

# **Limerick Report**

## **Expert Group to Investigate Cot Death Theories: Toxic Gas Hypothesis**

### **Chairman's Foreword**

#### **Sudden Deaths in Infancy**

The sudden unexpected death of an infant devastates bereaved families and is a potential anxiety for the parents of over 700,000 newborn babies each year in UK. Cot deaths, that is unexpected infant deaths occurring for no obvious reason, although uncommon, are the major kind of death amongst infants after the first month of life; the majority remain unexplained after post mortem examination and are known as Sudden Infant Death Syndrome. The terms are often used interchangeably. Because of developments in certification practice, the scale of the cot death problem has only been measurable with some degree of accuracy since about 1971.

#### **Toxic Gas Hypothesis**

The hypothesis that the primary cause of SIDS is poisoning by toxic gases generated in cot mattresses was first publicised in the media in 1989 by Mr B A Richardson, an independent consultant on biodeterioration of materials, after being consulted by Mr P R Mitchell, proprietor of a marquee company. First formally published as a letter in the Lancet 17 March 1990, it proposed that a fungus (*Scopulariopsis brevicaulis*), sometimes found in the domestic environment, could degrade the chemical compounds of phosphorus, arsenic and antimony that may be present in fire retardants or plasticisers in PVC cot mattress covers and other cot furnishings, and subsequently release the toxic gases phosphine, arsine and stibine. The hypothesis was reported to be supported by Richardson's experimental findings. It was investigated by an Independent Expert Group established by the then Chief Medical Officer in March 1990 and chaired by the late Professor Paul Turner (the Turner Committee). The Turner Committee considered the evidence and commissioned further studies to test Richardson's experimental work, but found Richardson's conclusions could not be substantiated by independent researchers and concluded in May 1991 that the hypothesis was unfounded.

#### **Television Publicity**

On 17 November 1994 a television programme, the Cook Report, presented a demonstration of Richardson's experimental work and data on antimony levels in tissue of infants which were claimed as new evidence to support his hypothesis. A second programme was advertised which was shown two weeks later on 1 December 1994 repeating the claims and showing high levels of antimony in 'normal' children's hair and claiming a correlation with levels in cot mattress coverings. Publicity about the programmes led to considerable public concern with many calls from worried parents. Terms of Reference of the Expert Group to Investigate Cot Death Theories

To look at the issue afresh, the Chief Medical Officer set up, on 30 November 1994, this independent advisory committee "The Expert Group to investigate Cot Death Theories" (Expert Group), which he asked me to chair. Our terms of reference were: To review the findings of the report on Sudden Infant Death Syndrome (the "Turner Report" 1991) and any subsequent data on hypotheses linking antimony with unexplained infant deaths in infants; and to advise the CMO on what further studies should be undertaken to investigate postulated causal relationships between chemicals and cot deaths.

## **Membership**

Members of the Group were chosen for their expertise in the relevant fields of chemistry, chemical and paediatric pathology, epidemiology, midwifery, mycology, paediatrics, public health, research methodology and toxicology. Some had professional experience of research into the causes of cot deaths, supporting bereaved parents and giving advice on how to reduce the risk. A few had sat on the Turner Committee. Others were wholly new to the field. There was also a lay member with experience of cot death (Annex 1).

## **Scope of Investigation**

Mr Richardson proposed that toxic gases were the primary cause of SIDS. There are, however, many different causes of infants dying suddenly and unexpectedly ranging from accidental suffocation or rare undiagnosed non-accidental injury, viral and bacterial infections, metabolic diseases, to deaths which remain wholly unexplained. We therefore have considered the wider question of whether chemicals used in cot mattresses pose any risk to infants. Process of Investigation

We have reviewed the Turner Report and have examined Mr Richardson's experimental findings, the prevalence and nature of microorganisms in infant cots and their ability to generate volatile gases from Group V chemical compounds, the toxicity of the compounds themselves and any gases produced or postulated, the pathology of SIDS, the concentrations and possible sources of antimony in infants, temporal changes in the chemical composition of mattress materials, and the relevant aspects of the epidemiology of SIDS.

The Expert Group has investigated the hypothesis with scientific rigour and impartiality. We took steps to establish the independence and credibility of our conclusions by ensuring that work which we recommended, much of which was funded by the Department of Health, was, if possible, submitted for publication in peer reviewed journals, so that the findings would be in the public domain. This policy was also adhered to by the Foundation for the Study of Infant Deaths who have sponsored a number of valuable studies relevant to our investigations, as have the Scottish Cot Death Trust and the Irish Sudden Infant Death Association. The cooperation of the Scientific Committees and Trustees of these charities, which are dedicated to research, prevention and bereavement support, is much appreciated.

We first met on 16 December 1994, published an Interim Report in December 1995 and held 24 meetings over three years. Our final report is based on work we have commissioned and that of others already published; we have also received a number of oral presentations. Our Report has been drafted by the members of the Expert Group. The opinions, conclusions and recommendations expressed in our report are the sole responsibility of the members of the Expert Group and must not be taken to reflect the views of the Secretariat, the Department of Health or those who gave evidence to or were consulted by the Expert Group (Annex 2).

## **There are four Appendices:**

I is Mr Richardson's Report to us of December 1994,

II is our response to various statements of Mr Richardson, and

IV is a Review of the Toxicology of some Fire Retardant Chemicals.

As Appendix III we attach the Supplementary Report of the CESDI Study of Sudden Unexpected Death in Infancy.

This work was commissioned by the Department of Health on the recommendation of the Expert Group. Three authors of this Supplementary Report are also members of the Expert Group, but responsibility for the Supplementary Report belongs entirely to the authors and not to the Expert Group.

During our deliberations it seemed to us that the proponents of the toxic gas hypothesis may have misinterpreted some published evidence and made some statements that could be misleading. We have addressed such matters in the relevant chapters and additionally in Appendix

## II.

We express our thanks to the many parents who assisted in the important studies commissioned by providing information, who gave permission for infant tissues to be tested and who donated cot mattresses. We are grateful also to the health visitors and other health professionals who collected data, to the many scientists who undertook experimental work, and to other experts whom we consulted. We recognise the large amount of work Mr Richardson has done and we appreciate his collaboration. I would like also to express our deep gratitude to the members of the secretariat for their invaluable scientific and administrative support .

### **Final Report**

We recognise the impossibility of proving a negative but, as members of the Expert Group to investigate Cot Death Theories, we unanimously conclude that our investigations, including our review of the findings of the Turner Report, have found no evidence of harm to infants from PVC mattresses or from use of fire retardant chemicals in cot mattress materials. We submit our Report to the Chief Medical Officer with the hope that the information in each chapter of our Report will be a useful resource for scientists and health professionals now and in the future.

### **Published by the Department of Health**

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**This site last updated 21 May 1998**

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