Biomedicine

Rick Weiss reports from Phoenix, Ariz., at the annual meeting of the Society for Neuroscience

Taste buds engage in cross-talk

A marriage of tiny electrodes and giant taste buds has given a new flavor to theories about taste. Researchers working with mud puppies – a variety of salamander with large taste buds – have made detailed physiological recordings from individual, taste-sensitive nerve cells. The findings indicate taste receptors are not simply passive recorders of chemical reactions in the mouth. Rather, these cells communicate with each other in complex ways, even within a single taste bud, before sending their sensory messages to the brain.

Like flavor-sensitive microprocessors, the specialized nerve clusters "make decisions" about what they are experiencing, says Stephen D. Roper of Colorado State University in Fort Collins. Moreover, the classical view that taste buds come in only four basic varieties – those that detect salt, sour, bitter and sweet – appears oversimplified, he says. Although these tastes do represent the four basic elements from which all flavors get built, new evidence indicates that individual taste buds, each containing about 40 taste-sensitive cells, can sense and process various combinations of all these components.

Sweetness receptors remain the trickiest to characterize, Roper says, largely because of difficulties in isolating and culturing them. Bitterness receptors have been extensively studied, in part because of their unparalleled ability to detect poisonous substances. Almost all poisons trigger bitter sensations in the mouth – a dead give-away of danger that has inspired attempts by both scientists and assasins to develop non-bitter poisons against rats and kings, Roper points out.

Roper says ongoing research into the details of flavor reception should ultimately prove helpful to people who suffer from dysgeusia – a chronic taste-reception abnormality that can literally leave its sufferers with a bad taste in their mouths. In addition, studies of taste buds' remarkably high turnover rates may provide new insights into nerve-cell development and regeneration. Beyond these wholesome benefits of research, he adds, the flavor industry – and epicures everywhere – stand to benefit from knowledge about the chemistry of taste enhancement.

Recent awakenings in melatonin research

Scientists investigating the brain hormone melatonin say new findings provide hope for people suffering from sleep disorders, seasonal depression or jet lag. Using radioactive markers, researchers have pinpointed the receptors where melatonin triggers its effects in the brain. The resulting map now allows them to study the hormone's biochemical activity and has already led to the development of synthetic compounds that can block or enhance melatonin's effects, says Margarita L. Dubocovich of Northwestern University Medical School in Chicago.

Researchers have long recognized melatonin – produced in the pineal gland deep within the brain – as a crucial player in the body's "biological clock." Melatonin production grinds to a halt each morning as the sunlight-detecting retina sends wakeup signals to the brain. At night its production resumes. Other cyclic functions – such as core body temperatures and the release of hormones that influence sleep – are programmed in part by melatonin's peaks and troughs.

Luzindole, the first melatonin-related experimental drug tested in humans, "resets" the biological clock by blocking melatonin receptors. Scientists hope other drugs under development, such as long-lasting melatonin analogs, may correct poor sleep patterns in nightshift workers and in melatonin-depleted elderly. Treatment with natural melatonin has already proved useful against symptoms of jet lag, Dobocovich says. And related drugs may lessen symptoms of depression in people sensitive to wintertime decreases in sunlight.

Environment

Iowa ranked No. 1 in radon survey

In Iowa, 71 percent of homes tested for radon early this year contained more than 4 picocuries per liter (pCi/l) of the natural radioactive pollutant – a level that warrants corrective action, according to the Environmental Protection Agency, which conducted the survey. EPA identified 10 Iowa counties with indoor radon levels ranging from 47 to 130 pCi/l. In fact, Iowa's radon problem appears more pervasive than that of any other state, EPA says. But Iowa's peak was not the highest recorded in this survey of eight states and several Indian lands. Researchers found indoor radon at levels more than double Iowa's peak in Ohio and at an Indian reservation in South Dakota.

EPA has measured radon exceeding 4 pCi/l in roughly one out of every four homes screened over the past three years – surveys representing half the nation. However, it conducts its assays under conditions aimed at identifying peak concentrations, not annual averages. Taking this into account, EPA Administrator William K. Reilly says, "We now estimate that 10 percent of all the homes in the United States have an annual average radon level of more than 4 pCi/l."

Although the federal government last year issued a highly publicized "radon health advisory" recommending immediate testing of all homes (SN: 9/24/88, p.206), only about 2 percent of U.S. households have undertaken such tests, Reilly says. Moreover, a survey conducted for the New York City-based Advertising Council Inc. found that while 67 percent of those polled recognized radon as a health risk, only 11 percent expected to test their homes for it in the coming year. To encourage testing, EPA solicited the nonprofit Advertising Council to develop a public service campaign. In mid-November, its ads should begin hammering home EPA's message that radon is a deadly carcinogen but testing is inexpensive, and even homes with high levels can be fixed.

Keep risky rocks under wraps

Rock hounds beware. Those pretty crystals you collect may flood your home with radon.

Scientists at the Paul Scherrer Institute in Villigen, Switzerland, put an ad in a mineral collector's journal offering to measure radon levels in homes displaying minerals. Collecting crystals is a popular Swiss hobby, and many displays include minerals – such as zircon, coffinite, carnotite, monazite, brannerite, titanite and pitchblende – containing radon-emitting uranium or thorium.

The researchers placed radon detectors at five sites in each of 35 homes. In general, radon levels in rooms displaying crystals were 2.7 pCi/l higher than the already high background average of about 5.5 pCi/l, according to Reto Crameri, a molecular biologist involved in the study.

Radon-220, the isotope emitted by thorium, wasn't detected outside display cases of thorium-rich minerals – perhaps, Crameri says, because this isotope decayed before it could leak out. The same was not true for uranium-bearing rocks. The radon-222 they emit has a half-life of nearly four days, more than 5,000 times longer than that of radon-220. Crameri says the Swiss data, reported in the September HEALTH PHYSICS, suggest rock collectors might consider sealing their display cases with tight-fitting rubber gaskets and venting showcase air outdoors.

The Swiss findings did not surprise Richard E. Toohey, health physics manager at Argonne (Ill.) National Laboratory. Mineral collections in some university geology departments "would have to be labeled as radiation areas if the [source of that] radiation were not naturally occurring," Toohey observes. He recommends that people consider shielding any rock collections – including rock walls or the crushed granite used in passive solar-heating systems – before investing in other radon-control strategies.