

SUDDEN INFANT DEATH SYNDROME

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INTRODUCTION

- ***Sudden Infant Death Syndrome (SIDS) continues to be the most common cause of postneonatal infant death***
 - ***25% of all deaths between 1 month and 1 year of age***
- ***SIDS is a complex, multifactorial disorder of which the cause is not fully understood***
- ***Some environmental risk factors are modifiable***
 - ***Reducing exposure to modifiable risk factors has lowered the incidence of SIDS***
- ***New research indicates genetic risk factors***
 - ***Actual risk of SIDS may depend on interaction of environmental and genetic risk factors***

DEFINTION

- ***Sudden death of an infant under 1 year old that is unexpected by history and unexplained after a thorough postmortem examination***
- ***Investigation includes:***
 - ***Complete autopsy***
 - ***Investigation of the scene of death***
 - ***Review of medical history***

Definition - SIDS

- ***Sudden Infant Death Syndrome (crib death) - the sudden death of an infant, usually under 1 year of age, which remains unexplained after a complete postmortem investigation, including an autopsy, examination of the death scene and review of the case history***

SIDS - What It Is

- ***Major cause of death in infants after 1st month of life***
- ***Sudden & silent in an apparently healthy infant***
- ***Unpredictable & unpreventable***
- ***Quick death with no signs of suffering - usually during sleep***

SIDS - What It Is Not

- ***Caused by vomiting or choking***
- ***Caused by external suffocation or overlaying***
- ***Contagious or Hereditary***
- ***Child abuse***
- ***Caused by lack of love***
- ***Caused by immunizations***
- ***Caused by allergy to cows milk***

General Characteristics of SIDS

- Usually occurs in colder months
- Mothers younger than 20 years old
- Babies of mothers who smoke during pregnancy or are exposed to second hand smoke
- 60% male Vs 40% female
- Premature or low birth weight
- Upper respiratory infections, 60% in prior weeks
- Occurs quickly and quietly during a period of presumed sleep

Risk Factors for SIDS

- ***Parental***
 - ***Young maternal age (age <20 years)***
 - ***Maternal smoking during pregnancy***
 - ***Drug abuse in either parent, specifically paternal marijuana and maternal opiate, cocaine use***

Short intergestational intervals

Late or no prenatal care

Low socioeconomic group

African American and American Indian

ethnicity (? socioeconomic factors)

Infant

***Brain stem abnormalities, associated
defective arousal, and cardiorespiratory
control***

Prematurity and/or low birth weight

Male sex

Product of a multiple birth

SIDS in a prior sibling

Antecedent respiratory infections

Environment

Prone sleep position

Sleeping on a soft surface

Hyperthermia

Postnatal passive smoking

RISK FACTORS

Box 1: Environmental factors associated with an increased risk of sudden infant death syndrome (SIDS)*

Maternal and antenatal risk factors

- Smoking
- Alcohol use (especially periconceptionally and in first trimester)
- Illegal drug use (especially opiates)
- Inadequate prenatal care
- Low socioeconomic status
- Low age
- Low level of education
- Single marital status
- Increased parity
- Short interval between pregnancies
- Intrauterine hypoxia
- Fetal growth retardation

Infant risk factors

- Age (peak 2-4 mo, but peak may be decreasing)
- Male sex
- Race/ethnic background (e.g., black, Native Indian, other indigenous group)
- No pacifier (“dummy”) used at bed time
- Prematurity
- Prone or side sleeping position
- Recent febrile illness
- Exposure to tobacco smoke
- Soft sleeping surface, soft bedding
- Thermal stress/overheating
- Face covered by bedding
- Sharing bed with parents or siblings
- Sleeping in own room rather than in parents’ room
- Colder season, no central heating

*Adapted from Hunt and Hauck.⁷

SOCIAL FACTORS

- Increased risk with:
 - Lower socioeconomic status
 - Younger maternal age
 - Lower maternal education
 - Single marital status



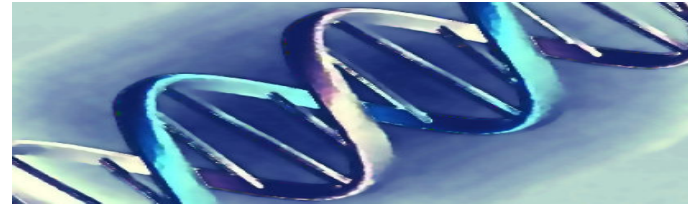
PREGNANCY RELATED FACTORS

- Mothers of SIDS infants:
 - Less prenatal care
 - Care initiated later in pregnancy
 - Low birth weight
 - Preterm birth
 - IUGR
 - Shorter intervals between pregnancies (< 18 mo)
 - More often 2nd or higher order birth child

OTHER CONCERNS

- Upper respiratory tract infection has not been found to be independent risk factor for SIDS
 - However, these and other minor infections may play a role in the pathogenesis of SIDS
 - For instance, if in prone position, heavily wrapped or head covered during sleep there was increased risk of SIDS with infection
- **Parents should be reassured that immunization does not present a risk for SIDS**
 - No temporal relation between vaccine administration and death
- **Not caused by vomiting or choking**

GENETICS



Box 2: Genes identified in case-control studies for which the distribution of polymorphisms differed between infants who died of SIDS and control infants*

Cardiac ion channelopathies

- Sodium channel (*SCN5A*)
- Potassium channel

Promoter region of the serotonin (5-HT) transporter gene (*5-HTT*)

Autonomic nervous system development

- Paired-like homeobox 2a (*Phox2a*)
- Rearranged during transfection (*RET*)
- Endothelin-converting enzyme-1 (*ECE1*)
- T-cell leukemia homeobox (*TLX3*)
- Engrailed-1 (*EN1*)

Infection and inflammation

- Complement C4A and C4B
- Interleukin-10

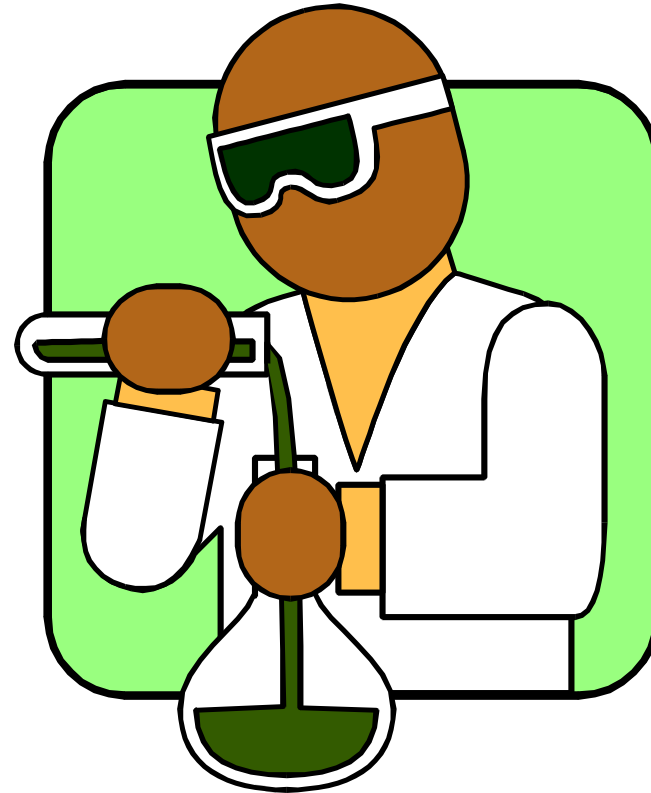
*Adapted from Hunt.⁷⁰

- **No specific genotypic differences** in infants who died of SIDS, but several **gene polymorphisms** identified
 - Generally involving entities in cardiorespiratory, immune function and arousal
- Triple risk model suggests gene polymorphisms may make certain infants more vulnerable to SIDS
- This vulnerability manifests when there is an environment challenge (prone sleeping, tobacco exposure)

Pathogenesis of SIDS

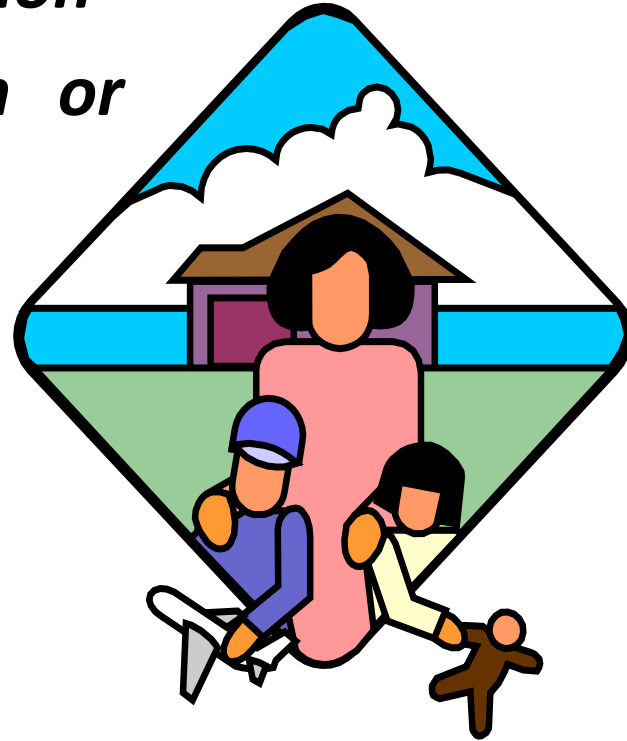
- * Generally accepted to be multifactorial*
- * Triple risk model*
 - * Vulnerable infant*
 - * Critical development period in homeostatic control*
 - * Exogenous stressors*
- * Brain stem abnormalities, associated defective arousal, and cardio-respiratory control*

Medical Findings Consistent With SIDS



External Appearance

- ***Normal state of hydration & nutrition***
- ***Small amount of frothy fluid in or about mouth & nose***
- ***Vomitus present***
- ***Postmortem lividity &/or rigors***



Internal Appearances On Autopsy



- ***Pulmonary congestion & edema***
- ***Intrathoracic petechiae 90% of time***
- ***Stomach contents in trachea***
- ***Microscopic inflammation in trachea***

AUTOPSY FINDINGS

- ***No pathognomonic findings***
- ***Common findings:***
 - ***Petaechial haemorrhages of thymus gland, visceral pleura in 68-95%***
 - ***Pulmonary congestion (89%) and oedema (63%) indicative of terminal left ventricular failure***
 - ***Oronasal secretions that are typically frothy, mucous and pink or bloody***

- *2/3 structural evidence of pre-existing, chronic low-grade asphyxia*
 - *Study identified CSF abnormalities.*
 - *Hypoxia frequently precedes death in SIDS*

- *One study of 20 SIDS infants found 50% had levels of IL-6 in CSF equivalent to those found in infants who died of infectious diseases*
- *Staphylococcus aureus may have role in infection as 56% of healthy infants and 86% of SIDS infants had these bacteria in the respiratory tract*

Typical SIDS Infant Scenario

- ***Almost always occurs during sleep or appearance of sleep***
- ***Usually healthy prior to death***
- ***May have had a cold or recent physical stress***
- ***May have been place down for nap, found not breathing or appearing dead***
- ***Parents not hearing signs of struggle***

Epidemiology of SIDS

- Leading cause of death in USA of infants between 1 month and 1 year of age
- 90% of deaths occur \leq 6 months age, mostly between 2 and 4 months
- In USA 2,600 deaths in 1999 (down from 5,000 in 1990)

Prevention of SIDS

- * Maternal factors***

- * attention to risk factors previously mentioned***

- * redress problems in medical care for underprivileged***

- * Environmental***

- * avoid prone sleeping***

- * back to sleep program: infant should sleep in supine position***

- ***Avoid sleeping on soft surfaces***
 - ***no pillows, comforters, quilts, sheepskins, and stuffed toys***
 - ***Sleeping clothing (such as a sleep sack) may be used in place of blankets.***
- ***Avoid hyperthermia***
 - ***no excessive blankets***
 - ***set thermostat to appropriate temperature***
 - ***avoid space heaters***

Diagnosis of SIDS

- *SIDS is a diagnosis of **exclusion***
- *Complete autopsy*
- *Examination of the death scene*
- *Review of the clinical history*
- *Differential diagnosis*
 - *child abuse*
 - *intentional suffocation*

Thank you