

Researchers also hope to gain insight into how taste cell function changes across the lifespan, from infancy and childhood through old age.

Although the current experiments utilized rat taste cells, Ozdener, Rawson, and colleagues intend to use taste cell biopsies from humans to try to grow human taste cells.

Monell scientists Karen Yee, Jie Cao, Joseph Brand and John Teeter also contributed to the research, which was supported by grants from the National Science Foundation and from the Givaudan Flavors Corporation.

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The Monell Chemical Senses Center is an independent nonprofit basic research institute based in Philadelphia, Pennsylvania. For 35 years, Monell has been the nation's leading research center focused on understanding the senses of smell, taste and chemical irritation: how they function and affect lives from before birth through old age. Using a multidisciplinary approach, scientists collaborate in the areas of: sensation and perception, neuroscience and molecular biology, environmental and occupational health, nutrition and appetite, health and well being, and chemical ecology and communication. For more information about Monell, please visit www.monell.org.

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