

Current Research Findings and Theories

Most scientists now believe that babies who die of SIDS are born with one or more conditions that make them especially vulnerable to the internal and external stresses that occur in the life of any infant. Currently, many researchers argue that the clue to finding the cause(s) of SIDS lies in a further understanding of the development and functions of the brain and nervous system of SIDS infants.

These scientists theorize that some babies at risk for SIDS have defects in those parts of the nervous system that control breathing and heart rate. Maturation of the brainstem may be delayed in SIDS infants. Myelin, a fatty substance that facilitates nerve signal transmission, appears to develop more slowly in SIDS infants than in other babies.

"The detection of subtle abnormalities in SIDS brains indicates that not all SIDS infants are 'normal' despite their lack of clinical abnormalities. The occurrence of brain abnormalities supports the concept that a vulnerable, and not a normal, infant is at risk for SIDS. The idea of a vulnerable infant forms a key part of a triple-risk model for the pathogenesis of SIDS" (Filiano and Kinney, 1994).

The Triple-Risk Model

Pathology studies of SIDS infants support the view that these infants possess underlying vulnerabilities that put them at risk for sudden death, a concept advanced by the triple-risk model in describing the sequence of events leading to the death of an infant. A number of scientists are currently applying this model in their search for a cause(s) of SIDS.

Vulnerable Infant. The first key element of the triple-risk model depicts an infant with an underlying defect or abnormality, which makes the baby vulnerable. In this model, certain atrophysiological factors (e.g., defects in the parts of the brain that control respiration or heart rate, and that occur during early life) explain vulnerability to sudden infant death.

Critical Developmental Period. The second element in the triple-risk model refers to the infant's first 6 months of life. During this critical developmental period, rapid growth phases occur and changes in homeostatic controls take place. These changes may be evident (e.g., sleeping and waking patterns), or they may be more subtle (e.g., variations in breathing, heart rate, blood pressure, and body temperature). It may be that some of these changes may temporarily or periodically destabilize the infant's internal systems.

Outside Stressor(s). The third element of this model involves outside stressors. These may include environmental factors (e.g., exposure to tobacco smoke, overheating, or prone sleep position) or an upper respiratory infection that most babies can experience and survive, but that an already-vulnerable infant may not be able to overcome. In and of themselves, these stressors do not cause infant deaths, but in a vulnerable infant, "may tip the balance against an infant's chances of survival" (Filiano and Kinney, 1994).

According to this model, all three elements must interact for a sudden infant death to occur—the baby's vulnerability is undetected until the infant enters the critical developmental period and is exposed to an outside stressor or stressors.



Brain Abnormalities in SIDS Infants

A team of researchers funded by the National Institute of Child Health and Human Development (NICHD) has discovered that infants who die of SIDS may have abnormalities in several parts of the brainstem. This finding builds on the results of an earlier study that identified abnormalities in the region of the brain known as the arcuate nucleus in babies who died of SIDS.

In the NICHD study, SIDS infants were found to have decreased binding of serotonin in the nucleus raphe obscurus, a brain structure linked to the arcuate nucleus, as well as four other brain regions. These areas of the brain are thought to play a crucial role in regulating breathing, heart beat, body temperature, and arousal (Panigrahy et al., 2000).

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