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Ms. Bunny Hamer
Florida SIDS Alliance
4044 W Lake Mary Blvd
Unit #104-209
Lake Mary, FL 32746

Dear Ms. Hamer:

Your support of Sudden Infant Death Syndrome (SIDS) research at Children's Hospital Boston speaks volumes about your commitment to preventing this devastating condition. I'm pleased to share the enclosed update from Hannah C. Kinney, Director of the CJ Murphy Laboratory for SIDS Research, highlighting her team's recent accomplishments and promising new studies.

Dr. Kinney and her colleagues in the Department of Pathology have made tremendous strides in their efforts to understand, diagnose and even prevent SIDS. They have identified the brainstem—the lower part of the brain—as the likely basis for SIDS, and are rigorously pursuing avenues of investigation to determine the brainstem's precise role. Over the last two decades, Dr. Kinney and her team have discovered abnormalities in tissue markers of serotonin in the lower brainstem of SIDS infants. Groundbreaking studies out of the CJ Murphy Laboratory point to a deficiency of serotonin in the lower brainstem—which could lead to the SIDS infant being unable to respond to life-threatening stressors during sleep. Dr. Kinney hopes to identify those living infants with a serotonin brainstem defect early and develop preventive treatments that would correct the serotonin deficiency—potentially eliminating the risk for death.

To learn more about Dr. Kinney's exciting research, please contact Zoë Hack Keller, Senior Major Gifts Officer at Children's Hospital Trust (617-355-4675; zoe.keller@chtrust.org.)

On behalf of Dr. Kinney and her team, my heartfelt thanks for championing this important work that makes a profound difference for our most vulnerable patients.

Sincerely,

James Mandell, MD



Children's Hospital Boston

Research Update: Sudden Infant Death Syndrome (SIDS)

CJ Murphy Laboratory for SIDS Research
in the Department of Pathology
March 2011

Hannah C. Kinney, MD, Director

Overview

The Sudden Infant Death Syndrome (SIDS) is a puzzle desperately in need of solving. SIDS is the leading cause of death in infants between 1 and 12 months of age in the United States today with more than 2,000 young lives lost per year, approximately 6 deaths a day. The tragedy of the loss of a baby to SIDS is increased by the anguish caused by the sudden nature of the death, its occurrence in a seemingly healthy baby without an underlying illness, and its lack of explanation by an autopsy. So what causes SIDS? Over the last two decades, federal and philanthropic support has helped advance our cutting edge research in the CJ Murphy Laboratory for SIDS Research, and we have pinpointed the brainstem—the lower part of the brain—as the likely basis for SIDS. We are committed to determining the brainstem's role in SIDS. We work with a strong sense of urgency to illuminate the underlying causes of SIDS so we can find the means to both identify and treat the abnormality in living babies to actually *prevent* these unexpected deaths. I'm pleased to share an update of how your generosity has enabled my laboratory to conduct research with the potential to make a difference for so many.

Cutting-edge research: studying the brainstem

We are examining the brainstem for a cause of death in SIDS infants because this region of the brain contains the vital centers that control breathing, heart rate, blood pressure, and temperature during sleep and waking. These centers are also important in determining how an infant responds to stressors—including low oxygen levels (hypoxia), high carbon dioxide (hypercarbia), and increased temperature—during sleep. Hypoxia and hypercarbia both can occur around the baby's face if the baby is sleeping on his stomach; increased temperature occurs if the baby is over-bundled. My team believes that normal babies are able to respond to hypoxic, hypercarbic, and/or thermal stressors before they become life-threatening because the brainstem's vital centers sense oxygen and carbon dioxide levels and initiate protective reflexes, such as turning the head and waking up (arousal). We hypothesize that SIDS babies have abnormalities in these vital brainstem centers that prevent them from properly responding to the stressor(s), resulting in sleep-related sudden death.

Promising discoveries

Over the last two decades, the CJ Murphy Laboratory has discovered abnormalities in tissue markers of serotonin in the lower brainstem. Serotonin is one of many neurotransmitters that govern all brain functions—thinking, feeling, breathing, sleeping, and arousal. In the lower brainstem (medulla), serotonin is an important chemical messenger involved in the control of breathing, heart rate, blood pressure, temperature, and arousal. In four datasets over the last 20 years, my team has discovered abnormalities in different serotonin markers, including in serotonin receptors and serotonin nerve cell maturation in SIDS babies. The datasets were each comprised of different SIDS cases and controls, meaning that the serotonin defects were found in “independent” or non-overlapping populations, thereby confirming the finding in different SIDS cases over time.

Overall, our findings point to a deficiency of serotonin in the lower brainstem—which could lead to malfunction of the vital centers and an inability of the SIDS infant to respond to life-threatening stressors during sleep. During waking, other neurotransmitters help govern vital functions, but sleep may “unmask” the serotonin defect, resulting in sleep-related death. We have searched for defects in other neurotransmitters in SIDS brainstems over the last two years, but the most consistent and widespread abnormalities have been in serotonin. We continue to study how abnormalities in still other neurotransmitters could interfere with serotonin function in SIDS babies, and we are actively working to uncover a possible serotonin brainstem defect in living infants to help identify those at risk for SIDS. If we can identify those living infants with a serotonin brainstem defect early, the next step would be to develop preventive treatments that would correct the serotonin deficiency—potentially eliminating the risk for death.

Studying animal models: a collaborative approach

To understand serotonin’s function in the lower brainstem and how deficiencies within it could lead to postnatal sudden death, we are studying serotonin function and malfunction in animal models of SIDS. Our goal is to pinpoint the precise mechanism whereby a deficiency of serotonin leads to sudden death in a critical postnatal period so that we can devise a specific way to prevent it. This work involves a NICHD-funded program project of which I’m the director. Investigators (including trainees at all levels) are located at Children’s Hospital Boston, Harvard Medical School, Dartmouth, Yale, and the University of Iowa. More than 30 investigators—including neuroscientists,

Serotonin brainstem defect: the key to SIDS?

The baby looks normal during the day; there’s nothing to indicate he is going to die of SIDS that night. He experiences some kind of stress during sleep, such as rebreathing carbon dioxide in the face-down position or increased temperature from over-bundling, that cannot be compensated for by the defective brainstem circuits, and he then goes on to die.

pediatric pathologists, geneticists, respiratory physiologists, pediatric neuropathologists, and neonatologists—are involved in the project, which is in its third 5-year cycle of continued NIH funding. We are in daily contact by email and phone, and we meet every two months to discuss ongoing research projects, new ideas, and new findings.

Investing in the future of SIDS research

One of my laboratory's major focuses is to train future SIDS researchers. We actively train students at all levels, including PhD candidates. In the collaborative program project mentioned above, an individual trainee often moves among the different laboratories to pursue the goals of his/her study. Many trainees have obtained faculty positions here and throughout the country and continue to pursue research aimed at understanding SIDS mechanisms.

The importance of philanthropic support

The research in the laboratory and program project is funded by private donations from SIDS families and SIDS organizations, as well as federally by the National Institute of Child Health and Development (the overseer of SIDS research at the National Institutes of Health). The private donations also provide seed money that serves as the foundation for grant submissions to the National Institutes of Health. Philanthropic funding like yours is absolutely critical in supporting doctoral and post-doctoral students in the laboratory, in enabling us to obtain state-of-art equipment that can keep pace with our work, and in advancing our cutting-edge research.

We offer our profound gratitude for your commitment, which helps propel us in our quest to understand and prevent tragic SIDS deaths.