

SUDDEN INFANT DEATH SYNDROME - RECENT DEVELOPMENTS

Media coverage has focused recently on the question of cot deaths or Sudden Infant Death Syndrome (SIDS) and how it is caused. It has been suggested that a cause of death may be connected with the infection of cot materials by fungi and/or bacteria which are naturally present in the environment.

In view of the amount of interest that this and related issues may generate among MPs' constituents, this Briefing Note addresses the problem of SIDS and summarises the new findings and their implications.

THE SCALE OF THE PROBLEM

Sudden Infant Death Syndrome (SIDS) is the commonest cause of death for children between the ages of 28 days and 1 year. Since 1971, when SIDS records were first kept by the Office of Population Censuses and Survey, its incidence has steadily increased at a time when most other causes of infant mortality have fallen. In 1987, 1528 infant deaths were attributed to SIDS in England and Wales - a rate of 2.24 per thousand live births (see Figure).

The distribution pattern of the syndrome is unusual. SIDS occurs far less often in babies born in the UK to mothers from Bangladesh, India and Africa and the rate in western countries (2-4 deaths per thousand live births) compares unfavourably with very low incidences in Russia, China, India and Africa. In Hong Kong, for example, the rate is 0.13. These statistics suggest a link between SIDS and childcare practices in developed countries.

POSSIBLE CAUSES OF SIDS

Considerable scientific effort has been put into finding the cause or causes of SIDS. The positioning of the baby during nursing, the relationship with crowding in the household, hyperthermia, upper airway obstruction, respiratory tract infection and possible deficiencies in the immune system have all been investigated. While one or more of these factors may be relevant in some cases, no single cause has been put forward to account for a majority of the deaths. Since a number of babies appeared to have suffered from a lack of oxygen before death, recent emphasis has been on causes involving the upper respiratory tract.

RECENT RESEARCH RESULTS

A recent research report by Penarth Research International Limited (a firm of consultants specialising in materials deterioration) suggests that the growth of naturally occurring microorganisms on cot mattresses may be a factor contributing to SIDS. Two possible mechanisms are proposed:

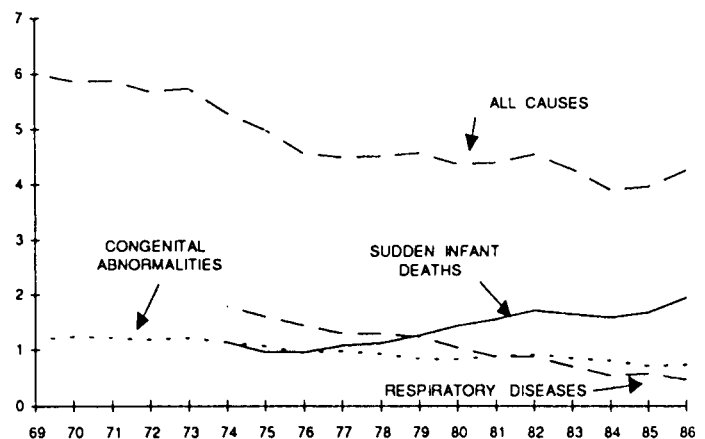
Poisoning whereby the child breathes in toxic gases released through the action of microorganisms which break down some of the additives present in PVC.
Allergic reactions to certain microorganisms present on cot materials.

Poisoning

Plastics generally contain a number of additives. The most common are plasticisers (to impart flexibility), biocides (to resist microbial attack), anti-oxidants (to resist breakdown caused by light), pigments for colouring and fire-retardant chemicals. Without these, plastic would be useless for many applications.

Microorganisms are adept at exploiting available food sources and, given the right conditions, plastics and plastic additives may be attacked. For this reason, manufacturers have to add biocides for certain applications. One of these is OBPA which contains arsenic.

POST NEONATAL DEATHS (ENGLAND AND WALES)
Selected causes 1969-1986 (per 1000 livebirths)



The possibility of fungi metabolising arsenic compounds to the gas arsine has long been recognised. Arsine is more toxic than hydrogen cyanide and can accumulate its toxic effect over long periods of exposure to low doses. Traces of arsenic in Napoleon's hair once raised the question of a murder conspiracy; more recently, their presence has been attributed to arsine released by the action of fungi on wallpaper containing arsenical pigments.

It was a tent and marquee operator who raised with PRIL the possibility of danger from PVC in cot mattresses. He had learnt that tent PVC which contains OBPA could generate arsine if it is attacked by fungi during storage.

PRIL carried out some investigations following this suggestion. Their subsequent report points out that;

- A number of different species of fungi are known to generate arsine from arsenic compounds. Since both phosphorus and antimony belong to the same chemical group as arsenic, it appeared likely that fungi would also produce phosphine and stibine respectively. These are both of similar toxicity to arsine.
- Using a known arsenic-metabolising fungus, samples of PVC from cot mattresses generate gases provisionally identified as stibine and arsine in laboratory tests.
- This fungus has been found to be present in PVC from used cot mattress covers, including all of 20 samples taken from mattresses on which an infant had died.
- The PVC immediately below the infant was most heavily infected, apparently because the fungus requires warmth and perspiration to enable it to grow and deteriorate the PVC.

PRIL concluded that it was possible for fungal action to form toxic gases from certain PVC additives. They listed phosphate plasticisers, OBPA and antimony trioxide as potential sources for phosphine, arsine and stibine respectively. Manufacturers confirm that antimony trioxide or tr-aryl phosphate plasticisers may be used, but state that OBPA would not be present in cot mattress covers.

Allergic Reactions

Investigations also showed that exposed foam (some mattresses are only partly covered by PVC) could be heavily infected by common fungal growths. These generate spores which can cause severe allergic reactions in sensitized infants. Since respiratory problems are often implicated in SIDS, it is suggested that this could be an additional contributory factor in some cases.

ISSUES RAISED

Both PRIL and outside experts have emphasised that these findings must be treated as preliminary. The results may suggest a mechanism for the release of toxic gases, but the detection tests used were not capable of unambiguous identification of these gases. Even if questions on the laboratory procedures are resolved, it would still be necessary to demonstrate that the fungus present on cot covers is capable of producing significant amounts of gas *in situ*, where nutrient levels would be much lower than in the lab tests. Nevertheless, public concern over the continued incidence of cot death makes it likely that some of the questions below will be raised without waiting for additional studies to be carried out.

What can be done to protect infants from any risk that may exist?

PRIL make the common-sense points that infants would be most at risk from a poisonous heavy gas when in a prone (face-down) sleeping position, when heavily covered up due to cool weather, and when left for long periods undisturbed. Any risk could be exacerbated by closed cots. Older mattresses and those which are soiled would be likely to carry a higher risk of infection, though effective cleaning can be difficult. Following the public disclosure of these results, the Department of Health has repeated its earlier advice on infant care. This includes keeping infants warm (but not over-heated) in well-ventilated surroundings and on clean sheets and linen. Parents are also advised to remain alert to signs that the infant is unwell. The British Plastics Federation say that parents should 'follow the quite normal hygiene procedures when dealing with infants and if in doubt seek medical advice'.

Follow-up Studies

In order to generate a sufficient burden of proof to decide whether action is justified on PRIL's hypothesis, additional research will be needed. Further work by the original authors is proceeding on a voluntary basis in cooperation with research units in hospitals at Bristol and Oxford. The Foundation for the Study of Infant Deaths has decided to commission research to assess the implications of the findings; the Department of Health is also evaluating the work. The Laboratory of the Government Chemist is repeating the experiments with more sophisticated analytical techniques.

Fire safety requirements for Manufacturers

Fire retardency requirements encourage the use of certain additives, among them phosphate plasticisers and antimony trioxide. PRIL has suggested that conflict may arise between such requirements and other safety considerations. At present however, such conflict does not exist. The Consumer Affairs Minister recently announced that covers on nursery equipment would remain exempt from the Furniture and Furnishings Fire Safety Regulations. This exemption was due to concerns over permeability and possible effects of the additives on sensitive infant skin. If it were confirmed that the same additives could generate toxic gases through microbial activity, future changes in the regulations would need to take account of this possible added hazard.

FURTHER INFORMATION

Additional details and background information are available from POST, 16, Great College Street (222 7085).

The PARLIAMENTARY OFFICE OF SCIENCE AND TECHNOLOGY has been set up by the Parliamentary and Scientific Committee to inform Parliamentarians on scientific and technological matters underpinning current issues.