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A POTENTIAL BIOLOGICAL CAUSE FOR SUDDEN INFANT DEATH SYNDROME **(SIDS)**

CJ Foundation for SIDS funds breakthrough research that indicates defective serotonin pathways in the brainstem may increase infants' vulnerability

November 1, 2006, Hackensack, New Jersey – CJ Foundation's funded researchers have released ground-breaking results from their study. New autopsy data provide the strongest evidence yet that Sudden Infant Death Syndrome is not a "mystery" disease but has a concrete biological cause.

In the November 1 issue of *The Journal of American Medical Association (JAMA)*, researchers at Children's Hospital Boston document abnormalities in the brainstem – a major part of the brain that regulates breathing, blood pressure, body heat, and arousal – in babies who died from SIDS.

SIDS is the leading cause of post-neonatal death in infants in the US. Although studies have identified SIDS risk factors, such as putting babies to sleep on their stomachs, there has been little understanding of SIDS's biological basis or causes.

Neuroscientists Hannah Kinney, MD, and David Paterson, PhD, at Children's Hospital Boston examined brain autopsy specimens from 31 infants who had died from SIDS and 10 who had died acutely from other causes, obtained from the San Diego Chief Medical Examiner's office. Dr. Henry Krous, a pediatric pathologist and SIDS expert, is also funded by the CJ Foundation, and played a major role in this study as well. Examining the lowest part of the brainstem, known as the medulla oblongata, they found abnormalities in nerve cells that make and use serotonin, one of over 100 chemicals in the brain that transmit messages from one nerve cell to another.

Based on their findings, Drs. Kinney and Paterson now hope that a diagnostic test can begin to be developed that could identify infants at risk for SIDS. They also envision some day a drug or other type of treatment to protect infants who have abnormalities in their brainstem serotonin system from sudden death.

"The CJ Foundation's steadfast commitment to funding only the most meritorious SIDS research over the last decade has led to this remarkable breakthrough," said Barry A. Bornstein, Executive Director and CEO of the CJ Foundation. "We're incredibly proud that our efforts are paying off. Our intent is to follow through on these and other significant research endeavors, so that someday SIDS will be eradicated completely and no family is ever faced with losing a loved one to SIDS."

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The brainstem serotonin system is thought to help coordinate breathing, blood pressure, sensitivity to carbon dioxide, and temperature during waking and sleep. When babies sleep face down or have their faces covered by bedding, they are thought to re-breathe exhaled carbon dioxide, therefore breathing in less oxygen. Normally, the rise in carbon dioxide and fall in oxygen activates nerve cells in the brainstem, which in turn stimulate respiratory and arousal centers in the brain, so that the baby turns his/her head or wakes up in order to protect the airway. "A normal baby will wake up, turn over, and start breathing faster when carbon dioxide levels rise and oxygen levels fall," explains Dr. Kinney.

But in babies who die from SIDS, defects in the serotonin system may impair these reflexes, the researchers believe.

Dr. Kinney previously documented serotonin receptor abnormalities in two other populations of SIDS infants – including in American Indian infants dying of SIDS in the Northern Plains, where the SIDS rate is among the highest in the world. The current study confirms those findings in a third population and, for the first time, pinpoints multiple defects in the system other than in serotonin receptors: deficiencies in a particular type of serotonin receptor (called 5HT_{1A}), an abnormally high number of serotonergic neurons (neurons that make and release serotonin), a preponderance of immature serotonergic neurons, and evidence for a relative deficiency in the serotonin transporter protein, which “recycles” serotonin so that nerve cells can reuse it.

“We provide strong evidence that SIDS is a biological problem, and indicates that the brainstem serotonin system is a good place to focus continued research efforts,” says Dr. Paterson.

He and Dr. Kinney believe that the abnormalities they observed begin during early development in the fetus during pregnancy, and that prenatal insults like maternal smoking and alcohol use may adversely affect development of the brainstem serotonin system during this time. More research is needed to explain what causes the abnormalities, and how they can be prevented. The findings also provide a biological explanation for why SIDS occurs twice as often in males than females – male SIDS infants had significantly fewer 5-HT_{1A} receptors than female SIDS infants.

The serotonin abnormalities also help explain why infants under 6 months are most vulnerable to SIDS. At birth, babies must adjust from being totally dependent on their mother to breathing on their own and maintaining their own blood pressure, breathing, and temperature control. If the brainstem serotonin system is defective or still immature, this switch to total independence by the newborn baby in the control of vital functions may be impaired during the crucial first six months of life when this transition becomes almost complete.

“We think that the control systems for vital or homeostatic functions reach full maturity towards the end of the first year of life” Dr. Kinney says.

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The researchers note that despite the national Back to Sleep campaign, which urges caregivers to put babies to bed on their backs, 65 percent of the SIDS infants in this study were found sleeping on their stomach or side.

The **CJ Foundation for SIDS** is a national nonprofit organization dedicated to supporting the special needs of the SIDS community through funding SIDS research, support services and public awareness programs.

Recognized as the leading SIDS organizations in the country and the largest non-government funder of programs, the CJ Foundation was co-founded in 1994 by Joel and Susan Hollander in memory of their daughter, Carly Jenna, who died from SIDS in 1993. Since its inception, the CJ Foundation has provided millions of dollars towards SIDS researchers, organizations, support programs and public education and awareness campaigns throughout the nation, making tremendous strides in its fight to eliminate SIDS.

The study was also funded by the National Institute of Child Health and Human Development, the First Candle/SIDS Alliance, the CJ Murphy Foundation, the Barrett Fellowship for SIDS Research, and the Scottist Cot Death Foundation.

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