BIOMEDICINE

From our reporter at the annual meeting of the Society for Neuroscience in New York City

Detecting deafness in newborns

Techniques for detecting deafness in newborns have been less than satisfactory. Now a husband-wife neuroscientist team at the University of California Medical School at San Diego and the San Diego Speech, Hearing and Neurosensory Center has designed a technique that promises to be accurate and quick.

Devised by Robert and Carol Galambos, the technique consists of attaching electroencephalogram electrodes to the head of a newborn and producing sounds (clicks) in his ear. Each sound passes through the auditory nerve and then through the brain, thereby producing wiggles on the EEG waves. These wiggles are detected by a computer. If sound is being poorly received by the infant, the size of the wiggles is small, and the wiggles are slowly produced. If the newborn can hear normally, the wiggles are large and rapidly produced.

The Galambos recently tried their technique on 24 prematurely born infants. All infants were found to have normal hearing. Then they tried the technique on 60 newborns and identified one as being deaf.

"The thing that is neat about the test," Robert Galambos told SCIENCE NEWS, "is that it is easy to test on little kids. It can be done when they're asleep. Results can also be obtained in an hour or so."

The Galambos' technique is already being applied clinically by several physicians—Hallowell Davis of the Central Institute for the Deaf in St. Louis, George Moushegian of the Callier Hearing Center in Dallas, Arnold Starr of the University of California at Irvine and Jun-Ichi Suzuki of Teikyo University in Tokyo.

Senility and lead

Lead has long been known to cause neurological damage. It has been implicated as a cause of mental retardation and hyperactivity in children (SN: 4/5/75, p. 222). Now lead is being indicted as a cause of another neurological-behavioral disorder—senility.

Werner J. Niklowitz of Indiana University School of Medicine produced acute lead poisoning in rabbits by giving them a single dose injection of tetraethyl lead. After the injections, the animals were sacrificed, and electron microscopy showed changes in their central nervous systems similar to those observed in people with Alzheimer's disease, a kind of senility.

Niklowitz's animal studies are buttressed by several clinical cases. In one, a patient who survived severe childhood lead poisoning died 42 years later, after a period of mental deterioration with Alzheimer's disease. In another, a typesetter who was exposed to lead from an early age became demented in his middle forties and died 15 years later. An autopsy performed on the typesetter revealed Alzheimer's disease changes. In a third case, a man who had worked in a storage battery factory for 30 years and was exposed to lead all this time came down with Alzheimer's disease.

How the brain misinterprets pain

In most instances, pain arises from the skin, and the brain recognizes pain as coming from this area of the body. When pain arises from organs and tissues within the body, however, the brain often has trouble determining exactly where the pain comes from. Why is this?

Neuroscientists have hypothesized that when the brain confuses the origin of pain, it may be due to the convergence of sensory inputs from skin and visceral tissues onto neurons of the central nervous system. Robert D. Foreman and his colleagues at the University of Texas Medical Branch at Galveston attempted to determine whether there was such a convergence onto cells of the spinothalamic tract, a spinal pathway by which sensory information related to a painful event is carried to the brain where it is perceived.

Activity in spinothalamic tract cells was monitored with microelectrodes inserted into the spinal cord. The cells were found to be excited by stimulation of both skin and visceral nerves. Thus, the tract seems to carry both skin and visceral pain messages to the brain. And since the brain is more familiar with pain arising from injury to the skin, it may misinterpret the origin of pain resulting from disease of internal organs.

Amnesia: How it works

Clinicians have long observed that people who suffer head trauma sometimes forget recent events but retain older memories. But is this really true? And over what time period does amnesia (memory loss) occur?

Larry Squire of the Veteran's Administration Hospital in San Diego has developed memory tests of events and of radio and television programs, which are designed to sample different periods of past time. For example, one of the tests, given before, during and six months after receiving electroconvulsive therapy, asked patients to recognize the names of television programs that had been aired for only one season between 1957 and 1972.

Squire's results show the classical description of amnesia to be correct: The more recent the memory, the more vulnerable it is to being lost. His results also show, for the first time, that memory loss can be graded over a period of years. For instance, one-year-old memories are lost, but five-year-old ones are not.

Subsequent experiments by Squire also show that amnesia is due more to an impairment in the acquisition and consolidation of new knowledge, rather than to a deficit in the ability to use the information which has already been stored.

Can brain damage be overcome?

Although neurologists have not yet reached a consensus on the value of behavioral therapy for brain-injured patients, such therapy seems to help rats, according to Mark R. Rosenzweig of the University of California at Berkeley and his co-workers.

Their experiments consisted of removing tissue from the cerebral cortex of rats of various ages, then exposing the rats to either enriched or impoverished experiences. Enrichment consisted of interaction with numerous rats and daily-changed stimulus objects including ladders, wood blocks and brushes. Impoverishment consisted of living alone or with only two other rats in a small cage and being deprived of play objects.

As the investigators hoped, enriched experiences improved the brain-damaged rats' ability to perform standard maze problems, and this improvement took place regardless of how old the rats were. Physiological measurements also confirmed the value of exposing brain-damaged rats to enriched experiences. For instance, such experiences increased both the weight of the cerebral cortex and the length of the cerebral hemispheres. There was also a subtle, but genuine change in the ratio of RNA to DNA as a result of enrichment. These nucleic acids direct brain growth and development.

Rosenzweig and his team also found, in another experiment, that 2 hours a day of enriched experiences were just as helpful as 24 hours a day of such experiences.