Elizabeth Pennisi reports from San Francisco at the annual meeting of the American Association for the Advancement of Science

Grunts prep babies for talking

When Lorraine McCune began monitoring language development in infants, she never paid much attention to their grunts. A researcher at Rutgers University in New Brunswick, N.J., McCune was hoping to learn how to predict when a baby would begin to talk. Most of the children she studied began picking up a few words in preparation for speech. But one just grunted.

Curious about his grunting, she listened again to recordings collected from other babies. She and her colleagues were surprised to find that grunts made up 10 to 45 percent of the infants' vocalizations, she says.

Grunts arise spontaneously in many animals when an increase in oxygen demand leads to a change in the larynx that causes air to reach deeper into the lungs. When exhaled air rushes through the resulting constriction, it creates a sound – ultrasonic in rats but audible in larger animals.

"Nobody has to start [doing] it; it's in the physiology," says McCune. Lots of animals, including monkeys, chimpanzees, and newborn rats use these utterances to communicate.

Babies begin to grunt at about age 3 months because of the effort they make to hold up their heads, she says. Three to 6 months later, they "hmm" and "uh" as their brain cells work to figure out the world around them. Finally, around their first birthday – about the same time they are babbling and forming their first words – babies begin purposeful grunting.

Data analyzed from five children studied by McCune indicate that once they figure out how to communicate with grunts, these babies quickly pick up and use many more words. "Communicative grunts are actually a developmental phase in children's transition to language," she concludes.

McCune thinks that babies associate the metabolic changes and the constricted feeling with what is happening around them and with the sounds that emerge from their throats. "They get the insight that a particular sound goes with a particular experience," she adds. "It's sort of a sound-meaning connection."

Quick, easy imaging of brain function

For medical diagnosis, magnetic resonance imaging (MRI) quickly took a place next to computerized tomography (CT) as a sophisticated imaging technology. Now, a variant of this technique is poised to join a different imaging tool, positron emission tomography (PET), as a means of monitoring brain function. Called functional MRI, this 3-year-old technology follows the flow of blood in the brain by detecting changes in the relative proportion of oxygenated and deoxygenated red cells. PET, too, tracks blood flow, but unlike PET, functional MRI works quickly and does not require the administration of a radioactive tracer, says Stephen M. Rao of the Medical College of Wisconsin in Milwaukee.

"It's an extremely easy-to-use technology to probe brain function," adds Kenneth Kwong, who is helping develop MRI at Massachusetts General Hospital in Boston.

Just a few research centers can carry out PET studies, but many hospitals and diagnostic centers routinely use MRI machines that, if modified with a special coil that generates a different pattern of magnetic pulses, can provide blood-flow data like those obtained from PET scans. Already, Rao has used functional MRI to observe how the brain plans and carries out movements.

For these experiments, volunteers tapped their fingers in unison, repeated a specific sequence of finger taps, or simply imagined they were doing this sequence. With each task, "we find a very large change in brain activity," Rao reports.

As a previous PET study had noted, the repetitive taps activated the primary motor cortex, while the sequences demanded that the motor cortex, a supplementary motor area, and two other regions become active. The imagined movements required activity primarily by the supplementary area, Rao notes. In addition, the MRI studies revealed details not seen with PET.

Studies like this are just the first step for the new technology. "You can do experiments so quickly that there will be literally an explosion of knowledge about the brain," Rao predicts.

However, he and his colleagues also note that they need to improve their ability to judge the sizes of blood vessels in the MRI image and their statistical techniques for analyzing the data obtained.

Gay rams lack hormone sensitivity

In male sheep, a lack of docking sites in the brain for a specific chemical messenger leads to homosexual tendencies. This finding strengthens the idea that biological factors underlie behavior, says Anne Perkins, an animal behaviorist at Carroll College in Helena, Mont.

For breeding purposes, ranchers evaluate the sex drive of rams by watching whether they try to mate with males or females and whether they ejaculate. To understand why some males prefer other males, Perkins tested the responses of both male and female sheep to estradiol, a type of estrogen important to the development of sexual characteristics.

She treated the sheep, then studied their brains a month later. In one respect, all the rams responded alike, no matter what their sexual leaning: The hormone did not cause a surge of luteinizing hormone, which is important to female sexual response, Perkins reports. However, the homosexual rams were more like females in that they possessed far fewer docking sites, or receptors, for estradiol in a part of the brain called the amygdala than did other rams.

In rodents, the differing responses of male and female amygdalas to estradiol account for differences in courtship behavior between the two sexes. Estradiol may play a similar role in sheep, says Perkins, by making heterosexual males responsive to female odors. The homosexual males, in contrast, respond more like females and are aroused more by male odors. "This may be one piece of the puzzle to help us understand sexual orientation," she says.

Not all teeth benefit from fluoride

Some anthropologists are questioning the value of commonly accepted efforts for preventing cavities in children's teeth. Timothy Jones, an anthropologist at the University of Arizona in Tucson, and his colleagues analyzed tooth decay in Tucson children. The researchers obtained information about the concentration of fluoride in drinking water, household income, education, milk and school lunch consumption, participation in fluoridation programs, and tooth decay from municipal and school records. By analyzing household garbage, the researchers assessed toothpaste and dental floss use and estimated soda and sugar consumption.

At first, the data contradicted long-held assumptions. For example, the scientists noticed an increase in cavities and missing and filled teeth in children participating in fluoridation programs. Upon closer analysis, however, they realized that these findings held true only for Hispanic children. Yet the analysis of garbage indicated that Hispanic kids did not eat more cavity-inducing diets; they even tended to brush their teeth about twice as often as other children. These results need further study, Jones notes. But they lead him to suspect that certain genetic factors may outweigh the value of dental hygiene measures for some groups and may account for the sometimes conflicting results of fluoridation efforts.