

Babies sound off: The power of babble

There is more to the babbling of a baby than meets the ear. A handful of scientists are picking apart infants' utterances and finding that not only is there an ordered sequence of vocal stages between birth and the first words, but in hearing-impaired babies a type of babbling thought to signal an emerging capacity for speech is delayed and distorted.

"The traditional wisdom [among developmental researchers] is that deaf babies babble like hearing babies," says linguist D. Kimbrough Oller of the University of Miami (Fla.). "This idea is a myth."

Oller reported his latest findings on hearing and deaf infants last week at a National Institutes of Health seminar in Bethesda, Md. He and his colleagues demonstrated eight years ago that hearing babies from a variety of language communities start out by cooing and gurgling; at about 7 months of age, they start to produce sequences of the same syllables (for instance, "da-da-da" or "dut-dut-dut") that are classified as babbling and can be recorded and acoustically measured in the laboratory, with words or wordlike sounds appearing soon after 1 year of age. Babbling – the emitting of identifiable consonant and vowel sounds – usually disappears by around 18 to 20 months of age.

In a just-completed study, Oller and his co-workers found that repeated sequences of syllables first appeared among 21 hearing infants between the ages of 6 and 10 months; in contrast, these vocalizations emerged among 9 severely to profoundly deaf babies between the ages of 11 and 25 months. In addition, deaf babies babbled less frequently than hearing babies, produced fewer syllables and were more likely to use single syllables than repeated sequences.

The deaf infants, Oller notes, still vocalized quite a bit, employing about as many squeals, growls and raspberries (sticking out the tongue and blowing) as hearing infants. Yet while the latter group produced more and more repeated syllables soon after initial forays into babbling, the hearing-impaired babies tended to make sounds, such as "uh-uh-uh," indicating a lack of closure in the vocal tract that prevents transitions between syllables. These sounds, says Oller, may be a substitute for what he calls "canonical" babbling.

The Miami investigators use transcriptions of recorded vocalizations and maps of sound wave spectra to determine when an infant utters so-called canonical syllables. In their approach, a canonical syllable must have a consonant, a vowel of sufficient sound intensity, a duration of 100 to 500 milliseconds and a transition

between vowel and consonant lasting no longer than 100 milliseconds. When such a syllable is repeated, it becomes canonical babbling.

In the past 10 years, Oller has pioneered the use of acoustic rules to define the sounds that make up babbling. Most investigators, however, still transcribe infant utterances without the benefit of an acoustic analysis.

For instance, linguists Carol Stoel-Gammon and Kiyoshi Otomo of the University of Washington in Seattle recently evaluated sounds made by 11 hearing infants and 11 hearing-impaired infants, most of whom were followed from 4 to 18 months of age. Group differences in babbling similar to those described by Oller turned up, report the researchers in the February *JOURNAL OF SPEECH AND HEARING DISORDERS*, although vocalizations were transcribed without quantitative acoustic measurements.

But both Oller and Stoel-Gammon point out that auditory feedback appears to be critical for the development of canonical babbling. "It's not clear how important the practice of vocalization is," says Oller, "but hearing babies appear to be engaging in playful practice when they produce canonical syllables." In addition, a few reports on infants who cannot vocalize normally because of throat operations or cleft palates indicate that their speech acquisition is delayed.

The analysis of babbling, adds Oller, may eventually prove useful in identifying early language and hearing problems. Babies with hearing impairments and no other handicaps are difficult to diagnose, he explains, and often reach the age of 18 months before the problem is recognized and treated.

Hearing-impaired babies in his study were provided with hearing aids. By providing feedback, the devices help promote canonical babbling, says Oller, but the sounds that the babies hear are "a long way from audible speech transmission." Larger samples of deaf infants, he notes, will probably show that some engage in limited canonical babbling before 10 months of age, while others do not start babbling until after 25 months of age.

Research on infant vocalization is itself in its infancy, points out Oller. He plans to explore other differences in the sounds made by hearing and deaf infants, and wants to identify hearing babies who are babbling late so they can be checked for language problems as they grow older.

"The key point," says Oller, "is that canonical babbling gives us a way to say when an infant has reached the stage when rules for speech are being followed. This hasn't been considered important in studies of deaf babies, and many child development texts still portray as true the myth that deaf babies and hearing babies babble alike." — *B. Bower*

Scientists predict second Ruiz blast

Mass evacuation of the Nevado del Ruiz mountainside began June 13, the 39th day in a row that scientists detected ominous rumbling inside the volcano. Colombian officials – remembering the eruption on Nov. 13, 1985, when rivers of mud killed more than 22,000 people (SN:11/23/85,p.326) – want everyone out of the way before the next flare-up. They have told 25,000 people to move to refugee camps in Libano, 17 miles southeast of Ruiz.

The prolonged seismic activity in the mountain suggests that magma (molten rock) is moving near the surface. Increasing sulfur dioxide spewing from volcanic vents also indicates upward-moving magma. And recently, scientists have measured subtle changes in the volcano's shape, which may represent the heaving and sighing that precede a great volcanic cough.

"We think the likelihood of a further eruption within days or weeks is very high," says Hansjürgen Meyer, scientist in charge of the Observatorio Volcanológico de Colombia in Manizales, 18 miles northwest of Ruiz.

But scientists may be reading the signs wrong, Meyer says, because they know so little about Ruiz. "You can only do a very basic kind of forecast when you haven't been able to observe several cycles of a volcano's activity, and so far we have only seen one," he says.

Geologists try to infer the mountain's behavior from that of other subduction volcanoes – created by the melting of oceanic plates as they descend under continents – and from the geologic record in the rocks of Ruiz. They know, for example, that Ruiz belches clouds of ash and rubble, as Mt. St. Helens does, but it does not send out racing rivers of lava as do the rift volcanoes of Hawaii. They also know the 18,000-foot Ruiz has erupted 10 times in 10,000 years, and it almost always sets off mudflows, called lahars.

Direct measurements of Ruiz date only from late 1984, when mountain climbers began feeling earthquakes and seeing large plumes of gas. And it wasn't until July 1985 that four portable seismographs were put on the mountain.

On Sept. 11 there was a minor eruption of steam, ash and rock. Nobody was hurt, but the event led to increased surveillance of the volcano.

By October, geologists had installed additional seismographs and set up tiltmeters to record changes in the mountain's shape. But the volcano gave no sure signals that it would erupt. Even on Nov. 12, when geologists climbed to the summit to collect gas samples, they saw no signs of an imminent explosion.

The Nov. 13 eruption was much smaller