



[SIDS - Theory of toxic gases newly discussed]

Toxic Gases in Infant Beds

Some 500 children are currently dying in this country from Sudden Infant Death Syndrome. Better information about the established risk factors could prevent many further deaths, but the cause of SIDS, toxic gases from mattresses, is being ignored despite clear epidemiological data.

An increase in „unexpected deaths among babies and infants for which thorough post mortem examinations provided no adequate explanation“ has been observed since about 1952 and was defined in 1968 as „Sudden Infant Death Syndrome (SIDS)“ [1]. Thus unexplained, SIDS was included in the ICSD (International Classification of Sleeping Disorders) under code 798.0 and under R95 in the ICD-10 and has been the subject of intensive research since then, without researchers being able to reach agreement on a cause [2].

An agreement, however, has been reached on the risk factors associated with SIDS [3]. Following information campaigns to prevent these risk factors, the number of sudden deaths in Germany has fallen steadily between 1991 and 1999 from 1.55 to 0.66 per 1 000 live births [4].

SIDS-Risk Factors

- Child lying on stomach or side
- Head covered by bedclothes
- Sleeping alone in a room or in parents' bed
- Parents smoking

Due to the fact that the preventative campaigns in the Netherlands, Denmark, Norway and Australia proved considerably more successful (in the Netherlands, e.g. the death rate is recorded at 0.14 per thousand) our Health Ministers in Bremen, at their conference in June 2001, unanimously pledged for an effective, nationally coordinated campaign of information [5].

While it is true that further spreading of information about risk factors would reduce the number of deaths further, much more could be achieved if the experts would agree not only on the risk factors, but also on the cause of sudden infant death. In view of the strength of the available information, there is no reason that this should be difficult for them.

The astonishing fact that medical scientists have been searching for so long and so unsuccessfully for the cause of such a frequent cause of death has led two forensic chemists, Dr. Jim Sprott in New Zealand and Barry A Richardson in England, to seek a toxic cause (see box: "Arsenic-tolerant fungi attack softeners"). In 1988, Richardson discovered that toxic gases were given off from the mattresses of children who had died from SIDS - specifically, the hydrogen compounds of phosphorus, antimony and arsenic, phosphine (PH_3), stibine (SbH_3) and arsine (AsH_3). This discovery provides an explanation for all of the known risk factors.

Richardson first examined 50 mattresses on which 45 SIDS victims had slept and found the fungus *scopulariopsis brevicaulis* in all of them - but only at the spot where the children had been lying and where this spot had been kept damp and warm, incubated samples of the infected material all generated toxic tri-hydride gases; in general stibine and phosphine were generated, the arsine that he had anticipated was only generated-sometimes and only small quantities.

These gases are much more toxic than carbon monoxide (limit values in Great Britain [6]: carbon-monoxide 100, phosphine 0.3, arsine 0.5, stibine 0.1 ppm) and also heavier than air (phosphine x 1.8, arsine x 2.71, stibine x 4.34 [6]). Particularly in England, antimony was present in the mattresses in the form of antimony trioxide, added for the purposes of flame protection. phosphorus in softeners, arsenic from the biocide. OBDA (10,10-bisphenoxyarsine).

Most deaths occurred in babies under the age of five months.

Most at risk are children who stay for long periods in their beds, sleep in bags on their stomachs and are so over-covered that they remain for long periods in respiratory contact with the accumulating gases. Higher temperatures result in more gases being developed. Stronger babies can push their bedclothes away at the onset of symptoms and thus gain air; smaller babies cannot. For this reason, babies die most frequently up to the age of five months, sleeping too well-covered on their stomachs and with signs of overheating.

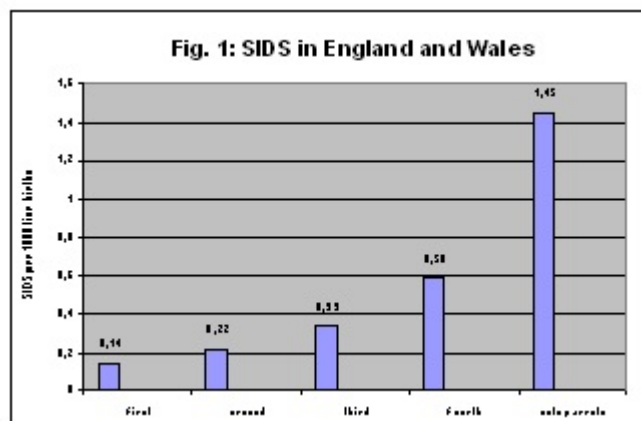
SIDS has only been reported in countries with western-style living habits where foam and PVC-covered mattresses are in use and only in the years after the introduction of these materials [7]. Since the infection of the mattresses with *scopulariopsis brevicaulis* requires a fairly long time, those babies sleeping on new-mattresses were significantly more rarely affected.

At the beginning of June 1989, Richardson's message was broadcast throughout the British media. Parents could easily avoid poisoning their babies with toxic gases, either by using a new mattress or by covering the old one with polythene. As a result of these reports, the sale of infant mattresses increased by 15 % and the SIDS rate, after a 30-year increase, began a steady fall, totaling 38 % until the end of 1991. In March 1990, following a short report from Richardson, discussions were opened on his theory in the Lancet [8] (see box „Over-enthusiastic proponent of a pet theory“).

No one in Germany undertook an examination of this hypothesis

Until now, no scientist in Germany has undertaken an examination - independent of the British experts - of the question whether toxic gases may be the cause of sudden infant death syndrome. Meanwhile, however, there are two sets of new epidemiological data that prove the case, the data presented in figure 1 and 2 and the success of the preventative campaign in New Zealand.

Figure 1: SIDS cases pr 1000 live births, first, second, third and further babies and babies of solo parents in England and Wales 1996-



99: 2 549 045 live births, 1198 cases of SIDS, values of first children set to 1:1 [9]

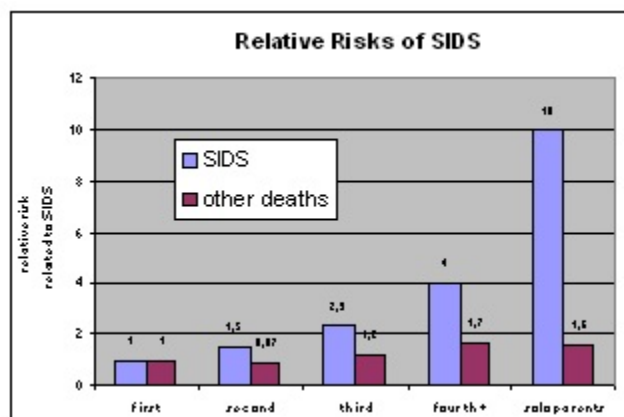
Babies die only very rarely on new mattresses. Thus, SIDS is associated with the condition of the mattress. Figure 1 illustrates this connection, not directly but with great clarity. Poisoning by extremely toxic gases is the only cause of sudden infant death that can possibly explain this diagram. If a mattress contains any compound of phosphorus, arsenic or antimony and certain fungi establish themselves in the mattress, gases can be released that lead to sudden infant death. Where the fungi in the mattress have already established themselves during use by another baby, the toxic gas is released even sooner and in greater quantity when the mattress is used again. In this way, the frequency of cases of sudden infant death increases from one child to the next [9,10]. This also explains the very large proportion of SIDS cases among the children of single parents who - for financial reasons - put their children to sleep on second-hand mattresses. It has been stated that the increase in the proportion of cases of sudden infant death from one sibling to the next is attributable to the increased likelihood of infection of babies by older siblings. Figure 2, however, refutes this statement. It shows the multiplication factors for SIDS compared to death due to other causes.

Were the infection explanation correct for figure 1, the quotients for cases of sudden infant death and death from other causes would be more or less consistent - but they are not. The sharp increase in the quotients from one child to the next refutes the infection explanation.

Figure 1 therefore already shows the crucial epidemiology for the sudden infant death syndrome. The fact that the probability of sudden infant death increases from one sibling to the next refutes all medical and physiological theories concerning the

cause of sudden infant death [11], except for that of toxic gases.

Figure 2: Relative risks of SIDS and other causes of death for Eng-



land and Wales 1996-1999 [9]

Successful preventative campaign in New Zealand

Since the end of 1994, the method for preventing cases of sudden infant death by covering infant mattresses has been publicised in New Zealand. More than 100,000 parents have already covered the mattresses for their babies in accordance with the „Cot life 2000“ specification. Not one case of sudden infant death has been reported from among these babies [12].

Arsenic-tolerant fungi attack softeners

In Southland, New Zealand, in summer 1985, there were some 10 deaths per 1000 live births; in winter, almost twice as many. The forensic chemist, Dr Jim Sprott, compared the details of infant care in the families where there had been an instance of SIDS with the 218 families with no death. On the basis of a questionnaire, he identified synthetic detergents, chemical nappy washes and sterilising solutions for bottles and dummies as co-factors. Following a campaign in the local press against the use of these chemicals, the instances of SIDS cases fell in Southland from 23 in 1987 to 5 in 1989 [13].

Chemical nappy washes bring proteins into the beds providing nourishment for the fungus and promoting its growth. Furthermore, detergents increase the permeability of infant skin to toxic gases. In 1988, a second forensic chemist, Barry A Richardson in England, discovered that arsenic-tolerant fungi attack the softeners in PVC and generate highly toxic arsine from the biocide containing arsenic OBPA (10,10- oxybisphenoxarsine). The manufacturers of OBPA described the biocide as „so non-toxic, it is even approved for baby mattresses“.

At the end of the nineteenth century, in Germany, England and France, arsenic had led to a mysterious series of thousands of deaths. At that time, it was Scheele's Green, a dye containing arsenic, from which the otherwise harmless household fungus, *scopulariopsis brevicaulis*, released the toxic gas arsine from damp wallpapers [18].

For a rather safe assumption that the covering of mattresses in pure polythene of an adequate thickness offers sure protection against SIDS one would want a high statistical significance of $p < 0.01$. In case of an expectation of one SIDS case in 2000 live births this statistical significance (based on the binomial distribution) would have been achieved already if out of 9200 live births sleeping on covered mattresses, no case of SIDS was observed. The observations reported in this case of 100 000 live births without one case of SIDS therefore backs up this statement with overwhelming reliability ($p < 1.9 \times 10^{-22}$)

Prior to the introduction of mattress covering, New Zealand had the highest proportion of sudden infant deaths in the world (2.1 deaths per 1 000 live births). Following the introduction of mattress covering, the figure dropped by 48 % (according to the official statistics for 1998) and among a particular sub-population of largely European origin (Pakeha) by an estimated 60 %. The extent of the decrease in the proportion of sudden infant death cases in New Zealand cannot be attributed to the orthodox advice offered for the reduction of sudden infant death by reducing risk factors. These tips published in New Zealand have barely altered since 1992. In the meantime, the Pakeha population in New Zealand has achieved a low proportion of SIDS cases of 0.4 per 1000 live births. The New Zealand Ministry of Health has confirmed that the practice mattress covering is more widespread among the Pakeha population than among the other ethnic groups. That the number of SIDS cases in New Zealand is not even lower, despite the greater safety provided by mattress covers, lies in the fact that the authorities there have not yet fully accepted the explanation provided by Sprott and Richardson and therefore only advise that the known-risk factors be avoided.

In Germany, the theory of toxic gases as the cause of SIDS has been considered disproved, though there has never been an independent examination of the studies commissioned by the British Government (see box „Over-enthusiastic proponent of a pet theory“). The members of the scientific advisory board of the GEPS („Joint parental initiative into sudden infant death syndrome“) have not even shown any inclination to take into account the epidemiological findings set down here [14] and the authorities and institutes concerned continue to insist that toxic gases cannot play a significant role in SIDS. This provides further confirmation of the observation made by Kuhn that the established scientific bodies stick firmly to their established theories and can have problems with anything new [15].

It is therefore of huge importance that the German environmental medicine bodies take up this matter - as the British already have done [16].

The German campaign for the prevention of sudden infant death based on the New Zealand example, „Cot Life 2000“ is called „Wiegenleben 2002“ [17]. Anyone wishing to take part in this or who would like to order a polythene Babesafe mattress cover from New Zealand by airmail can get one immediately from the address given (for € 24) or from TG Sprott directly [12] Alternatives manufactured and distributed in Ger-

Over-enthusiastic proponent of a pet theory

Richardson's message [19] caused serious problems for the British government. By the 1989 „Furniture and Furnishings Regulations“, the government forced mattress manufacturers to incorporate flame protection in their mattresses. This flame protection usually contains antimony oxide and/or organophosphate softeners.

The statistics clearly showed that the number of deaths increased in line with the increase in use of antimony and phosphorus on mattresses. Some mattresses contained sufficient antimony and phosphorus to theoretically create 15000 fatal doses of toxic gases. Lawyers had already begun preparing class actions for compensation from the government.

In March 1991 the government appointed an initial group of scientists, the Turner Committee, its report appeared in June 1991 [20]. After two further, very effective „Cook Reports“ on „The Cot Death Poisonings“ that were broadcast on television on 17. 11. and 01. 12. 1994, a second group, the Limerick Committee was appointed. Its members P Fleming [21] and DW Warnock [22] had already published reports in the Lancet 1995. The final report of the Limerick Committee appeared in May 1998 [23].

In these reports, the hypothesis relating to toxic gases put forward by Sprott and Richardson was discussed and, on the basis of "irreproducible findings", many „unproven“ or "incorrect facts", rejected outright. An editorial in the Lancet entitled „SIDS theory: from hype to reality“ took pleasure in stating, that „An overzealous proponent of a pet theory and a media crusader do not make a good pairing“ [24]. In this way the toxic gases theory was rendered obsolete for the readers of Lancet and thereby for the majority of scientists and therefore not worthy of further examination

Anyone who would read the 38-page report with 259 references that Richardson presented to the Limerick Committee [7] would be unable to justify the opinion expressed in the Lancet editorial. And anyone who has the opportunity to read the commentary by Richardson on the final report of the Limerick Committee is forced to recognise that there is plenty that does not ring true [25]. Further, anyone ordering Sprott's pocket book [13] obtains sufficient credible proof that those appointed by British Government were hushing up matters on the latter's behalf.

The problem, however, is not only the time required for reading some 500 pages. The two forensic chemists are sound experts in a separate field and there are only a very few medics who are competent to judge the arguments for and against.

many at present are considerably more expensive, despite the shorter distances involved.

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