

Welcome

Welcome to the beautiful city of Auckland and the Sixth SIDS International Conference! How fortunate we are to have an opportunity to meet in such a lovely location. We are gathered here together as a family to share our knowledge and compassion for Sudden Infant Death Syndrome and the many families who have lost precious little lives. We can be proud that through our years of research, education and family support, the SIDS rate in developed countries has dropped dramatically.

International conferences provide a special forum for scientists, health professionals, SIDS parents, and community members to join together in the battle against SIDS. Plenary sessions, workshops, poster walks and social activities all allow us a chance to learn and share our special knowledge of SIDS. Networking with others doing the same things in different countries has led to some very beneficial relationships.

A special focus of this conference in New Zealand is the indigenous populations and those countries with low SIDS awareness. The SIDS rate has not been reduced in these areas and greater attention must be directed here. Learn, share and enjoy your time in New Zealand. Make a special effort to meet others from different parts of the world. When you go home, share what you have gained here and nurture the relationships that you begin here in Auckland. Together we will continue to make a difference.

Best wishes to you all

A handwritten signature in black ink that reads "Kathy Dirks". The signature is written in a cursive, flowing style.

Kathy Dirks
Chairman, SIDS International

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Organisers



Conference Steering Committee

Conference Chair: Felicity Price, SIDS parent, former chair SIDS International
Programme Chair: Dr Ed Mitchell, Assoc. Professor of Paediatrics, University of Auckland Medical School; SIDS researcher
Committee: Lee Schoushkov, Chief Executive, Child Health Research Foundation, New Zealand Cot Death Association
Robyn McKeown, Chair, Parent Advisory Committee, New Zealand Cot Death Association
Riripeti Haretuku, Co-ordinator, Maori SIDS Prevention Team
Eseta Finau, Co-ordinator, Pacific Islands SIDS Prevention
Graeme Baker, former Trustee, Sudden Infant Death Charitable Trust

Abstract Review and Scientific Committee Chairs

Epidemiology: Dr Ed Mitchell
Pathology: Dr Roger Byard
Physiology: Professor Barry Taylor
Interventions: Dr Rodney Ford
Priority Groups: Dr David Tipene-Leach
Psychosocial: Dr Louise Webster
Parent: Robyn McKeown
Management: Lee Schoushkov

SIDS International Executive Committee

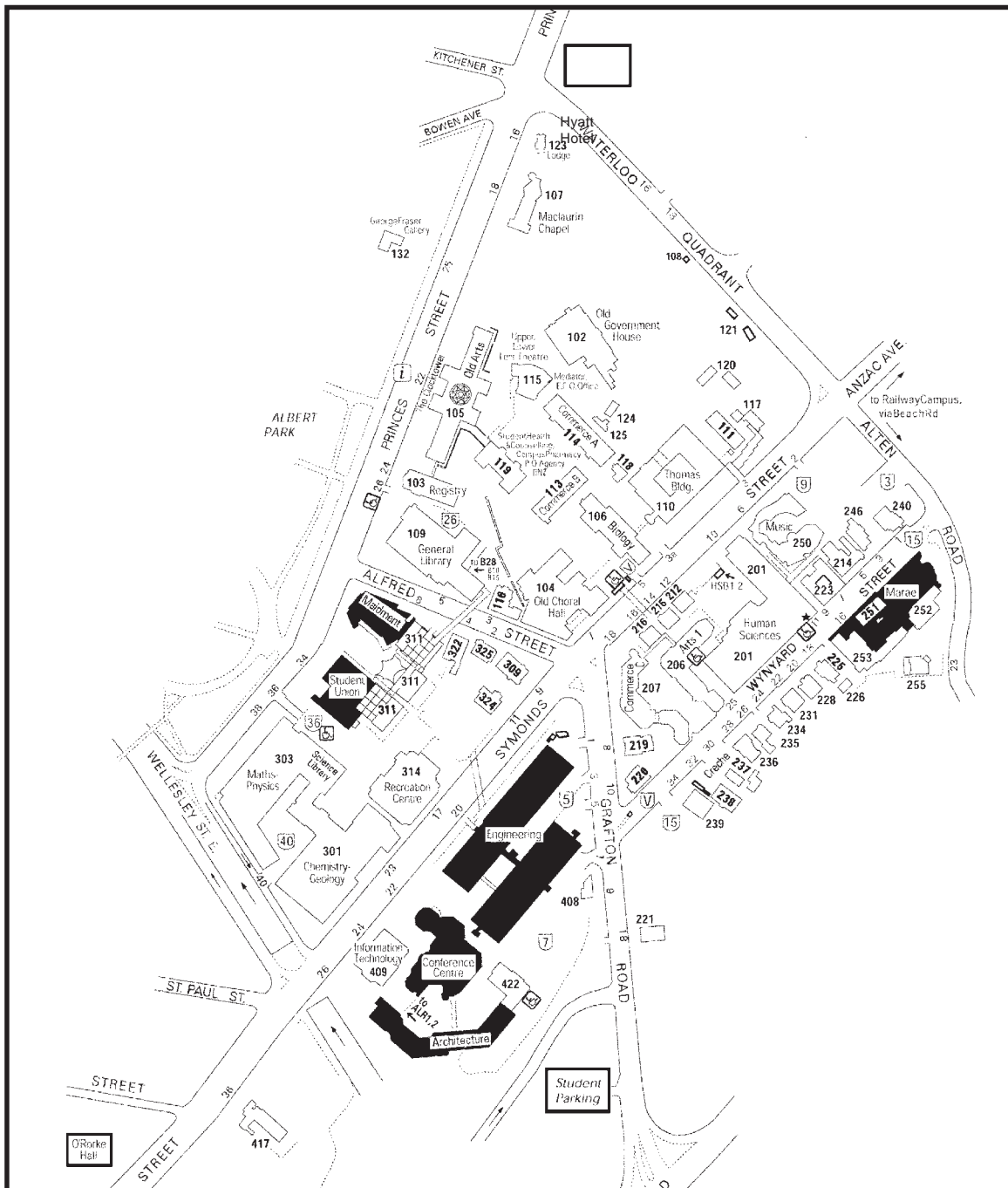
Chairman: Kathy Dirks (USA)
Deputy Chair: Pietro Sebastiani (Italy)
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Michael O'Doibholin (Ireland)
Lauritz Stoltenberg (Norway)
Global Strategy Task Force: Kaarene Fitzgerald (Australia)

SPONSORS

The Organising Committee thank the following organisations for their support:

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Cot Death Association of New Zealand
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Health Research Council of New Zealand
MAM Babyartikel
Ministry of Health (Child and Youth Health)
Scenic Circle Hotels
Safe T Sleep (NZ) Ltd
SIDS New Zealand Inc.
Smokefree
Ted and Mollie Carr Medical Travel Fund
Tomme Tippee

Venue Guide



Registration Desk	Conference Centre 22 Symonds Street	Concurrent Sessions	1.401 Engineering School 20 Symonds Street
Speaker Preparation	ALR3 Architecture School 22 Symonds Street (same building as the Conference Centre)		ALR1, ALR2, ALR4 Architecture School 22 Symonds Street (same building as the Conference Centre)
Plenary Sessions	Maidment Theatre Alfred Street	Polynesian Evening	Sheraton Hotel 83 Symonds Street
People's Forum (Wednesday)	Functions Room (Student Union Building)		

Featured Speakers



Dick Obershaw

Dick is the director and psychotherapist at the Grief Center and Burnsville Counseling Clinic in Minnesota. He is a master presenter who has specialised in grief therapy. His plenary address will set the stage for the rest of the conference and will be of value to both SIDS parents and health professional alike. He will also run workshops for SIDS dads and families during the conference.

André Kahn

Andre is Professor of Paediatrics at the Free University of Brussels in Belgium. He has published extensively on the physiology of infants. His knowledge on apparent life threatening episodes (ALTE) is second to none.

Henry Krous

Henry is Professor of Pathology at the San Diego School of Medicine, California. He is a world renown paediatric pathologist, who has made a major contribution to our knowledge of SIDS. He has been responsible for the development of the standardised autopsies and death scene investigations, which has been implemented throughout the United States and in many other countries.

Leslie Randall

Leslie is a member of the Ni Mii Pu (Nez Perce) Nation. She is a nurse and epidemiologist. For the past 7 years she has worked both as a researcher and a counsellor in the Aberdeen Area Indian Health Servicewith families who have lost infants both as a researcher and a counsellor in the Aberdeen Area Indian Health Service. She was able to combine traditional methods of support to the families as well as western methods.

Roseanne English

Eighteen years ago, Roseanne experienced the death of her two-month old son to SIDS. She is also a nurse. In 1983, she founded the Philadelphia Chapter of the National SIDS Foundation and has been Executive Director of the Pennsylvania SIDS Center for fourteen years where she has gained a wealth of experience in providing SIDS services, particularly to African American and Native

American families.

Tony Nelson

Graduated University of Cape Town in 1978, and worked in South Africa, Zimbabwe, Saudi Arabia, New Zealand, Malawi and Hong Kong. He completed a doctoral thesis on "Sudden Infant Death Syndrome and Child Care Practices" in 1989. Currently he is Associate Professor in Paediatrics at the Chinese University of Hong Kong. Research interests include SIDS and child care, diarrhoeal diseases, childhood obesity and international development aid.

Jim McKenna

Jim is Professor of Anthropology and Director of the Mother-Baby Behavioural Sleep Laboratory, University of Notre Dame. He studies the ecology and evolution of human development, emphasizing cultural influences on childhood and infant sleep environments in relationship to SIDS risks, especially, the role of parental contact in regulating infant sleep physiology. He pioneered laboratory studies of mother-infant co-sleeping in the bedsharing/breastfeeding context.

Lew Lipsitt

Lew is a developmental psychologist, and is now Emeritus Professor at Brown University. He continues to be very active researcher and is supported by a four-year NIH grant to continue the longitudinal work into adulthood on 4,000 children studied since birth. He has authored many articles on infant learning and perception, including papers on SIDS.

Roger Byard

Roger is a Specialist Forensic Pathologist at State Forensic Science in Adelaide and is an Associate Professor with the University of Adelaide. Dr Byard qualified in pathology in Canada and the United States. He has had a longstanding interest in SIDS, sudden childhood death and other aspects of paediatric forensic pathology, and has written numerous papers on this topic.

Programme

To locate the abstract, match the number in front of the title with the same number in the abstract section.

Tuesday 8 February

1000	Powhiri	Waipapa Marae
1230	Lunch	
1400	Opening ceremony Chairperson: Felicity Price Official Poening by the Hon. Tariana Turia	Maidment Theatre
1430	Keynote address: Chairperson: Felicity Price 1 Grief <i>Richard Obershaw (USA)</i>	Maidment Theatre
1530-1600	Afternoon tea	Maidment Theatre
1600-1730	Keynote addresses Chairperson: Ed Mitchell	Maidment Theatre
1600	2 Disadvantaged communities <i>Leslie Randall (USA), N Cobb, RT Bryan.</i>	
1620	3 Arousal and survival mechanisms <i>André Kahn (Belgium)</i>	
1640	4 Contributions of Pathology to SIDS Beginning the New Millennium <i>Henry Krous (USA)</i>	
1700	5 A world view of infant care practices <i>Tony Nelson (Hong Kong)</i>	
1730	Close	
1830	Polynesian Evening	Sheraton Hotel

Wednesday 9 February

0900-1030	Plenary theme: Smoking Chairpersons: Paul Johnson & Paparangi Reid	Maidment Theatre
0900	6 Smoking and SIDS: an epidemiological overview <i>Ed Mitchell (New Zealand)</i>	
0915	7 Pre and postnatal exposure to tobacco smoke- effects on the risk of SIDS <i>Peter Blair (England), PJ Fleming, M Ward Platt, IJ Smith, P J Berry, Jean Golding and the CESDI SUDI research team.</i>	
0930	8 Smoking and Sudden Infant Death Syndrome - Tentative Biological Mechanisms <i>Joseph Milerad (Sweden)</i>	

0945 **9 Oxygen chemoreceptors in perinatal lungs express functional nicotinic acetylcholine receptors-Implications for SIDS**
Ernest Cutz (Canada)

1000 **10 The SmokeChange Programme: Successfully changing smoking in pregnancy**
Rodney Ford (New Zealand)

1015 **11 How successfully are babies protected from passive smoking – a biochemical validation**
Rodney Ford (New Zealand)

1030-1100 **Morning coffee**

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1100-1230 Concurrent symposia

Concurrent symposium: Co-sleeping

Chairpersons: Riripeti Haretuku & Carl Hunt

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1100 **12 Bed Sharing, Cot Death and Public Health Policy – the New Zealand Experience**
Robert Scragg (New Zealand)

1115 **13 Potential Benefits of Mother-Infant Co-sleeping in Relationship To Reducing SIDS: Let's Not Throw Out the Baby With Dangerous Beds or Dangerous Co-sleepers**
James McKenna (France)

1130 **14 Cosleeping - A pathologist's perspective (14)**
Roger Byard (Australia)

1145 **15 Where should babies sleep, alone or with their parents**
Peter Blair (England), PJ Fleming, IJ Smith, M Ward Platt, J Young, P Nadin, PJ Berry, J Golding, and the CESDI SUDI research team.

1200 **16 Bed sharing: a marker for increased close physical contact**
Pat Buckley (Australia), R Rigda, IC McMillen.

1215 **17 A Maori perspective**
David Tipene-Leach (New Zealand)

Concurrent symposium: Pacifiers

Chairpersons: Francesco Cozzi & Rodney Ford

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1100 **18 A reduced risk of SIDS associated with the use of dummies (pacifiers): Findings of the ECAS Study**
Bob Carpenter (England), P.D. England, P. Fleming, J. Huber, L.M. Irgens, G. Jorch, and P. Schroeder.

1115 **19 Dummy (pacifier) use on the Day/Night of Death: Case-control study of sudden infant death syndrome (SIDS) in Scotland, 1996-99**
Hazel Brooke (Scotland), DM Tappin, C Beckett, A Gibson.

1125 **20 A preliminary investigation into when and how a pacifier falls out of a babies mouth during sleep**
Peter Weiss (England)

- 1135 **21 Influence of pacifier on sleep characteristics in healthy infants**
Patricia Franco (Belgium), S Scaillet, S Chabanski, J Grosswasser, A Kahn.
- 1145 **22 Influence of pacifier on autonomic nervous control in healthy infants**
Patricia Franco (Belgium), S Scaillet, S Chabanski, J Grosswasser, A Kahn.
- 1155 **23 The impact of pacifier use on breastfeeding duration**
Alison Vogel (New Zealand)
- 1205 **24 Pacifier and digit sucking infants I: morbidity in the first 18 months of life**
Peter Fleming (England), Kate North, Jean Golding and the ALSPAC study team.
- 1220 **25 Non-nutritive sucking behaviours in children from birth to two**
Art Nowak (USA)

Concurrent symposium: SIDS organisations

ALR1

Chairpersons: Lee Schoushkoff & Joyce Epstein

- 1100 **26 The future of SIDS organisations**
Joyce Epstein (England)
- 1110 **27 The future of SIDS organisations: an Australian perspective**
Kaarene Fitzgerald (Australia)
- 1120 **28 Establishing an Economic Basis for the Norwegian SIDS Society**
Tor G. Hake (Norway)
- 1130 **29 Future directions in bereavement support for SIDS organizations**
Anne Giljohann (Australia)
- 1140 **30 Developing a strategic alliance with the private sector to increase public awareness on SIDS**
Fionna Chapman (Canada), DJ Keays.
- 1150 **31 Declining SIDS rate in Japan corresponds to reduction of risk factors**
Stephanie Fukui (Japan), T. Sawaguchi, H Nishida, Takeshi Horiuchi.
- 1200 **32 Development of FSID's Regional Programme 1990-2000**
Ann Deri-Bowen (England)
- 1210 **33 Consensus on prevention leads to minimal incidence**
Reinier Hopmans (Netherlands)
- 1220 **34 Kits for Kids - Resources for Bereaved Children**
Wendy Claridge (Australia)

1230-1400 Lunch and poster session

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1400-1530 Concurrent free paper sessions

Epidemiology

Chairpersons: Tony Nelson & Peter Blair

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- 1400 **35 Changes in the epidemiological pattern for sudden infant death syndrome (SIDS) in South-Eastern Norway 1984-1998**
Marianne Arnestad (Norway), Marie Andersen, Åshild Vege, Torleiv O. Rognum
- 1410 **36 A study of pregnancy outcomes within western Australian families in which a sudden infant death syndrome (SIDS) death occurred**
Maxine Croft (Australia), A Read, C Bower, M Hobbs, N de Klerk.
- 1420 **37 Epidemiology of sudden infant death syndrome (SIDS) in the Tyrol before and after an intervention campaign**
Ursula Kiechl-Kohlendorfer (Austria), U. Pupp, E. Haberlandt, W. Oberaigner, W. Sperl.
- 1430 **38 Current risk and preventative factors in the Netherlands, 1995-1999**
Monique L'Hoir (Netherlands), AC Engelberts, GA de Jonge.
- 1440 **39 Current epidemiology of SIDS in Ireland, results from a case /control study 1994-98**
Tom Matthews (Ireland)
- 1450 **40 Unaccustomed events and sudden infant death syndrome**
Philip Schluter (Australia), RPK Ford, EA Mitchell, BJ Taylor.
- 1500 **41 Case-control study of sudden infant death syndrome Scotland, 1996-99 - A previously used (old) infant mattress still seems to increase SIDS risk**
David Tappin (Scotland), H Brooke, C Beckett, A Gibson.
- 1510 **42 SIDS infants - How healthy and how normal? A clinical comparison with explained sudden unexpected deaths in infancy**
Martin Ward Platt (England), PS Blair, PJ Fleming, IJ Smith, TJ Cole, CEA Leach, PJ Berry, J Golding and the CESDI SUDI research team.
- 1520 **43 Are the risk factors for sudden infant death syndrome different at night?**
Sheila Williams (New Zealand), EA Mitchell, BJ Taylor.

Pathology

Chairpersons: Jane Zuccollo & Peter Campbell

ALRI

- 1400 **44 Examination of cytokines in laryngeal secretion during acute respiratory disease**
Aashild Vege (Norway), M Arnestad, C Lindgren, TO Rognum.
- 1410 **45 The potential relationship between apneas, apoptosis & brainstem plasticity**
Toshiko Sawaguchi (Japan)

- 1420 **46 Changing practices in certification of sudden unexplained infant deaths in Scotland 1993-98**
Hazel Brooke (Scotland), A Gibson.
- 1430 **47 Exclusion of non-SIDS cases from a group of sudden unexpected deaths in infancy and early childhood - which diagnostic tool gave the diagnosis**
Aashild Vege (Norway), Marianne Arnestad, Torleiv O. Rognum.
- 1440 **48 Mutations in the mtDNA Gene TRNA^{GLY} in SIDS and Controls**
Torliev Rognum (Norway), Opdal SH, Musse MA, Vege Å.
- 1450 **49 Analysis of Cardiovascular and Respiratory Nuclei in Sudden Infant Death Syndrome**
Tahera Ansari (England), M. Rossi, P. Sibbons.
- 1500 **50 Detection of pyrogenic toxins of *Staphylococcus aureus* among German SIDS infants**
Anthony Busuttill (Scotland), A.M Alkout, V.S. James, R. Amberg, and C. C. Blackwell.
- 1510 **51 The effect of Interleukin 10 (IL-10) on inflammatory responses induced by pyrogenic toxins implicated in SIDS**
Osama Al Madani (Scotland), A.E. Gordon, A.M. Alkout, D.M. Weir, A. Busuttill, C.C. Blackwell
- 1520 **52 Sudden infant death syndrome: back to basics**
Larry Becker (Canada)

Physiology

Conference Centre

Chairpersons: André Kahn & Joseph Milerad

- 1400 **53 Bedsharing and overnight monitoring: from the laboratory to the home setting**
Sally Baddock (New Zealand), BC Galland, CA Makowharemahihi, BJ Taylor, DPG Bolton.
- 1415 **54 Bedsharing and the micro-environment of sleep in early infancy: Physiological effects on the infant**
Peter Fleming (England), Andrew Sawczenko, Jeanine Young, Barbara Galland, Peter Blair.
- 1430 **55 Vasoconstrictor responses following spontaneous sighs and head-up tilts in infants sleeping prone and supine**
Barbara Galland (New Zealand), Barry J Taylor, David PG Bolton, Rachel M Sayers.
- 1445 **56 Sleeping position affects arousability of premature infants**
Rosemary Horne (Australia), Bandopadhyay P, Vitkovic J, Andrew S, Chau B, Cranage SM, Adamson TM.
- 1455 **57 The effects of prone sleeping and antenatal maternal smoking on the arousability of the term infant**
Rosemary Horne (Australia), Ferens D, Watts A-M, Lacey B, Andrew S, Vitkovic J., Chau B, Cranage SM, Adamson TM.
- 1505 **58 Evidence as to why phenothiazines are associated with SIDS**
Heather Jefferies (Australia), GM McKelvey, EJ Post, AKW Wood.

1515 **59 Cerebral circulatory responses to repeated and continuous hypoxia in sleeping lambs**
Adrian Walker (Australia), Daniel A Grant, and Jennene Wild.

1530-1600 Afternoon tea

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1600-1730 Concurrent sessions

Safe sleeping environment

Chairpersons: Brad Thach & Shirley Tonkin

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1600 **60 Mechanisms causing the sudden death of infants while sharing a sleep surface with others**
Brad Thach (USA), Kemp, B. Unger, M. Case, M. Graham.

1610 **61 The development of movement in infants**
Susan Beal (Australia)

1620 **62 Hazardous situations for small infants: - car seats and strollers etc**
Shirley Tonkin (New Zealand)

1630 **63 The CESDI SUDI study: cot deaths outside the cot**
Peter Blair (England), PJ Fleming, IJ Smith, M Ward Platt, J Young, P Nadin, PJ Berry, J Golding, and the CESDI SUDI research team.

1640 **64 Dangerous sleeping environments of infants under two years of age**
Caroline De Koning (Australia), Jodie Leditschke, Peter Campbell

1650 **65 The infant positioning project: A professional education initiative**
Stephanie Cowan (New Zealand)

1700 **66 Safe Sleeping Environments for Infants: A CPSC Perspective**
N Scheers (USA), George W. Rutherford, Jr., M.S.

1710 **67 Should the infant sleep in mother's bed?**
Maurice Kibel (South Africa), M F Davies.

1720 **68 Back to sleep and SIDS prevention: Is positional plagiocephaly a real problem?**
Tristan de Chalain (New Zealand), G. Bartlett, A.Law, C. Furneaux, M. Rees.

Bereavement

Chairpersons: Louise Webster & Ann Deri-Bowen

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1600 **69 Risk factors and sudden infant death syndrome: an overview of parenting practices in the republic of Ireland**
Mary McDonnell (Ireland)

1615 **70 Training bereaved parents for peer support**
Nuala Harmey (Ireland), Ger O'Brien, Carmel Finnucane, Margarita Synnott.

- 1630 **71 New initiatives for supporting bereaved parents**
Ann Deri-Bowen (England)
- 1645 **72 Bereavement response to the death of a child**
Ian Mitchell (Canada)
- 1700 **73 Babies of the dreaming - aboriginal families supporting each other in bereavement**
Lynn Briggs (Australia)
- SIDS service development and models** **ALR1**
Chairpersons: Carol Everard & Alison Waite
- 1600 **74 Sudden death liaison officer program. A police initiated support service for bereaved parents that ensures best practice in reporting procedures for sudden infant death syndrome**
Joe Joyce (Australia), B Graydon.
- 1610 **75 Integrated Emergency Response Model**
Michael Corboy (Australia)
- 1620 **76 Police investigation into the sudden and unexpected deaths of infants. The way forward**
Gill Piloni (England)
- 1630 **77 Children's protection workers and SIDS risk reduction. An exploratory project to reduce the risk of SIDS in families known to the Children's Protection Service**
Dorothy Ford (Australia), J Breen.
- 1640 **78 Mortality of babies enrolled on a support programme for vulnerable babies or anxious parents**
Alison Waite (England), JL Emery, RG Carpenter, R Coombs, C Daman-Willems, CMA McKenzie.
- 1650 **79 Risk factors and sudden infant death syndrome: an overview of child health in the republic of Ireland**
Mary McDonnell (Ireland)
- 1700 **80 Unexpected Infant Deaths: The value of death scene investigation and multidisciplinary review**
Peter Fleming (England), P Blair, J Berry.
- 1710 **81 Health care visits by children from birth to two years in an urban health center**
Helen Lerner (USA)
- 1720 **82 Infant care practices in Victoria, Australia, 1997-1998: a population survey to evaluate the effectiveness of enhanced SIDS risk reduction measures**
Dorothy Ford (Australia), C Sanderson, M Wilkinson
- 1730 **83 Getting the reduce the risk advice to disadvantaged populations – a mobile information project**
Joyce Epstein (England)
- 1630-1730 Workshops**
- (1) **84 Fathers do survive SIDS** **ALR2**
Graeme Baker (New Zealand) & Richard Obershaw (USA)

(2) **85 Parents & the media** ALR4
Helen Cormack (Scotland)

1730-1830 People's forum **Functions Room**
Epidemiology: Peter Fleming (England) (Cash bar available)
Physiology: Adrian Walker (Australia)
Grief: Richard Obershaw (USA)
Education: Stephanie Cowan (New Zealand)
Indigenous: David Tipene-Leach (New Zealand)

1900-2000 **Memorial Service** **Waipapa Marae**

Thursday 10 February

0900-1030 **Plenary theme: Indigenous and at risk groups** **Maidment Theatre**
Chairpersons: David Tipene-Leach & Naomi Hall

0900 **86 Indigenous and high risk communities**
Leslie Randall (USA), TK Welty.

0915 **87 At risk groups and socioeconomic determinants**
Rosanne English (USA)

0930 **88 Sitisi: plight and response of pacificans in Aoteroa**
Eseta Finau (New Zealand) Nite Fuamatu, Sitaleki Finau, Colin Tukuitonga.

0945 **89 Reducing the risk of SIDS for aboriginal infants in Australia: developing collaborative strategies**
Jan Carey (Australia), DL Ford.

1000 **90 Competent professional care at time of a SIDS death prevents a lifetime of dysfunction**
Nuala Harmey (Ireland), M. McDonnell.

1015 **91 Integrated SUDI death scene protocol in Christchurch**
Wendy Dallas Katoa (New Zealand)

1030-1100 Morning coffee **Conference Centre**

1100-1300 Concurrent Symposium

Concurrent symposium: Development and behaviour ALR1
Chairpersons: Lewis Lipsitt & James McKenna

1100 **92 Psychobiological considerations**
William Fifer (USA)

1115 **93 Defensive behaviour saves most babies' lives**
Lewis Lipsitt (USA)

1130 **94 Childcare as an adaptive system and SIDS prevention: re-articulating the Infant's dis-articulated caregiving environment**
James McKenna (France)

- 1145 **95 Influence sleep position experience on ability of prone sleeping infants to escape from asphyxiating microenvironments by changing head position**
Brad Thach (USA), Dorota A. Paluszynska, Kathleen A. Harris.
- 1200 **96 A study of night-time infant care practices: A comparison of room-sharing and bed-sharing in a group of mothers and their infants of low-risk for SIDS**
Jeanine Young (England), Peter Blair, Katie Pollard, Peter Fleming, Andrew Sawczenko.
- 1215 **97 Exhaled air accumulation in the infant sleeping environment and the prevention of sudden infant death**
Andrew Corbyn (Papua New Guinea)
- 1230 **98 Infant care practices among Alberta Cree, Canada**
Elizabeth Wilson (Canada)
- 1245 **98A Bedsharing practices of different cultural groups**
Sally Baddock (New Zealand)

Concurrent symposium: High risk populations and socioeconomic determinants

**Engineering
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Chairpersons: Laura Hillman & Pauline Hopa

- 1100 **99 Child care decisions of deprived parents - what matters to them?**
Michael Wailoo (England), E. Anderson & SA Petersen.
- 115 **100 Sudden Infant Death Syndrome (SIDS) and infant care practices in Saskatchewan, Canada**
Koravangattu Sankaran (Canada), Meleth, Annal Dhananjayan; Meleth, Sreelatha and Sankaran, Rajini.
- 1130 **101 Infant sleeping practices in North Queensland: A survey of indigenous and non-indigenous women**
John Whitehall (Australia), P Cole, R Muller and K. S. Panaretto.
- 1145 **102 What do aboriginal mothers know about reducing the risks of SIDS?**
Sandra Eades (Australia), AW Read, The Bibbulung Gnarnep Team.
- 1200 **103 "Reduce the Risk" – Efforts to improve effectiveness in reaching aboriginal peoples in Canada**
Debra Keays (Canada) A Corriveau, F Chapman.
- 1215 **104 Telephone subsidy enhances participation of socioeconomically disadvantaged families without telephones in collaborative home infant monitoring evaluation (CHIME)**
Carl Hunt (USA)
- 1230 **105 Sudden infant death syndrome in native and non-native population: trends over 19 years**
Ian Mitchell (Canada)

- 1240 **106 Taking care of baby – a joint programme between aboriginal organisations and SIDS Northern Territory to develop culturally appropriate resource material**
Jenny Ganter (Australia), Jenny Baraga, Dawn Cardona, Kim Low Choy, Margaret King, Marlene Liddle, Margaret Richards, Wanatu Stephenson, Pat Williams.
- 1250 **107 Examination of SIDS risk factor, attitudes and behaviours among racially diverse mothers in a high risk rural population**
Laura Hillman (USA), J Davis, C. Molitor; C. Mothershead.

Concurrent symposium: Imposed apnoea

Chairpersons: André Kahn & Hazel Brooke

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- 1100 **108 Clinical aspects**
Martin Samuels (UK)
- 1130 **109 Unnatural deaths as a cause of SIDS**
Sara Levene (UK)
- 1145 **110 The differential diagnosis of imposed suffocation or SIDS? An approach to solve the question**
Torliev Rognum (Norway)
- 1200 **111 Intra-alveolar pulmonary siderophages, acute pulmonary haemorrhage and nasal haemorrhage: markers for imposed suffocation?**
David Becroft (New Zealand)
- 1215 **112 Physiological recordings in SIDS, ALTEs and imposed apnoea**
Christian Poets (Germany), Martin P Samuels, David P Southall.
- 1240 **Discussion**

1200-1300 Workshop

- 113 Bereaved children - their needs** **ALR2**
Nuala Harmey (Ireland)
- 1300 Lunch **Conference
Centre**

Friday 11 February

0900-1030 Plenary theme: Current controversies

Chairpersons: Ed Mitchell & Kaarene Fitzgerald

**Maidment
Theatre**

- 0900 **114 The relationship between vaccines, breastfeeding, temporarily dysfunctional reticuloendothelial system, E.Coli, lipopolysaccharide, endotoxemia and SIDS**
Hilary Butler (New Zealand)
- 0915 **115 Immunisation: A protective factor against SIDS**
Martin Ward Platt (England), PJ Fleming, PS Blair, IJ Smith, P J Berry, Jean Golding, and the CESDI SUDI research team.
- 0925 **116 Immunisation is not a risk factor in SIDS**
Martina Findeisen (Germany), MMT. Vennemann, G. Jorch, E. Mueller, B. Brinkmann.

- 0935 **117 Microbiological Studies of Sheepskin Bedding**
William Cullen (Canada)
- 0950 **118 The CSEDI SUDI case-control study: No evidence to support the 'Toxic gas' hypothesis for SIDS**
Peter Fleming (England), Peter Blair, Jem Berry, Martin Ward-Platt, Iain Smith and the CSEDI SUDI research team.

1010 **119 Screening for long QT interval**
Marco Stramba-Badiale (Italy)

1025 **Discussion**

1030-1100 Morning coffee

**Conference
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1100-1245 Concurrent sessions

Education

Chairpersons: Stephanie Cowan & David Tappin

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- 1100 **120 Building social capital strategies to reduce SIDS in communities of colour**
Naomi Hall (USA)
- 1110 **121 The effect of home-based motivational interviewing on the smoking behaviour of pregnant women. A pilot randomised controlled trial**
David Tappin (Scotland), MA Lumsden, C McKay, D McIntyre, H Gilmour, R Webber, S Cowan, F Crawford, F Currie.
- 1120 **122 Impact of the back to sleep campaign on SIDS risk factors in the United States, 1990-97**
Marian MacDorman (USA), C-W Ko, HJ Hoffman, M Willinger.
- 1130 **123 Teaching and learning strategies for marginalised groups in society**
Catherine Henniker (Australia)
- 1140 **124 Development of a teaching package for accident and emergency nurses on the management of sudden death in infancy from a personal involvement**
Carolyn Stead (England)
- 1150 **125 Babysitters of today parents of tomorrow - Working with schools to inform, educate and promote the 'Reduce the risks' message**
Lin Roche (England)
- 1200 **126 "Reduce the risk" campaign in Norway**
Hilde Eriksen (Norway)
- 1210 **127 Child death review: An effective community based approach to improve SIDS investigation, intervention, and risk reduction efforts**
Theresa Covington (USA)
- 1220 **128 Fran's successful failure**
Stephanie Cowan (New Zealand) Anne O'Malley, Rodney Ford.

- 1230 **129 Evaluation of a strategy to prevent sudden infant death syndrome (SIDS)**
Alejandro Jenik (Argentina), S Cowan, JM Ceriani Cernadas, EAS Nelson.
- Physiology**
 Chairpersons: Adrian Walker & Brad Thach
- 1100 **130 Sudden infant death syndrome (SIDS) and the Jervell and Lange-Nielsen syndrome (JLNS) in Norway**
Marie Andersen (Norway), M Arnestad, CV Isaksen, H Torgersen, Å Vege, TO Rognum.
- 1115 **131 Dummy Sucking And Oral Breathing In Newborn Infants**
Francesco Cozzi (Italy), O Aljbour, C Tozzi, F Morini, E Bonci, DA Cozzi.
- 1130 **132 Pacifier and digit sucking infants III: Physiological effects**
Peter Fleming (England), Katie Pollard, Jeanine Young, Peter Blair, Andrew Sawczenko.
- 1145 **133 Prone sleeping affects circulatory control in infants**
Tom Matthews (Ireland)
- 1200 **134 Effects of risk factors for SIDS on the development of heart rate patterns**
Stewart Peterson (England), MP Wailoo, A Jackson, C Pratt.
- 1215 **135 Gastroesophageal reflux and apnea of prematurity: Is there a relationship?**
Christian Poets (Germany), CS Peter, N Sprodowski, B Bohnhorst, J Silny.
- 1230 **136 The effects of maternal smoking and diet on growth and cardiorespiratory development telemetred from the home during sleep in infants**
Paul Johnson (England), Andrews DC, Bawtree L, Mathews F, & Neil A.
- 1245 **137 Immunisation does not alter infant sleep-wake activity**
Pat Buckley (Australia), A Lokuge, IC McMillen.
- Bereavement**
 Chairpersons: Judy Freiman & Graeme Baker
- 1100 **138 The use of a bereavement assessment tool with families after the sudden death of a child: Impact on quality of care**
Ann Dent (England), Peter Fleming, Peter Blair.
- 1115 **139 Lessons from an ancient story of grief for the new millennium**
Judy Freiman (Australia)
- 1130 **140 Care and assistance after SIDS and children-accidents**
Dag Nordanger (Norway), K. Dyregrov and A. Dyregrov

ALRI

**Engineering
1.401**

1145	141 Grandparent bereavement - challenge and change <i>Alison Stewart (New Zealand)</i>	
1200	142 SIDS Parents Responding to Families: The Wellington Experience <i>Madeleine Taylor (New Zealand)</i>	
1215	143 Creative Memories <i>Sue Wilkinson (Australia), Vivienne Bateman.</i>	
1200-1300	People's Forum Pathology: Roger Byard (Australia) Epidemiology: Peter Blair England) Indigenous: Riripeti Haretuku (New Zealand)	ALR2/ALR4
1245-1330	Lunch	Conference Centre
1330-1430	POSTER WALK Presenters to be by posters Facilitators: Clinical & Physiology: Barry Taylor (New Zealand) Pathology: Roger Byard (Australia) Education, SIDS organisations: Rodney Ford (New Zealand) Bereavement: Richard Obershaw (USA) Epidemiology and Indigenous: Peter Fleming (England)	
1430	Final Plenary Session Chairpersons: Sylvia Limerick & Marco Stramba-Badiale	Maidment Theatre
1430	144 Infant care practices: what should we advise <i>Tony Nelson (Hong Kong)</i>	
1445	145 Physiology: major questions to be addressed <i>André Kahn (Belgium)</i>	
1500	146 Pathology: major questions to be addressed <i>Henry Krous (USA)</i>	
1515	147 Disadvantaged communities – the future <i>Rosanne English (USA)</i>	
1530	148 The future direction for SIDS research and prevention – to lead or be led? <i>Kaarene Fitzgerald (Australia)</i>	
1545	Closing ceremony	

Poster Presentations

149 SUDDEN UNEXPECTED DEATH WHEN YOUR CHILD IS OVER ONE YEAR OF AGE

Graeme Baker (New Zealand)

150 BEREAVEMENT SUPPORT VIA THE INTERNET

Karon Cox (Australia)

151 VIDEO AS GRIEF SUPPORT

T. Giving Kalstad (Norway)

152 SEMINAR FOR UNPROCESSED GRIEF

D. Nordanger, (Norway) T. Giving Kalstad

153 BEREAVED KIDS

Pauline Ingram (New Zealand)

154 REDUCTION OF SUDDEN INFANT DEATH SYNDROME - IMPACT ON BEREAVEMENT SUPPORT SERVICES FOR FAMILIES

Yani Switajewski (Australia)

155 SIDS PARENTS CONTRIBUTING TO A SIDS ORGANISATION

Lesley and Peter Jones (Australia)

156 DEVELOPING AN EFFECTIVE PUBLIC EDUCATION AND AWARENESS CAMPAIGN ON SIDS

JF Hazel, (Canada) S Cotroneo

157 EXPANSION OF SERVICES BY SIDS NEW SOUTH WALES - THE PROCESS

Michael Corboy (Australia)

158 FEWER BEREAVED PARENTS - LESS TAKE UP OF BEFRIENDER SUPPORT - WHAT NEXT FOR THE SIDS ORGANISATIONS?

Ann Deri-Bowen (UK)

159 THE AUSTRALIAN SIDS ONLINE CATALOGUE

Joanna Durst (Australia)

160 EXTENDED SEMINARS FOR BETTER PARENTAL SUPPORT

H.Eriksen (Norway)

161 REGIONAL BEREAVEMENT SUPPORT COOPERATION

H.Eriksen (Norway)

162 PARTICIPATION IN RESEARCH: INFORMED CONSENT, MOTIVATION AND INFLUENCE

Rebecca Hayman (New Zealand)

163 SUPPORT AND INFORMATION OFFERED TO ACCIDENT AND EMERGENCY DEPARTMENTS IN THE NORTHERN REGION OF ENGLAND

G. Latter (UK)

164 THE POWER OF THE HOME VISIT FOR EXTENDING THE INFLUENCE OF SMOKING INTERVENTIONS

Carol Reardon (New Zealand)

165 DEVELOPING AN EFFECTIVE PARTNERSHIP TO REDUCE THE RISK OF SIDS IN CANADA

R. Sloan, (Canada) M. Labrèche

166 OUR BABY DIED FROM SUDDEN INFANT DEATH SYNDROME

Carolyn Stead (England)

167 EVALUATION OF INFORMATION CAMPAIGN AGAINST SIDS IN THE NORTHEASTERN OF POLAND

Jolanta Wasilewska (Poland)

168 RISK SCORING FOR SIDS - EPIDEMIOLOGICAL & ENVIRONMENTAL FACTORS

PS Blair, (UK) PJ Fleming, M Ward Platt, IJ Smith P J Berry, Jean Golding, and the CESDI SUDI research team.

69 WEIGHT GAIN AND SIDS : POOR GROWTH AMONGST THOSE INFANTS BORN WITH A NORMAL BIRTHWEIGHT

PS Blair, (UK) P Nadin, TJ Cole, PJ Fleming, IJ Smith, M Ward Platt, PJ Berry, J Golding, and the CESDI SUDI research team.

170 THE CESDI SUDI CASE-CONTROL STUDY: THE THERMAL ENVIRONMENT OF INFANTS DURING SLEEP AND THE RISK OF SIDS

Peter Fleming, (UK) Peter Blair, Jem Berry, Martin Ward-Platt, Iain Smith and the CESDI SUDI research team.

171 IS THERE A GENETIC COMPONENT TO THE INFLAMMATORY RESPONSES IMPLICATED IN SIDS?

A.E. Gordon, (Scotland) D.A.C. MacKenzie, D.M. Weir, A. Busuttill, C.C. Blackwell

172 FUTURE DIRECTIONS FOR SIDS RESEARCH

Dr Sara Levene (UK)

173 HONG KONG CASE-CONTROL STUDY OF UNEXPECTED INFANT DEATH: LEGAL, ETHICAL AND PRACTICAL ISSUES

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174 DEATH-SCENE INVESTIGATION IN THE GERMAN CASE-CONTROL STUDY ON SIDS

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175 A WAY OF SIDS INVESTIGATION IN FORENSIC PRACTICE

Klara Toro, (Japan) Gyorgy Dunay, Toshiko Sawaguchi, Akiko Sawaguchi

176 THE BMBF SIDS STUDY IN GERMANY: PRELIMINARY RESULTS FROM A NATION WIDE STUDY

MMT Vennemann, (Germany) M. Findeisen, E. Müller, B. Brinkmann

177 SIDS INFANTS – HOW HEALTHY AND HOW NORMAL? A CLINICAL COMPARISON WITH EXPLAINED SUDDEN UNEXPECTED DEATHS IN INFANCY

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180 ABORIGINAL MOTHERS: CHILD CARE KNOWLEDGE AND FACTORS

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181 SUDDEN INFANT DEATH SYNDROME IN INDIGENOUS AND NON INDIGENOUS INFANTS IN NORTH QUEENSLAND: 1990-1998

J Whitehall1, (Australia) KS Panaretto1, G McBride.

182 VOLUMETRIC ANALYSIS OF PLACENTAL TISSUE FROM INFANTS SUCCUMBING TO SUDDEN INFANT DEATH SYNDROME (SIDS) AND INTRA UTERINE GROWTH RETARDED (IUGR) INFANTS.

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183 STEREOLOGICAL ESTIMATION OF TOTAL VILLOUS SURFACE AREA IN PLACENTAS FROM SUDDEN INFANT DEATH SYNDROME (SIDS) CASES AND INTRA UTERINE GROWTH RETARDED (IUGR) CASES.

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184 PLACENTAL VILLI AND INTERVILLOUS SPACE DEVELOPMENT IN SUDDEN INFANT DEATH SYNDROME (SIDS) AND INTRA UTERINE GROWTH RETARDED (IUGR) CASES.

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185 GENETIC, DEVELOPMENTAL AND ENVIRONMENTAL FACTORS CONTRIBUTING TO SUSCEPTIBILITY TO SIDS: THE NEED FOR MULTIETHNIC STUDIES

C.C. Blackwell, (Scotland) D.M. Weir, A. Busuttill

186 WHY IS THE PRONE SLEEPING POSITION A SIGNIFICANT RISK FACTOR FOR SIDS?

N. Molony, (Scotland) A. Busuttill, D.M. Weir, C.C. Blackwell

187 ACUTE GRIEF SUPPORT IN SUDDEN UNEXPECTED DEATHS IN INFANCY (SUDI)

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188 CRIB DEATH, COT DEATH & SIDS. A TRILOGY

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189 RESULTS OF THOROUGH INVESTIGATIONS IN 81 CONSECUTIVE SUDDEN AND UNEXPECTED DEATHS IN INFANTS AND CHILDREN.

C Rambaud, (France) E Briand, M Guibert, D Cointe, H Razafimahefa, J de Laveaucoupet, A Coulomb, F Capron, M Dehan.

190 PATHOGENESIS OF ALTE IN INFANTS WITH NASAL OBSTRUCTION

DA Cozzi, (Italy) A Piserà, M Ilari, A Casati, F Morini, F Cozzi

191 ALTE IN INFANTS WITH NASAL OBSTRUCTION

F Cozzi, (Italy) A Piserà, L Oriolo, F Morini, A Casati, DA Cozzi.

192 PARENT REPORTED SLEEP DISORDERED BREATHING AND BEHAVIOURAL FEATURES IN 2-4 MONTH-OLD INFANTS

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193 IS YOUR MONITOR REALLY NECESSARY?

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194 RESEARCH ON PREVENTION OF SUDDEN INFANT DEATH AND METHODS FOR SELECTION OF HIGH RISK GROUPS

Klara Toro, (Hungary) Loretta Toth, Zsuzsanna Csukas, Ferenc Rozgonyi, Toshiko Sawaguchi, Akiko Sawaguchi

195 KANGAROO CARE (KC), APNOEA OF PREMATURITY (AOP) AND BODY TEMPERATURE

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196 THE EFFECT OF MATERNAL SMOKING IN PREGNANCY ON INFANT RESPONSES TO PERIODIC THERMAL STIMULUS

Browne CA, Colditz PB, (Australia) Dunster KR.

197 GABA RECEPTOR IN HUMAN PERINATAL ASPHYXIA

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198 PACIFIER AND DIGIT SUCKING INFANTS II: DEVELOPMENTAL CHANGE AND BEHAVIOURAL EFFECTS

Katie Pollard, Peter Fleming, (UK) Jeanine Young, Peter Blair, Andrew Sawczenko

199 A MATHEMATICAL MODEL OF OVERNIGHT TEMPERATURE CHANGES IN INFANTS: INVESTIGATION OF THE EFFECTS OF EPIDEMIOLOGICAL RISK FACTORS FOR SIDS.

Linda Hunt, Peter Fleming (UK) Andrew Sawczenko, Ruth Wigfield.

200 RT-ISH: A NOVEL METHOD FOR DETECTING RECEPTOR SUBUNITS IN VIVO.

A.J. Hawkins (Australia) and P.R. Dodd

201 AUTOMONIC RESPONSES IN INFANTS WHO HAD APPARENT LIFE THREATENING EVENTS (ALTE) OR IRRITABILITY (IRR)

RM Hayman, (New Zealand) BC Galland, BJ Taylor, DPG Bolton, RM Sayers.

202 VENTILATORY RESPONSES OF ALTE INFANTS AND INFANTS WITH A HISTORY OF IRRITABILITY

RM Hayman, BC Galland, BJ Taylor, DPG Bolton, RM Sayers.

203 EFFECTS OF HYPERTHERMIA AND MURAMYL DIPEPTIDE ON IL-1b, IL-6 AND MORTALITY IN NEONATAL RAT MODEL

EAS Nelson, (China) Wong Yin, K Li, TF Fok, LM Yu.

204 THE MOEBIUS STRIP AND THE SUDDEN DEATH OF AN INFANT DURING SLEEP

T.Sawaguchi (Japan)

205 CAPNOGRAPHY AND PREMATURITY, AGE AND POSITION EFFECTS

E Tirosh, (Israel) A Bilker, D Bader, A Cohen.

**207 TRANSIENT AROUSALS AT APNEA
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AROUSALS AT APNEA TERMINATION**

H. Wulbrand (UK)

**208
OXYGENATION AND BREATHING
PATTERN IN HEALTHY TERM INFANTS
DURING SLEEP**

*J. Milerad, (Sweden) E Horemuzova, M
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**209 ALTERED BREATHING PATTERN
AND TACHYCARDIA IN YOUNG LAMBS
EXPOSED TO NICOTINE PRENATALLY**

*J. Milerad, (Sweden) H.W. Sundell, O.
Hafström, P.A. Minton, S Poole*

**210 PRENATAL NICOTINE EXPOSURE
(PNE) ALTERS SLEEP-RELATED
MODULATION OF VENTILATION IN
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*J. Milerad, (Sweden) HW. Sundell, O.
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**211 FLEXIBLE LARYNGOSCOPIC
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OBSTRUCTIVE SLEEP APNEAS OF
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*Joseph Milerad, (Sweden) Stefan
Johansson , Gunnar Biorck , Miriam Katz-
Salamon.*

**212 SAFE T SLEEP MAY REDUCE
INCIDENCE OF SIDS**

Miriam Rutherford, (New Zealand)

Social Programme

TUESDAY 8th

Polynesian Evening

18:00hrs

Sheraton Auckland Hotel

Dress: tidy casual

One ticket is included in the delegate registration fee

Guest tickets - \$90 (subject to availability)

THURSDAY 10th

Waiheke Island Experience

13:40-21:00

Dress: tidy casual, take a hat and sunscreen
Tickets - \$108 per person; including wine tasting and dinner (bookings close Wednesday 13:00hrs)

Beverages (other than wine tasting) – own cost

Assemble at the Registration Desk 10 minutes prior to departure

New Zealand's Best

14:00-20:00

Dress: tidy casual, take a hat and sunscreen
Tickets - \$60 per person; including dinner (bookings close Wednesday 13:00hrs)

Beverages – own cost

Assemble at the Registration Desk 15 minutes prior to departure

SIGHTSEEING TOURS

WEDNESDAY 9th

Full Day Wilderness Experience

09:15-17:00

Dress: casual, take a hat and sunscreen, flat-soled sturdy shoes a must

Wet weather gear supplied if required.

Tickets - \$99 per person; including lunch (bookings close Tuesday 15:00hrs)

Assemble at the Registration Desk 10 minutes prior to departure

SATURDAY 12th

Waitomo/Rotorua Tour

You will be collected from your hotel/hostel. For your pick-up time please refer to your ticket.

Dress: casual

Tickets - \$215 per person; including morning tea, light lunch and an evening snack (subject to availability)

Wednesday 9th

19:00-2000 **MEMORIAL SERVICE**

Waipapa Marae

FIELD OF FLOWERS

We are putting together a wall display of a "Field of Flowers". Parents attending the conference are invited to provide a flower they have made themselves to commemorate the unique little person they lost to SIDS. The flower can be made of any material but it must not be bigger than 5cm x 5cm. It needs to have a stem that will withstand being pushed through flat matting (a toothpick, skewer or wire will work).

General Information

The following information is offered to make your conference attendance as pleasant and as trouble-free as possible. If you require help, please call at the Registration Desk in the foyer of the Conference Centre and we will do everything we can to assist you.

Airport Departure Tax

An airport tax of NZ\$20 per person is payable on departure from New Zealand.

Badges

As a security requirement, delegates will be required to wear their conference name badges to all sessions and social functions. No-one will be admitted to sessions without a badge.

Banking Facilities

The following banks are located in or near Auckland University:

ASB Bank

Penbrooke House
31 Princes St
Telephone: 306 3066
Hours: 09.00-16.30hrs

National Bank

19A Princes St
Telephone: 358 5149
Hours: 09.00-16.30hrs

Bank of New Zealand

Old Arts Building, Auckland University
Telephone: 373 6556
Hours: Monday/Thursday/Friday
09.00-16.30hrs
Tuesday/Wednesday 09.30-16.30hrs

Buses

Details of the Link Bus are included at the back of the Auckland Guide in your satchel and the route for the free inner city bus is on the fold-out map attached to the front of the guide.

Carparking

Carparking is available in the Wilson Carpark near the intersection of Grafton Road and Stanley Street. Entrance is from Grafton Road.

The carpark is open at the following times:

Monday-Friday 24 hours
 \$4.00 per day
Saturday & Sunday 24 hours - no charge

Credit Cards

American Express, Diners, Mastercard and Visa are accepted in most shops and hotels in New Zealand. These credit cards will also be accepted for all conference fees.

Dress

Dress for all business sessions and social functions is casual.

Facsimiles

If you wish to send a facsimile, please contact the Registration Desk.

Goods and Services Tax

Goods and services in New Zealand are subject to a 12.5% Goods and Services Tax (GST). This is usually included in the price and it is clearly stated if it is not. This tax cannot be claimed back when leaving the country.

Messages

Messages will be displayed on the message and information board by the Registration Desk. If you wish to have a message left for you or a facsimile sent to you during the conference the numbers for those sending the message or the facsimile are:

Telephone: +64 21 659 240

Facsimile: +64 9 360 1242

Medical Services

Emergency medical services are available on a 24 hour, 7 day basis at the Southern Cross Accident and Emergency Central Care, 122 Remuera Road, Auckland, telephone: 524 5943.

In an emergency **dial 111** for an ambulance, the police or the fire department.

Pharmacies

Pharmacy & Post Office

Auckland University
Old Arts Building (by Clock Tower)
Telephone: 373 7999
Hours: Monday-Friday
08.00-17.30hrs

Pharmacy 246

246 Queen Street, Auckland
Telephone: 379 4362
Hours: Monday-Thursday
08:00-18:00hrs
Friday 08:00-19:00hrs
Saturday 10:00-16:00hrs
Sunday Closed

Newmarket Urgent Pharmacy

60 Broadway, Newmarket
Telephone: 520 6634
Hours: Monday-Friday
18:00-23:00hrs
Saturday-Sunday 09:00-23:00hrs
Prescription only 23:00-07:30hrs

Postal Facilities

The nearest Post Office is in the Bledisloe Building, adjacent to the Aotea Centre or at Auckland University in the Old Arts Building adjacent to the Clock Tower.



Refreshments

Lunch, morning coffee and afternoon tea are included in your registration fee and are provided during the programmed breaks in the Conference Centre with the exception of the Tuesday afternoon tea which will be served in the foyer of the Maidment Theatre.

Registration Desk

The Registration Desk is located in the Conference Centre.

Telephone: +64 21 659 240

Facsimile: +64 9 360 1242

It will be open at the following times:

Monday 7 th	1700-1900hrs
Tuesday 8 th	0800-1800hrs
Wednesday 9 th	0800-1730hrs
Thursday 10 th	0800-1400hrs
Friday 11 th	0800-1530hrs

Shopping

Shopping hours vary but are usually 09:00-17:30hrs Monday to Friday and 09:30-16:00hrs on Saturdays. There is some limited shopping on Sundays.

Smoking

All the conference venues are smoke free buildings. Delegates are requested to observe this policy.

Special Dietary Requirements

If you have advised any special dietary requirements on your registration requirements, these will have been onforwarded to the caterers to prepare special meals for lunches and the Polynesian Evening. Please ask the catering staff to bring you your special meal.

Speaker Preparation Room

Please report to the room (ALR3) well in advance of your presentation to check your audio-visual aids.

Taxis

As there is no taxi rank close to the conference venue, we suggest that you book by telephone (there is a telephone which accepts Telecom phone cards and credit cards in the foyer of the Conference Centre). Tell the taxi company to collect you from outside the Architecture School at the

University, 22 Symonds Street.

Tipping

Tipping is not usual practice in New Zealand and is only offered for good service.

Telephone Directory

Emergency Services

111 (fire/police/ambulance)

Registration Desk

Telephone: 021 659 240

Facsimile: 360 1242

Accident & Medical Clinic

Telephone: 524 5943

(122 Remuera Rd, Remuera)

After Hours Pharmacy

Telephone: 520 6634

Auckland Visitors Centre

Telephone: 366 6888

Telephone Directory Enquires

National 018

International 0172

Taxi Services

Co-op Taxis 300 3000

Corporate Cabs 0800 733 833 or 631 1111

Airlines

Reservations	Arrival/Departure Information
Air New Zealand 357 3000	306 5560
Ansett Australia 0800 736 409	0800 736 409
Ansett New Zealand (Domestic) 0800 267 388	0800 267 388
British Airways 356 8690	306 5575
Cathy Pacific Airways 379 0861	256 8232
Malaysia Airlines 0800 657 472	306 5579
Qantas 357 8900	367 2325
Singapore Airlines 303 2129	306 5565
United Airlines 379 3800	367 2324

Hotels

Cambridge Apartments	375 9300
Cintra Apartments	379 6288
Copthorne, Anzac Avenue	914 2610
Hyatt Regency Hotel	366 1234
O'Rorke Hall	373 7599
Oxford Apartments	358 3328
Park Towers Hotel	309 2800
Sheraton Hotel	379 5132

Conference Abstracts

1 THE SURVIVORS OF A CHILD'S DEATH: PARENTS AND PROFESSIONALS

Richard Obershaw

Burnsville Grief Center, US

In this presentation we will explore the grief reactions of both groups and focus on the shared feelings. The focus will be on bringing together all of those assembled at this conference with one shared experience-GRIEF

2 DISADVANTAGED COMMUNITIES

LL Randall, N Cobb, RT Bryan

*Centers for Disease Control and
Prevention and Indian Health Service,
Albuquerque, NM*

What is a disadvantaged community and how does it differ from indigenous populations? Definitions of disadvantaged communities, indigenous populations, and the difference between the two will be examined along with a historical perspective of how some American Indian and Alaska Native (AI/AN) and indigenous populations became disadvantaged. A disadvantaged community is a group of people that experiences disparity of health, privilege, income and opportunity in relation to the larger population. It can be a subgroup of any population regardless of race or creed although skin color is often a factor. Indigenous populations are populations that have lived in the area the longest time. These may be conquered or colonized populations. They may be self sufficient with health status and SES comparable to the total population. They, often, become disadvantaged populations after acculturation or assimilation. Historically, through contact with European explorers, introduction of new species of mosquito, rats, and infectious diseases such as smallpox, yellow fever, many indigenous populations have been decimated (Bryan, 1999). Other factors such as racism and discrimination affect disparities; opinions differ over how much these factors influence the disease process. In the United States the AI/AN have experienced a decline from healthy tribes that followed traditional diets and culture to tribes riddled with chronic diseases such as diabetes, cancer and heart disease. While most infectious diseases are declining among AI/AN, chronic diseases are occurring in epidemic proportions. AI/AN rates for diabetes are highest in the nation, and survival rates for cancer are among the

lowest. AI/AN suicide rate is 70% higher than the U.S. all races and diseases of the heart are the leading cause of death. Age adjusted death rates were greater by large percentages than the U.S All Races for alcoholism (579%), tuberculosis (475%), diabetes (231%), and accidents (212%). Even though tremendous strides have been made in reducing infant mortality, AI/AN have the highest postneonatal mortality rate which is twice the White rate and a SIDS rate three times the White rate (Trends 1997).

3 Arousal and Survival Mechanisms

André Kahn

*Free University of Brussels, Brussels,
Belgium*

4 CONTRIBUTIONS OF PATHOLOGY TO SIDS BEGINNING THE NEW MILLENIUM

Henry E. Krous

*Children's Hospital-San Diego &
University of California, San Diego School
of Medicine*

Pathologists have added to our understanding of SIDS in the past and are well positioned to contribute in the future. This presentation focuses upon three recent San Diego SIDS Research Project studies.

Neck Rotation and VA Compression Hypothesis

Hypothesis: Some SIDS cases result from neck extension and/or rotation causing VA compression and brainstem ischemia.

Aim: To compare neck rotation & extension in 246 SIDS cases and 56 natural infant deaths. In this retrospective analysis, neck position classified into 3 groups: 1. Either neutral or flexed forward, & not rotated, 2. Either extended *or* rotated and 3. Extended *and* rotated. Since neck flexion has not been hypothesized to cause VA compression, it was treated the same as neutral neck position.

Results: Simultaneous neck extension & rotation was not reported in either group. When data regarding neutral/flexed/extended position and rotation of the neck were combined, significant differences were not found between the two groups ($P=.94$). 40% of SIDS cases and 41% of natural deaths were found with the neck either extended or rotated (OR 0.97, 95% CI 0.45, 2.11). There were no significant differences between the groups when neck rotation & extension were analyzed independent of one another. Neck rotation among cases found *prone* was

common and not significantly different between the two groups (49% of 146 SIDS cases, 58% of 24 natural deaths, $P=.38$; OR 0.68, 95% CI 0.28, 1.62). Neck rotation among infants found in the *supine* position occurred one third as often in the SIDS group (9% of 33 cases) as in the natural death group (29% of 14 cases), however, the difference was not significant ($P=.17$; OR 0.25, 95% CI 0.05, 1.31).

Conclusion: Our analysis found no evidence to affirm the importance of neck rotation in SIDS.

Intrathoracic Petechiae (IP) and Found Face Position

IP are common in SIDS and can develop after breathing against an obstructed airway or deep gasping. Prone sleep, a risk factor for SIDS, may cause external oronasal airway obstruction or allow rebreathing. If external airway occlusion were important, then one would have expected the rate of intrathoracic petechiae to be higher in the group with the facedown position compared to the other face position group.

Aims: To determine (1) The rate of IP in the facedown position in SIDS, and (2) If IP occur more frequently and with greater severity in SIDS victims found facedown versus other face positions.

Results: Face position groups were not significantly different with respect to age, sex ratio, or gestational age. 36.7% of the 199 SIDS cases were found both prone and facedown. 51.4% of 142 SIDS cases found prone were facedown. IP were present in 98.6% and 93.0% of the facedown and face other groups respectively, (OR 6.35, 95% CI 0.80, 50.63). IP were present on 0,1,2 or 3 thoracic organs in 1.4%, 21.9%, 26.0% and 50.7%, respectively, of the facedown group compared to 8.0%, 16.8%, 30.4% and 44.8%, respectively, of the face-other group. Thymic petechiae were present in 77.1% and 70.6% of the facedown and face-other groups, respectively; (OR 1.4, 95% CI 0.71, 2.78). Thymic petechiae were absent, mild, moderate or severe in 22.8%, 37.1%, 14.3% and 25.7% of the facedown group, respectively, compared to 29.4%, 34.4%, 9.2% and 26.9% of the face-other group, respectively. None of the above differences were statistically significant.

Conclusion: These data argue against *external* airway obstruction, but do not exclude *internal* oronasal obstruction or rebreathing in SIDS.

Vascular Endothelial Growth Factor (VEGF) and SIDS

VEGF is highly sensitive to changes in tissue

PO_2 , even within the physiologic range and increases peripheral O_2 delivery by stimulating angiogenesis and capillary density.

Aim: to determine whether hypoxia precedes SIDS by measuring CSF VEGF levels in 14 SIDS cases and in 6 control infants dying of known causes.

Results: The mean CSF VEGF levels were 158.8 ± 46.4 pg/dl in the SIDS cases (increased in 10 of 14 cases) and 65.0 ± 37.7 pg/dl in the controls (elevated in 1* of 6 cases, *massive intestinal infarction).

Conclusion: These preliminary results suggest that hypoxemia precedes death in SIDS.

Future Directions

Future areas in SIDS to which pathology can contribute are refinement of the definition, medical diagnosis, delineation of disorders masquerading as SIDS, research and public service, the latter including providing information to survivors, clinicians and the media. Pathologists still will play an important role in grief support, legislation and education.

5

A WORLD VIEW OF INFANT CARE PRACTICES

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Tremendous progress has been made in tackling the problem of SIDS. In the 1980s New Zealand was the world leader in SIDS mortality statistics. From the 1990s New Zealand has been a world leader in SIDS research. Many of the modifiable SIDS risk factors identified in studies from New Zealand and elsewhere are related to methods of child care and campaigns to "Reduce the Risk of SIDS" have focused on these factors. Following the 2nd SIDS International conference in Sydney in 1992 the SIDS Global Strategy Task Force embarked on a study to document child care practices in as many different countries and cultures as possible with the aim of providing baseline child care data and to stimulate new hypotheses. The protocol for the International Child Care Practice Study (ICCPs) was distributed to 80 potential centres in 1995 and data from 20 centres in 17 countries was received. Wide variations in child care practices were demonstrated, including those linked to SIDS such as prone sleeping, side sleeping, bedsharing, use of pacifiers (dummies or soothers), breast

feeding, use of pillows. Four studies have reported that pacifiers are protective against SIDS. Yet breast feeding promotion campaigns, such as the Baby Friendly Hospital Initiative, advise that no artificial teats or pacifiers be given to breast feeding infants. ICCPS data noted rates of pacifier use ranging from 12% (Japan), 14% (Dunedin), 16% (Chongqing) to 69% (Italy), 71% (Odessa) and exclusive breast feeding rates at 12 weeks from 4% (Hong Kong) to 80% (Stockholm). Pacifier use was associated with not exclusively breast feeding at 12 weeks or not ever breast feeding ($p < 0.001$, Chi-square for trend). Although this association is consistent with other studies, causation cannot be implied from this ecological data. However dogmatic advice on pacifier use – in either direction – is best avoided at this stage. A campaign advising parents to wrap infant mattresses with polythene has received much publicity in the lay press in New Zealand and the United Kingdom. ICCPS data were analysed to look at mattress wrapping. Parents were asked to describe the mattress covering and answers were coded as cloth, plastic, rubber, netting or other. Two centres used additional codes. 14% of the total sample recorded that their infant's mattress was covered with plastic with rates ranging from 0-2% (Chinese samples) and 1% (Japan) to 59% (Scotland, Ireland) and 67% (Manitoba). There was no indication that centres with low rates of SIDS were more likely have a higher rates of mattresses being covered with plastic. Although no conclusions should be drawn from this data, it helps demonstrate that these wide differences probably reflect local cultural preferences and types of products available in different countries. In view of the heterogeneity of the samples in the ICCPS, it is important that such differences are not over-interpreted and that they are viewed within the qualitative context of each individual sample. The ICCPS data are not intended to show that any particular practice increases or decreases the risk of SIDS, but instead to help us to better understand the complexity of child care within different cultures. These findings should inject some additional caveats to all of us involved in advising parents, especially those from non-western cultures, how to reduce the risk of SIDS.

6 SMOKING AND SIDS: AN EPIDEMIOLOGICAL OVERVIEW

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There is substantial evidence to conclude that maternal smoking caused a marked increase in SIDS. There have been almost 50 studies that have examined this relationship and all indicate an increased risk. Since the reduction in the prevalence of prone sleeping position there have been eight studies examining maternal smoking and SIDS. The pooled unadjusted relative risk (RR) from these studies is almost five, which suggests that infants of mothers that smoke have almost a five times risk of SIDS compared with infants of mothers who do not smoke. Adjustment for potential confounders lowers the risk estimate; however, many studies over adjust, such as controlling for birthweight, resulting in an inappropriate low estimate of the risk.

Epidemiologically it is difficult to distinguish the effect of active maternal smoking during pregnancy from involuntary postnatal tobacco smoking of the infant to smoking by the mother. The mechanism for SIDS is unknown; however, it is generally believed that the predominant effect from maternal smoking is from in utero exposure of the fetus.

Clear evidence for environmental tobacco smoke exposure can be obtained by examining the risk of SIDS from paternal smoking where the mother is non-smoker. There have been six such studies. The pooled unadjusted RR was 1.4, which is much smaller than the effect seen for maternal smoking (RR=4.7)

7 PRE AND POSTNATAL EXPOSURE TO TOBACCO SMOKE -EFFECTS ON THE RISK OF SIDS

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Results published from the first 2 years of our study suggest the risk from tobacco exposure is both prenatal and postnatal [1]. This hypothesis is investigated more fully with the complete three year data set.

Methods A three year case-control study conducted in 5 of 14 Health Regions in

England (population ~ 17 million, 500,000 livebirths). Parental interviews were conducted for each infant who died and for four controls matched for age and time of sleep. Ascertainment was over 90% [2]. This analysis includes 325 SIDS and 1300 matched controls.

Results In the multivariate model, controlling for all factors significant in the univariate analysis, prenatal tobacco exposure represented by maternal smoking during pregnancy (OR=2.65[95% CI: 1.40-5.03]), and postnatal tobacco exposure represented both by paternal smoking (OR=2.01[95% CI: 1.09-3.68]) and a parental estimate of infant exposure to tobacco smoke on an average day (OR=2.01[95% CI: 1.01-4.00] for no exposure compared to an hour or more) remained significant when modelled together. In the univariate analysis all three factors demonstrated a strong dose-response effect with the number of cigarettes smoked or the number of hours of exposure, but this was not so clear in the multivariate model when these factors were modelled either together or independently. A strong dose-response effect was found however if the risk associated with smoking in this multivariate model was represented by the number of smokers in the household (one smoker : OR=4.44[95% CI: 2.07-9.53], two smokers : OR=7.96[95% CI: 3.34-18.93], three or more smokers : OR=23.76[95% CI: 4.44-127.16]).

Conclusion Postnatal exposure to tobacco smoke does not appear to be a proxy measure for prenatal exposure, results suggest an additional risk which increases with the number of smokers in the household.

1 Blair PS, Fleming PJ et al. Smoking and the sudden infant death syndrome : results from 1993-5 case-control study for confidential inquiry into stillbirths and deaths in infancy. *BMJ* 1996; 313: 195-8.

2 Fleming PJ, Blair PS, Pollard K, Platt MW, Leach C, Smith I, Berry PJ, Golding J. Pacifier use and SIDS - Results from the CESDI SUDI case-control study. *Arch Dis Child* 1999;81:112-116.

8 SMOKING AND SUDDEN INFANT DEATH SYNDROME – Tentative Biological mechanisms

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Epidemiological studies indicate a causal

relationship between maternal smoking and SIDS, but the underlying biological mechanism has so far not been elucidated. Evidence derived from experimental studies, mostly based on chronic nicotine administration during fetal life, suggest that nicotine, through its effect on synaptic neurotransmission impairs the neural regulation of autonomic, behavioural and homeostatic functions. The main pharmacologic effect of nicotine is release of dopamine and noradrenaline from synaptic nerve terminals in the brain and elsewhere. Dopaminergic neurons are mainly involved with regulation of neuroendocrine functions, locomotion and reward-seeking behaviour like food intake while noradrenergic neurons regulate autonomic functions such as cardiorespiratory control but also cognition and responses to stress. Known adverse effects of prenatal exposure are dopamine mediated functions such as cortisone and pituitary hormones release and noradrenaline mediated functions such as sympathetic activation in response to exogenous stress. The latter involves mechanisms of arousal and autoresuscitation during hypoxemia i.e. those defence and survival mechanisms that are believed to fail in infants who succumb to SIDS. Prenatally nicotine exposed rats lack for instance the normal adrenomedullary catecholamine release during hypoxia and may die at hypoxic levels that unexposed rat pups would survive without major ill effects. Similar findings of a deficient “fight or flight response” during hypoxia have also been observed in young lambs treated either before or after birth and in infants born to smoking mothers.

It appears likely that the combination of adverse nicotine effects, reduced birth weight and visceral organ size and impaired the ability to activate sympathetic defense mechanisms, may render an infant more vulnerable to stress. Whether these mechanisms alone may explain SIDS in babies is unclear, in particular the effects of maternal smoking on the infant’s immune system need to be further explored.

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9

Oxygen Chemoreceptors in Perinatal Lung Express Functional Nicotinic Acetylcholine Receptors - Implications for Sudden Infant Death

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Pulmonary neuroepithelial bodies (NEBs) are thought to function as airway chemoreceptors involved in the autonomic control of breathing, especially in the neonate. They are composed of innervated clusters of amine (serotonin) - and neuropeptide-containing cells which respond to acute hypoxia (low Po₂) via a membrane bound O₂ sensing mechanism (Nature 365:153, 1993). Both the frequency and size of NEBs have been shown to increase in the lungs of infants who died of SIDS, especially those born to smoking mothers (Pediatrics 98:668, 1996). Among various known risk factors, maternal smoking during pregnancy has been independently associated with SIDS. Nicotine, a major component of cigarette smoke, may contribute to the pathophysiology of SIDS by interfering with the function of respiratory control mechanism components, including peripheral chemoreceptors.

Since the cellular effects of nicotine are mediated via nicotinic acetylcholine receptor (nACh-R) we have investigated its expression and function in NEB cells using neonatal animal lung models (hamster, rabbit). Our studies have shown: NEB cells express mRNA for beta2 subunit of nACh-R as shown by non-isotopic in-situ hybridization; at protein level, nAChR (beta2) was localized to NEB cell membrane using immunohistochemical methods; dose dependent inward current was elicited by application of nicotine (5-100 microM) to NEB cells, using whole-cell patch-clamp method on fresh lung slice preparation; cultures of NEB exposed to nicotine (100 microM) for 3 days showed diminished response to acute hypoxia defined by reduced serotonin release measured by HPLC.

Chronic nicotine exposure, via activation of nACh-R may compromise the function of NEB as airway O₂ sensor, in addition to carotid body chemoreceptors and brain stem neurons, and increase the vulnerability of infants to SIDS.

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10

THE SMOKECHANGE PROGRAMME: SUCCESSFULLY CHANGING SMOKING IN PREGNANCY

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SmokeChange is a personalised intervention strategy to reduce tobacco smoke exposure to pregnant women and the foetus. We report on the process and outcomes of the participants.

Background: Traditionally, smoking intervention programmes have focused on cessation. However, this approach is largely ineffectual for those with little desire to stop. SmokeChange was developed to be relevant for all pregnant women who smoke: it promotes personalised interventions that consider each woman's readiness for change.

Method: A cross-section of general medical practices, randomly selected, agreed to register all pregnant women with SmokeChange. Smoking women were contacted by a SmokeChange Educator, who visited them at home. The Educator worked with women and their families for up to 12 months to support cognitive, environmental and behavioural changes to smoking.

Results: GPs registered 1,390 pregnant women. Current smoking was reported by 437 (31.4%), of whom 352 expressed interest in the programme. Some 209 (47.8% of smokers) chose to enrol with the SmokeChange intervention programme and, of these, 149 women (34.1% of smokers) continued with the programme for at least four visits.

Cessation: For this latter group, 28 (18.8%) reported that they had stopped smoking by their last visit in pregnancy. This self-reported cessation was supported by cotinine measurements. Quit attempts: another 26 (17.5%) reported at least one cessation attempt and reduced their smoking by 63%. The remaining 95 (63.8%) Continuing smokers reduced their smoking by 40%. Substantial smokefree environment (homes and cars) changes were also made.

Conclusion: The SmokeChange approach (personalised interventions matched to individual readiness for change) was both acceptable to pregnant women and enabled participants to reduce tobacco toxin exposure to their developing infant.

11 HOW SUCCESSFULLY ARE BABIES PROTECTED FROM PASSIVE SMOKING A BIOCHEMICAL VALIDATION

Rodney Ford

Canterbury Health Limited, NZ

Aim: To measure and compare the level of environmental tobacco smoke exposure (ETS or passive smoking) in two groups of infants; one group having mothers that were given regular SmokeChange advice while the second group received standard antenatal care.

Research Design: ETS exposure was examined in 85 infants: 36 SmokeChange infants and 49 control infants. The infants were studied at 6 months of age. ETS was assessed using a structured questionnaire and two biochemical measurements: the urine cotinine/creatinine ratio (short-term exposure) and hair nicotine concentration (long-term exposure).

Results: There were no significant differences found between the SmokeChange and control groups in any of the ETS measures. Overall, the questionnaire revealed that 75/85 (88.2%) infants were exposed to ETS, with mothers contributing half of all exposure. The median ETS exposure to the infants was estimated at 2.4 cigs/day (Q1=0 Q3=5.6) with 1.2 cigs/day (Q1=0 Q3=2.7) coming from the mother. Based upon the cotinine/creatinine ratio, evidence of short-term ETS exposure was observed in 66/81 (81.5%) infants, and biochemical assay of hair nicotine revealed that 44/63 (69.8%) of infants suffered prolonged ETS exposure. Increased maternal smoking consumption levels were associated with an increased likelihood of biochemical evidence for ETS exposure.

Conclusions: Over two thirds of infants had biochemical evidence of long-term ETS exposure. The source of ETS was primarily from the mother. Much more needs to be done to protect infants from ETS exposure.

12 BED SHARING, COT DEATH AND PUBLIC HEALTH POLICY – THE NEW ZEALAND EXPERIENCE

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Many parents bed share with their new born infant, particularly in non-European populations. Results from the New Zealand Cot Death Study, published in 1993, revealed an interaction between maternal tobacco smoking and bed sharing on the risk of the

sudden infant death syndrome (SIDS). The effect of the interaction was to make bed sharing a strong and statistically significant risk factor of SIDS among infants with mothers who smoked, but not among infants of non-smoking mothers. This finding has been confirmed by case control studies in England, Scotland, the USA and by a further New Zealand study.

A meta-analysis of results from previous case control studies produced a summary SIDS relative risk associated with bed sharing of 2.06 (95% confidence interval: 1.70, 2.50) for infants of smoking mothers. Thus, there is strong evidence now that bed sharing is a major risk factor for SIDS for infants whose mothers smoke. Public health policy should be directed against bed sharing by these infants, since they carry an increased SIDS risk from bed sharing additional to their already increased risk from maternal smoking.

In contrast, it is unclear from previous reports whether bed sharing is a risk factor for infants of non-smoking mothers since most individual studies have not found a significant ($p>0.05$) increase in SIDS risk for these infants. A meta-analysis of previous case control studies produced a summary relative risk associated with bed sharing of 1.42 (1.12, 1.79) for infants of non-smoking mothers. Thus, bed sharing appears to be a weak risk factor for SIDS when the mother does not smoke. For these infants, who have a low absolute SIDS risk, the 40-50% increase in risk needs to be balanced against other perceived benefits from bed sharing, such as increased breast feeding.

In New Zealand, attributable risk calculations have helped in setting public policy on bed sharing. Only a small proportion of the SIDS deaths attributed to bed sharing (11%) occur in infants of non-smoking mothers. These deaths make up only 3% of all SIDS deaths but come from 28% of the total infant population. In contrast, 26% of all SIDS deaths can be attributed to bed sharing among infants of smoking mothers, who comprise 16% of the total infant population. Thus, extending the current policy against bed sharing, which is targeted at infants of smoking mothers, to all infants would potentially save an extra 3% of deaths. But, if public attitudes are favourable to bed sharing, there could be a marginal cost (against accepting a policy not to bed share) by including infants of non-smoking mothers in the recommendation not to bed share, since in New Zealand they comprise 28% of the total infant population.

13 **Potential Benefits of Mother-Infant Cosleeping in Relationship To Reducing SIDS: Let's Not Throw Out the Baby With Dangerous Beds or Dangerous Cosleepers**

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The biological and social appropriateness of mother-infant cosleeping is illustrated by developmental, clinical, and psychobiological data, as well as findings from our three separate laboratory studies of mother-infants bedsharing (one form of cosleeping). Mother-infant cosleeping evolved to protect and feed infants throughout the night. Millions of mothers worldwide know that strong emotions underlie and motivate co-sleeping, even though they may be unaware of co-sleeping as a biologically appropriate arrangement which, in turn induces important behavioral and physiological changes in both infants and mothers.

These changes have been reported in extensive peer-reviewed laboratory studies and include increased use of the safe, supine infant sleep position, increased breastfeeding, increased infant movement, arousal and awakenings during sleep, reduced deep and increased light sleep, more affectionate and protective maternal interventions, increased sensitivity to the presence of the co-sleeping partner, reduced infant crying, fewer (infant) obstructive apneas in deep sleep, longer infant sleep, and more positive evaluations by bedsharing mothers of their nighttime experiences.

Many of these findings support our contention that in otherwise safe cosleeping conditions, cosleeping, and cosleeping in the form of bedsharing, ought to help some especially arousal deficient infants resist a SIDS. Still, bedsharing remains controversial in the United States as evidenced by the Consumer Product Safety Commissioner announcing to the American public that: "the only safe place for an infant to sleep is in a crib". I will show how and why this statement is wrong, and how her role in the controversy beautifully illustrates the extent to which personal social ideologies are regularly passed off to the public as proven scientific facts, in this area of research.

14 **COSLEEPING – A PATHOLOGIST'S PERSPECTIVE.**

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'Cosleeping', or the shared sleeping of an adult with an infant, has been an emotive and difficult issue. There is no doubt that shared sleeping provides an opportunity for enhancing parent-infant bonding, as well as increasing opportunities for breast feeding. There is also evidence that shared sleeping may provide increased stimulation of an infant thereby enhancing neurological maturation. In addition, cosleeping is a widespread practice within many communities with few reported problems. However, it must be recognised that rare cases do occur where an infant has died from accidental suffocation due directly to the adverse effects of sleeping in the same bed as an adult. Soft bedding, heavy covers, overweight, sedated or intoxicated parents, or simple parental fatigue are all factors which logically should increase the risk of accidental asphyxia. Certain infants also do not show normal arousal responses when their airways are occluded.

Problems that arise for the pathologist are twofold. Firstly the autopsy findings in such cases are invariably identical to those found in SIDS. There has been disturbance of the scene and no coherent history may be available of the position of the infant when found. Airway compromise may also occur without a parent lying directly over an infant. Problems also arise when there may have been other young children in the bed at the time of the death whose positions during the night are not determinable. Thus, the diagnosis of accidental asphyxia may simply not be possible.

The second major problem that arises for pathologists is convincing colleagues that 'overlying' is a real, albeit rare, entity. For example, a case where a young infant was found dead in bed with two parents who had been markedly intoxicated, and whose mother stated that she had not been aware that she had been 'sleeping on him' was not accepted as anything but a 'SIDS' death by several clinical colleagues. Hospital staff have challenged the concept of death due to overlying by stating that they coslept with all of their children, and so there can be no risk. The risk is not, however, absolute and it is well recognised that the majority of infants survive – however, some do not.

For this reason further studies are needed

to help us to define potentially dangerous cosleeping environments and perhaps to also identify infants who may be at increased risk. Pathologists have a duty to provide parents with the most accurate assessment of the circumstances leading up to their infant's death and the subsequent autopsy findings and conclusions. It is not our role to 'protect' parents from our conclusions – rather we should be trying to help them to understand them as clearly as possible. It also does not help the broader issue of community safety if potentially dangerous situations are not identified and dealt with appropriately.

15 WHERE SHOULD BABIES SLEEP, ALONE OR WITH PARENTS?

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Whilst the benefits of the supine sleeping position for infants are now clear, there is no consensus on where the infant should sleep in relation to the parents. The risks associated with different sleeping environments and sudden infant death syndrome (SIDS) has been investigated.

Methods A three year case-control study conducted in 5 of 14 Health Regions in England (population ~ 17 million, 500,000 livebirths). Parental interviews were conducted for each infant who died and for four controls matched for age and time of sleep. Ascertainment was over 90% [1][2]. This analysis includes 325 SIDS and 1300 matched controls.

Results In the multivariate analysis infants who bed-shared and were then put back in their own cot were not at an increased risk (OR=0.67 [95%CI:0.22-2.00]). There was an increased risk associated with those who bed-shared for the whole sleep or were taken to and found in the parental bed (OR=9.78 [95%CI:4.02-23.83]), infants who slept in a separate room from their parents (OR=10.49 [95%CI:4.26-25.81]) and infants who shared a sofa (OR=48.99 [95%CI:5.04-475.60]). The risk associated with being found in the parental bed was not significant for older infants (>14 weeks) or for infants of non-smoking parents. Certain risk factors specifically associated with the cot environment (e.g. prone position, head-covering) served to increase the significance associated with bed-sharing. In a more

restricted *a priori* model controlling for recent maternal alcohol consumption (>2 units), duvet covers (>4 togs), parental tiredness (infant slept =4 hours for longest sleep in previous 24 hours) and overcrowded housing conditions (>2 people per room of the house), bed-sharing became non-significant.

Conclusions There are certain circumstances when bed-sharing should be avoided, particularly relevant for infants less than 4 months old. Sofa-sharing with infants should always be avoided. There is no evidence that bed-sharing is hazardous for infants of non-smoking parents.

1 Fleming PJ; Blair PS; Pollard K, Platt MW, Leach C, Smith I, Berry PJ, Golding J. Pacifier use and SIDS - Results from the CESDI SUDI case-control study. *Arch Dis Child* 1999;81:112-116.

2 Leach CEA, Blair PJ, Fleming PJ, Smith IJ, Platt MW, Berry PJ, Golding J. Epidemiology of SIDS and explained sudden infant deaths. *Pediatrics* 1999;104:e43

16 BED-SHARING: A MARKER FOR INCREASED CLOSE PHYSICAL CONTACT

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The conditions under which bed sharing is or is not an independent risk factor for SIDS remain controversial. In preliminary studies, we have previously found that bed-sharing infants appear to experience different child-care practices than their non-bed-sharing counterparts. In the present study, we hypothesised that bed sharing may act as a marker for increased close physical contact between infants and their caregivers. The aim of this study was to examine the relationship between bed sharing and other infant sleep environments in a longitudinal study in the first six months of life. A 24h sleep-wake diary was recorded weekly for 38 healthy term infants (gestational age 37 - 41 wks; 16 male, 22 female) between the 2nd and 24th week after birth. Infants were classified as bed-sharing (BS) if, at 2 - 12 weeks after birth and again at 13 - 24 weeks after birth, their diary records showed two consecutive episodes of BS which had a duration of > 4h in one week and >2 h in the other week. This definition identified 8 BS infants and 30 non-bed-sharing (NBS) infants. When compared, infants in the BS group spent a significantly

greater number of hours per 24 hours bed-sharing (3.9 ± 0.9) than infants in the corresponding NBS group (0.17 ± 0.1) and they also bed shared for significantly more weeks (BS 18.4 ± 1.3 , NBS 4.3 ± 0.9).

When the sleeping environment of the BS and NBS groups were compared, we found that BS infants spent significantly more time asleep/24h in the carer's lap or sling, that is, in close body contact (eg. BS 2.0 ± 0.9 h/24, NBS 0.4 ± 0.2 h/24h at 12 wks). Although the BS group also spent more time room-sharing with parents, this difference was not statistically significant. However, the BS group did spend significantly less time sleeping alone than the NBS group (eg. BS 2.6 ± 0.9 h/24h, NBS 7.2 ± 1.0 h/24h at 12 wks). We conclude that BS infants experience greater proximity to, and more close physical contact with their caregivers whilst sleeping in environments other than the bed.

17 A MAORI PERSPECTIVE

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This paper is about the changing messages given by the Maori SIDS Prevention Programme to their communities in response to the developing state of knowledge regarding the risk factors, bedsharing and maternal cigarette smoking.

We outline the progressive development of risk factor information about bedsharing and smoking, starting with the consideration of these practices as independent risk factors. We then outline the position of smoking as a confounder for bedsharing and finish with the identification of *in-utero* smoking, in particular, as being of most significance.

We trace the step by step refinement of the corresponding Maori prevention messages from one that did not reject bedsharing, and thus remained within the Maori world view, to one that included other infant sleeping options but was careful to mitigate the potential backlash from Maori women regarding the challenge to the culturally valued practice of bedsharing.

18 A REDUCED RISK OF SIDS ASSOCIATED WITH THE USE OF DUMMIES (PACIFIERS): FINDINGS OF THE ECAS STUDY.

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In 1992-3 five major case/control studies were set up in Europe to reassess SIDS risk factors. In 1994 the European Concerted Action on SIDS, ECAS, was funded to bring together the data from these and 12 other studies. Data on 745 cases and 2411 controls were assembled from 20 centres. Extensive logistic regression analysis resulted in a multivariate model using 19 statistically significant variables and 36 parameters and showed that the corresponding odds ratios for SIDS were remarkably homogeneous across Europe.

Substantial data on dummy use were available. Odds ratios for SIDS (95% confidence limits) associated with dummy use were:

	Univariate	Multivariate (adjusted for 35 factors)
Dummy ever used v. not used	0.88 (0.72; 1.06)	0.79 (0.62; 1.00)
Dummy used in last sleep; Y v N	0.47 (0.36; 0.60)	0.51 (0.38; 0.73)

Univariate analysis suggested an increased risk if a dummy is sometimes used but was not used in the last sleep. But after multivariate adjustment the increased risk was found to be completely insignificant, $p = 0.345$. There was no evidence that the reduction in risk associated with dummy use was dependent on the position in which the infant was put down to sleep.

Calculations of population attributable risk suggest that overall SIDS rates in Europe might be reduced by 31% if dummies were universally always used.

19 DUMMY USE ON THE DAY/NIGHT OF DEATH: CASE-CONTROL STUDY OF SUDDEN INFANT DEATH SYNDROME (SIDS) IN SCOTLAND, 1996-99

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It has been reported that dummy (pacifier) use may protect against cot death (1, 2).

Objective: To investigate the relation between infant care practices for SIDS victims on the day/night of death compared with control infants the night before interview, in Scotland.

Methods: This was a national study of 159

infants dying of SIDS (cases) and 229 controls by means of home interviews comparing methods of infant care and socio-economic factors, from 1996-9. Matched multivariate analysis used conditional logistic regression controlling for: duration of breast feeding, deprivation category, birthweight, parity, maternal age, mother in paid employment prior to birth, mother's marital status, age mother left school, mother smokes. Unmatched multivariate analysis also took account of infant age.

Results: A dummy was sucked during the last sleep by 39% (42/108) of SIDS infants compared with 52% (118/229) of control infants on the night before interview (OR, 0.59; 95% CI 0.36, 0.96). The protective effect of dummy use remained when multivariate adjustment was made using a matched (OR, 0.33; 95% CI 0.15, 0.77) or unmatched model (OR, 0.39; 95% CI 0.20, 0.74).

Conclusions: The protective effect of dummy use against SIDS observed in studies in New Zealand, England and Holland is also apparent in Scotland.

1 Fleming PJ, Blair PS, Bacon C, Bensley D, Smith I, Taylor E, Berry J, Golding J, Tripp J. Environment of infants during sleep and risk of the sudden infant death syndrome: results of 1993-5 case-control study for confidential inquiry into stillbirths and deaths in infancy. *BMJ* 1996; 313:180-1.

2 Mitchell EA, Taylor BJ, Ford RP, Stewart AW, Becroft DM, Thompson JM, Scragg R, Hassall IB, Barry DM, Allen EM, et al. Dummies and the sudden infant death syndrome. *Arch Dis Child* 1993; 68:501-4.

20 A PRELIMINARY INVESTIGATION INTO WHEN AND HOW A PACIFIER FALLS OUT OF A BABIES MOUTH DURING SLEEP

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A number of reports have indicated that the use of a pacifier is associated with a reduced risk of SIDS. Mechanism(s) for such an association remains to be understood, but it is likely that any effect occurs during an infant's sleep-time. However, it has been suggested that a pacifier does not remain in the mouth for any significant length of time during sleep.

We have therefore carried out this preliminary study to investigate how often a pacifier falls out of an infant's mouth during sleep and also to observe the reasons for dislodgment.

During the course of polygraphic studies, videotape recordings were made of 18 healthy infants aged between 13 and 70 days (median = 36). Recordings commenced as soon as the infant fell asleep. The subjects were allowed to suck on a pacifier which was replaced by the attendant if it fell out. The videotapes were analysed for the length of time the subject held the pacifier in its mouth and how the pacifier became dislodged.

The average length of time an infant kept a pacifier in its mouth during sleep was 11 minutes. The incidence of retaining a pacifier in the mouth for longer than 30 minutes averaged 2 per infant during the 3-4 hours of the recordings. The average maximum duration babies kept the pacifier in the mouth was 60 minutes (range 33-132).

Half of all pacifier falls occurred during a recognisable sucking state and 67% involved a movement of the infant's head.

Based on these observations it appears unlikely that a direct influence of pacifier use on autonomic (e.g. cardiorespiratory) functions may be responsible for the reduced risk of SIDS. Other possible interactions, e.g. improved oral clearance from bacteria in pacifier users have to be considered and remain to be elucidated.

21 INFLUENCE OF PACIFIER ON SLEEP CHARACTERISTICS IN HEALTHY INFANTS

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Pediatric Sleep Unit, Hôpital Erasme,¹ Hôpital des Enfants Reine Fabiola,² Université Libre de Bruxelles,³ ATEC, Brussels, Belgium.

Objective: To evaluate the influence of a pacifier on sleep characteristics in healthy infants.

Patients and method: Two groups of healthy infants (median age of 10 weeks) were studied polygraphically during one night: 36 infants were regular pacifier users, 20 never used a pacifier. These infants were exposed to white noises of increasing intensities during REM sleep. Arousal thresholds were defined by the auditory stimuli needed to induce polygraphic arousals. Spectral analysis of heart rate was studied in short segments of REM sleep preceding auditory stimuli. The high frequency component reflected parasympathetic tonus (PS) and the low frequency on high frequency ratio corresponded to sympathovagal balance (OS).

Results: After 30 minutes of sleep, 56% of “pacifier users” lost their pacifier.

Sleep parameters: There were no significant differences in sleep parameters between the two groups of infants.

Arousability: Polygraphic arousals were higher in “nonpacifier” than in “pacifier” users ($p=.010$).

Autonomic nervous system: “Nonpacifier users” had less PS ($p=.038$) and more OS ($p=.050$) compared to “pacifier users”.

Conclusion: Propensity to arouse and PS were greater in infants who were regular pacifier-users in REM sleep. It has been suggested that the use of a pacifier reduces the risk of SIDS. Some stresses known to increase the risk of SIDS (prone position, high ambient temperature, infants of smoking mothers) also favour both an increase in arousal thresholds and an imbalance of autonomic nervous system, such as decrease in PS and/or increase in OS.

22 INFLUENCE OF PACIFIER ON AUTONOMIC NERVOUS CONTROL IN HEALTHY INFANTS

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Objective: To evaluate the influence of a pacifier on sleep autonomic nervous system in healthy infants.

Patients and method: Two groups of healthy infants (median age of 10 weeks) were recorded polygraphically during one night: 36 infants were regular pacifier users, 20 never used a pacifier. Autonomic nervous system (ANS) evaluated by spectral analysis of the heart rate (HR) and sleep parameters were studied. The high frequency component of HR spectral analysis reflected parasympathetic tonus (PS) and the low frequency on high frequency ratio corresponded to the sympathovagal balance (OS).

Results: No differences were found in sleep parameters and ANS during the whole night between “pacifiers users” and “non-pacifiers users”. After 30 minutes of sleep, 56% of “pacifier users” had lost their pacifier. Comparing the “sucking” from the “non-sucking” periods in “pacifier users”, there was more PS ($p=.01$) and less OS ($p=.02$) during the “non-sucking” periods in REM sleep. Comparing the “non-sucking” periods

in “pacifier users” with similar periods in “non-pacifier users”, PS was decreased ($p=.038$) and OS increased ($p=.05$) in “non-pacifier users” in REM sleep. These findings were not found in NREM sleep.

Conclusion: It has been suggested that the use of pacifier reduces the risk of SIDS. Autonomic imbalance such as decreased PS and/or increased OS have been found in future SIDS victims and in infants exposed to environmental factors known to increase the risk of SIDS (prone position, high ambient temperature, infants of smoking mothers). Sucking habits could regulate autonomic control in healthy infants.

23 THE IMPACT OF PACIFIER USE ON BREASTFEEDING DURATION

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Background: There has been debate over the influence of pacifier use on breastfeeding. Avoidance of pacifier use is included as one of the “Ten Steps To Successful Breastfeeding” promoted by the WHO and UNICEF. Only some studies have adjusted for potential confounders.

Objective: To determine predictors of pacifier use in the first year of life and to assess the influence of pacifier use on the duration of breastfeeding,

Study Design: We conducted a prospective cohort study. Three hundred and fifty mother-infant pairs were followed to one year of age to determine the impact of the use of a pacifier on the duration of breastfeeding.

Results: Daily pacifier use was associated with early cessation of breastfeeding (RR 1.71, 95% CI 1.29, 2.28) and a reduced duration of full breastfeeding (adj RR 1.35, 95% CI 1.05, 1.74). Finger sucking was not associated with a reduced duration of breastfeeding (RR 1.05, 95% CI 0.81, 1.37). Pacifier use less than daily was not associated with a change in duration (RR 1.02, 95% CI 0.75, 1.39). Most mothers commenced use of a pacifier within the first month. Multiple logistic regression analysis found the use of a pacifier was associated with male gender (adj RR 1.97, 95% CI 1.23, 3.13), maternal smoking in pregnancy (adj RR 2.23, 95% CI 1.01, 4.95), and low maternal confidence with breastfeeding (adj RR 2.70, 95% CI 1.48, 4.93).

Conclusions. Daily pacifier use is associated with a reduced duration of breastfeeding. Less frequent use does not reduce the duration of breastfeeding.

24 PACIFIER AND DIGIT SUCKING INFANTS I: MORBIDITY IN THE FIRST 18 MONTHS

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Pacifier use is associated with a decreased risk of SIDS [1], and is widely believed to suppress digit sucking in infants, but little is known of the relative effects of these two forms of non-nutritive sucking on morbidity in infants.

Methods. As part of a continuing cohort study (ALSPAC) of 14,000 infants born in Avon, UK, in 1991-2, [2] information was collected on pacifier use at 4 weeks and 6 months, and on pacifier and digit sucking at 15 months of age. This was correlated with data on infant morbidity from birth to 18 months of age.

Results. Pacifier use fell from 58% in infants at 4 weeks to 49% at 6 months and 36% at 15 months; it was most prevalent amongst infants of younger, more deprived mothers, who smoked and did not breast feed. Adjusting for these factors, pacifier use was associated with a higher prevalence of respiratory (cough, wheeze, apnoea), gastrointestinal (vomiting, diarrhoea, colic), and other morbidity (e.g. earache, fever, excessive crying) throughout the first 18 months. At 15 months, 21% infants sucked their thumb or finger, and 2% sucked both a pacifier and a digit. Finger or thumb sucking was most prevalent amongst infants of non-smoking, older mothers, who breast-fed more than 4 weeks. In a multivariate analysis, infants who sucked a digit alone were less likely than pacifier users to have had earache or to have seen a doctor as an emergency, and more likely to have a regular sleeping pattern. Morbidity was generally highest amongst those infants who sucked both a pacifier and a digit.

Conclusions Despite its association with a lower risk of SIDS, pacifier use is associated with significantly higher morbidity in infancy, than for infants not given a pacifier, particularly for those who also suck a finger or thumb.

1. Fleming PJ, Blair PS, Pollard K, Platt MW, Leach C, Smith I, Berry PJ, Golding J. Pacifier use and SIDS - Results from the CESDI SUDI case-control study. *Arch Dis Child* 1999; 81: 112-116.

North K, Fleming P, Golding J. Pacifier use and morbidity in the first six months of life. *Pediatrics*;1999;103:e34

25 NON-NUTRITIVE SUCKING BEHAVIOURS IN CHILDREN FROM BIRTH TO TWO

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Sucking behaviors in infants and young children are derived from the physiological need for nutrients. Current understanding of child development suggests that sucking behaviors also arise and are continued in part from psychological needs. Thus, normally developed infants have an inherent, biological drive for sucking. This need for sucking can be satisfied through nutritive sucking, including breast and bottle-feeding, whereby the infant obtains food, or through non-nutritive sucking on objects such as digits, pacifiers or toys that may serve primarily to satisfy psychological needs. While sucking behaviors are normal in infants and young children, prolonged duration of such behaviors may have consequences in regard to the developing orofacial structures and occlusion.

We have been following non-nutritive and nutritive sucking in infants and young children in a series of longitudinal studies since 1980. Although there have been many retrospective reports describing the effects of habits on dental relationships there have been few, if any, prospective longitudinal studies. Also claims are made by manufacturers of artificial nipples and pacifiers on the advantages of their products on the development of oral structures. Professionals are frequently questioned by parents to provide recommendations for early feeding methods as well as how to satisfy the infant's sucking reflexes. Additionally, although there is some information available regarding the prevalence of sucking behavior, there is relatively little known about the patterns of nutritive and non-nutritive sucking behavior in normal infants and young children.

It will be the intent of this presentation to present longitudinal information on the prevalence of sucking behaviors from a large sample of infants and toddlers. Additionally, information will be provided on the discontinuation of non-nutritive sucking behavior of infants and toddlers. Finally information on the effect of non-nutritive sucking on growth and development of the teeth and jaws will be demonstrated.

26

THE FUTURE OF SIDS ORGANISATIONS

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In 1996 the Foundation for the Study of Infant Deaths held a press conference in London to announce its future direction. To find the causes and prevention of SIDS, the future lies in broadening the work to focus, paradoxically, not solely on SIDS, but the wider field of infant death and infant health. The paper will describe the processes FSID went through that led to that decision and the reasons why. The reasons were not just, as suggested above, dictated by the needs of research, but also included changes in public perceptions of FSID's work and changes on the environment within which FSID was operating. The paper will show how the organisation's work has subsequently evolved, and continues to evolve, in response to the unique challenges that SIDS organisations face in scientific research, family support and public information campaigning.

27

THE FUTURE OF SIDS ORGANISATIONS: AN AUSTRALIAN PERSPECTIVE

Kaarene Fitzgerald

SIDSaustralia

Most Australian SIDS Organisations commenced independently in the late 1970's with different names. There are now nine, still independent, organisations who formerly joined together in 1990 in a federated body called SIDSaustralia to run the Red Nose Day campaign, centrally fund research and produce national educational material. Support programs are undertaken locally through the state/territory SIDS Organisations.

For several years a national office was operated with the charter of developing and implementing national aims and objectives. This mode of management was unsuccessful due to a lack of understanding of local requirements and lead to a major national strategic planning process. A successful system of subcommittees was implemented. This then lead to another new beginning.

Now, with reducing numbers of SIDS deaths, less interest by researchers and clinicians and increased competition from other non-profit organisations the need to present a unified and fresh approach is apparent.

There have been many changes, some minor and some major. In December 1998 it was agreed all organisations would alter their name to reflect their state/territory eg the Sudden Infant Death Research Foundation became SIDSvictoria. And, in 1999 it was agreed that services would be expanded to support the families of all children up to the age of six who died suddenly and unexpectedly regardless of cause.

A new strategic planning process has recently been undertaken by one of the National Directors and the nine Chief Executive Officers. Main issues surround how can the image of "one group, one voice, undertaking a wide range of programs" be developed with autonomy still remaining at a local level. This paper will describe the processes followed to date and expected outcomes.

28

ESTABLISHING AN ECONOMIC BASIS FOR THE NORWEGIAN SIDS SOCIETY

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Since 1995, the Norwegian SIDS Society has been able to carry out its tasks based on a solid economic foundation. The Norwegian Ministry of Health provides the organization with an annual contribution which covers approximately one third of the administration costs. But our main source of income has been fundraising through nation-wide telemarketing. This economic basis has enabled us to support national research on SIDS with more than US \$2M throughout the nineties.

In addition to funds generated from telemarketing, we have received considerable support from The Norwegian Foundation for Health and Rehabilitation which we have then distributed to various recipients. This funding has been used for medical research, nation-wide information of risk factors and bereavement support.

Our financial condition allows the Norwegian SIDS Society to not only keep a full-time staff of five, but also to contribute substantial support to several international projects such as the *SIDSI News* and to participate actively on international conferences.

As we know that fund raising is among the major problems for SIDS parents societies in several other countries, we would like to share our experiences in this area.

29 FUTURE DIRECTIONS IN BEREAVEMENT SUPPORT FOR SIDS ORGANISATIONS

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The 'model of service' provided at SIDSvictoria by the partnership of professional social workers and trained volunteer parent supporters, has been developed and refined in response to parents' wishes over many years. The combination of professional counselling and peer support provides an excellent service which is based on both up-to-date theoretical knowledge, and the experiential knowledge that comes from shared experience. This staff mix enables a variety of opportunities and styles of support to be offered to bereaved families, according to their needs. Key components of this 'model of service' will be detailed in this presentation.

The dramatic reduction in the number of children dying of SIDS as a result of the Reducing the Risks of SIDS health promotion program, has enabled SIDSvictoria to trial an innovative extension of its service. This extension of the outreach crisis and ongoing bereavement support service targets a wider group of Victorian families whose children of six years and under die suddenly and unexpectedly from drowning, poisoning, a fast-onset illness, a motor vehicle accident, through a fire, homicide or in some other way. Surprisingly there has been no similar support offered to these families at the time of their child's death. Of course SIDS families continue to receive the same support. In 1993 a pilot program was initially set up in a regional Victorian city, in which the SIDSvictoria 'model of service' was offered to families whose children had died suddenly and unexpectedly in a variety of ways. Following the success of this project, SIDSvictoria formally extended its bereavement support service in 1997, and in June 1999 the 'member organisations' comprising SIDSaustralia agreed to a similar extension of bereavement services.

30 DEVELOPING A STRATEGIC ALLIANCE WITH THE PRIVATE SECTOR TO INCREASE PUBLIC AWARENESS ON SIDS

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The mandate of the Canadian Foundation for the Study of Infant Deaths (SIDS Foundation) includes working with Canadians to promote public awareness about SIDS. Our risk reduction campaign is called Back to Sleep. Campaign materials have been distributed to hospitals, health care professionals, public health units and daycares across the country.

The feedback we received from our SIDS toll-free telephone line suggested that we needed to reach secondary caregivers (i.e. grandparents and babysitters) with the risk reduction message. Many callers also felt we needed to adopt additional strategies to reach both health care professionals and new parents.

The Foundation met with Procter and Gamble to discuss a partnership, with the goal of increasing awareness of SIDS. The company had already placed the SIDS toll-free number on its "Pampers" packaging for newborn infants. Procter and Gamble has now agreed to place the "back to sleep" message in English, French and Spanish on all diapers for babies up to one year of age. In addition, the company has agreed to produce door or crib-hangers carrying the risk reduction message, as a reminder for all parents and secondary caregivers. Procter and Gamble will sponsor an ambitious marketing campaign, which will include redevelopment of the Back to Sleep brochures, TV infomercials about SIDS, the hiring of a leading spokesperson for the SIDS campaign and finally, the distribution of SIDS information in all prenatal and newborn hospital packages distributed to parents.

In support of the proposed campaign, the Foundation has identified the need for additional background materials and an improved website in order to accommodate increasing levels of interest and media enquires. The Foundation is currently working with both private and public sector partners to develop and fund these projects. An initial partnership with Procter and Gamble was successful and this allowed the Foundation to feel confident in seeking to broaden the base of this alliance. In this case, the desire of Procter and Gamble to tap the market of young families was matched to the Foundation's goal of increasing SIDS awareness at little or no cost to its members.

31 DECLINING SIDS RATE IN JAPAN CORRESPONDS TO REDUCTION OF RISK FACTORS

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After a SIDS prevention campaign in Japan, a reduction of SIDS risk factors has been observed with a corresponding reduction in the SIDS rate. The SIDS family Association Japan started a prevention campaign by distributing information on risk factors to medical professionals from mid 1996 and a pamphlet for new and expectant mothers from mid 1997. Because of the results of a government study on SIDS cases, the Japanese Ministry of Health and Welfare has fully endorsed the SIDS prevention campaign in Japan since mid 1998.

In the winter of 1996/97 the SIDS Family Association Japan and the National SIDS Research Group carried out the International Child Care Practices Study. Two years later, in the winter of 1998/99 the SIDS Family Association took another sampling with the same survey. The text of the questionnaire was supplied by the SIDS Global Strategy Task Force and translated to Japanese. These surveys were distributed in four hospitals in Yokohama and Tokyo and resulted in a total of 289 completed surveys in 1996/97. In 1998/99 the surveys were distributed in one hospital in Yokohama only with a resulting 49 completed surveys.

	96/97 Yokohama Survey	(96/97 Total Surveys)	98/99 Yokohama Survey
Sleep Position			
Prone	4.2%	(6.3%)	2%
Side	10.5%	(4.9%)	2%
Back	85.3%	(88.8%)	96%
Smoking			
Mother	9.4%	(9.3%)	0%
Father	47.9%	(49.8%)	51%
Breastfeeding			
Formula only	10.4%	(19%)	8%

Preliminary figures show the SIDS rate in Yokohama City at 0.15 per 1000 live births in 1998. The government figures for the nationwide SIDS rate in Japan are as follows (birth to one year): 0.44 in 1995, 0.39 in 1996 and 0.41 in 1997. Preliminary figures for 1998 for birth to two years shows the SIDS

rate has dropped to 0.33 which represents a decrease of 24%.

32 DEVELOPMENT OF FSID'S REGIONAL PROGRAMME 1990-2000

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The regional development programme developed from a pilot study which identified the following needs:

- More guidance and training for volunteers. The opportunity for volunteers to exchange ideas and feel less isolated.
- Identification of support available for bereaved parents in the regions
- More information for professionals.

By 1990 the Foundation for the Study of Infant Deaths (FSID) had appointed a part time, paid, coordinator for each of the fifteen Regional Health Authorities in England and Wales. Regional population ranged from 2.5 – 5 million covering 8 – 22 districts per region. The coordinators worked 12 hours per week from home.

The presentation will show what impact regional development had on the work of the Foundation and the changes that evolved during the ten year period. It will include:

- The need to redefine the regions from 15 to 13 and increase the number of working hours from 12 to 14 each week
- The way in which the limited hours have shaped the job description
- Changing pattern of FSID Groups of Friends from 101 in 1990 to 140 at its peak in 1992 and down to 63 in 1999
- Change of befrienders and befriender support from 600 untrained befrienders in 1990 to 383 trained befrienders in 1999
- Development of the Care of the Next Infant project from 51 centres in 1990 to 172 centres in 1999
- Department of Health funded project to visit every Accident & Emergency department

33 CONSENSUS ON PREVENTION LEADS TO MINIMAL INCIDENCE

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Stichting Wiegedood, The Netherlands

The Netherlands today is proud of the lowest cot death incidence in western countries: 0.14 per 1000 livebirths, 28 cases (<1 year) in 1998. (Central Bureau of Statistics). Significant progress has been made ever since the peak year of 1984: 1.22. (1987: 0.91; 1992: 0.41; 1995: 0.26; 1997: 0.17).

This encouraging progress resulted from:

1. concentration on epidemiologically found risk factors and translation of the findings into preventive recommendations.
2. national consensus amongst all medical disciplines, starting with the back to sleep advice in 1987.
3. the widely spread dissemination of eight easy to follow recommendations tailored to specific conditions in the Netherlands (also to customs of ethnic minorities) and incorporated in the policies of the national infant welfare system covering a large majority of all infants.

The 8 points are: sleep position, overheating, bedding, roomsharing, smoking, breast feeding and dummy, sedatives, rest and routine.

Since the early eighties, encouraged by a parents' organisation, a small number of physicians with unflagging energy kept focussing on cot death. In 1996, when ECAS (European Concerted Action on Sids) and the report of the National Consensus on Prevention had drawn maximum attention, the Dutch Foundation for the Study of Infant Death (Cot Death Foundation) was established by volunteer professionals of different disciplines (medical, research, media, accountancy, law). A strategy for further reduction of incidence was developed, aimed at completion and intensifying of the 8 points above, supported by meticulous study of remaining cases.

We are possibly reaching a minimal 'unavoidable' hard core incidence, estimated at $\pm 0.10/1000$. These may comprise: secondary prone position, smoking, extremely adverse social and psychological circumstances, total lack of information, accidental death including infanticide, inability to provide care. This will not be easy to cope with. Yet efforts should be made in order to reach out to these infants at great risk.

34 KITS FOR KIDS – RESOURCES FOR BEREAVED CHILDREN

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SIDSvictoria, Australia

"How do we help our other kids?" is a common concern expressed by bereaved parents for their surviving children. SIDSvictoria established a Children's Program in 1993. The program developed out of this common concern expressed by parents and out of a need expressed by a group of bereaved children.

The aims of the program are:

- To acknowledge children's grief and resource their needs.
- To provide diverse opportunities for young people to meet together to normalise their grief experience.
- To explore relevant ways for children to express their feelings and tell their stories.
- To encourage sensitive and understanding responses to bereaved children by providing information and support to grieving parents and the community.

Children have opinions, attitudes and their own understanding of what has happened in their lives. "I hate that Zoe was alive and that I never saw her. But the happy thing is that you (Mum) had two babies." Tully 5. The acknowledgement of their feelings and the right to express their stories is a fundamental premise of the program.

Resourcing the needs of bereaved children within the context of their family has become an integral part of family support. The range of resources developed allows for individual, age appropriate materials to be made available to children. Through the program children are empowered with the responsibility to help in the development of resources. This generates a unique, inbuilt integrity - children resourcing and supporting children.

This paper will describe the development of resources with and for bereaved children and the application of these resources.

35 CHANGES IN THE EPIDEMIOLOGICAL PATTERN FOR SUDDEN INFANT DEATH SYNDROME (SIDS) IN SOUTH- EASTERN NORWAY 1984-1998

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Since 1990 the SIDS rate in Norway decreased from 2.4 to 0.6 per 1000 live births, being stable after 1993. The prone position is still a major risk factor, but as the number of infants found dead in this position has decreased, other less dominant risk factors have become more visible. The objective of this study was to analyse possible changes in risk factors for SIDS during the last 15 years.

In a case-control study questionnaires were distributed to 203 SIDS parents and 538 control parents in the south-eastern region of Norway. Factors related to pregnancy, birth, first year of life and time of death were recorded.

Before 1989 91% of the SIDS victims were found in a prone position, while the figure now is 55%. Only 10% of SIDS victims and 2% of controls now usually sleep prone. Some risk factors seem stable despite the change in rate and decline in prone position, such as cold last week (47%) and face covered (34%). More SIDS mothers than control mothers smoke during pregnancy in the whole period (OR 2.93, CI 2.77,3.13). Never using a dummy still seems to increase the risk for SIDS (night-time use 0-2 months OR 1.82, CI 1.70,1.95), but no significant difference was found for dummy sucking (OR 1.98, CI 0.90,4.35).

In the last years though, some changes are seen. An increasing number of SIDS victims are found dead while co-sleeping (previously no difference; after 1993 OR 3.1, CI 2.61,3.67). In the last three years 42% of the SIDS victims were found dead while co-sleeping while only 25% of controls used to co-sleep. Breastfeeding no longer shows any significant difference. More SIDS victims have mothers under the age of 25 (since 1993 OR 5.37, CI 3.97,7.24), and finally fewer SIDS victims are found outdoors (24% until 1992, after 1993 8%).

36 A STUDY OF PREGNANCY OUTCOMES WITHIN WESTERN AUSTRALIAN FAMILIES IN WHICH A SUDDEN INFANT DEATH SYNDROME (SIDS) DEATH OCCURRED.

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Background: Midwives' records of Western Australian (WA) births are routinely linked to registrations of births and deaths for infants delivered from 1980 to 1996, and then linked to WA health data to create a longitudinal record for each infant.

Objective: To compare the rates of occurrence of birth defects and other pregnancy outcomes in SIDS infants and their siblings, with the rates in families in which there was no SIDS death.

Methods: Probabilistic record linkage was used to identify siblings using maternal information routinely recorded on the midwives' record for births during 1980 to 1992.

Results: Linkage of records of births in WA from 1980 to 1992 (n=310,255) resulted in the formation of 181,133 sibships. Data for those women (n=53,734) whose first pregnancy occurred during 1980 to 1991, and who had at least two singleton births were analysed. The rates of occurrence of birth defects and death from other causes during infancy or early childhood were found to be similar in SIDS families to other families (of the same size).

Conclusions: The rates of occurrence of birth defects and deaths from other causes in infancy and early childhood, in the families in which SIDS infants were born, do not appear to be greater than those in other WA families, of the same size. However, further record linkage is required to obtain the population sizes needed to draw confident conclusions.

37 EPIDEMIOLOGY OF SUDDEN INFANT DEATH SYNDROME (SIDS) IN THE TYROL BEFORE AND AFTER AN INTERVENTION CAMPAIGN

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We investigated the epidemiology of sudden infant death syndrome (SIDS) in the Tyrol, a western part of Austria, before and after an intervention campaign.

Descriptive characteristics and risk factors of SIDS before the campaign were assessed in a retrospective case-control study (1984 to 1994). In April 1994 a country-wide information campaign on modifiable risk behaviours was initiated. Afterwards we prospectively collected data on childcare practices for all infants born in the Tyrol (participation rate 72%; n=28,361) and evaluated new SIDS cases (1994 to 1998).

SIDS incidence decreased from 1.83 (average incidence 1984-1994) to 0.4/1000 live births immediately after the campaign and remained at this level until 1998. The frequency of maternal smoking during pregnancy declined (22.9% vrs. 14.5%, p<0.01), as did the prevalence of the prone sleeping position (53.7% vrs. 5.4%, p<0.001) and of non-breastfeeding (21.3% vrs. 6.7%, p<0.001). All these variables were prominent risk factors of SIDS before the campaign and remained significant thereafter. On account of the marked decrease in the prone sleeping position, smoking became the most

prevalent SIDS risk factor. The side sleeping position significantly increased (5.1% vrs. 36.4%, $p < 0.001$) and the social status of mothers of SIDS infants tended to be lower than before the campaign. The clear winter preponderance of SIDS evident before the campaign disappeared or even reversed. Our study documents the long-term efficacy of a low-cost intervention campaign in the form of health education. Further efforts have to be targeted at the socially disadvantaged, thereby focusing more attention on maternal smoking and avoidance of the side sleeping position.

38 CURRENT RISK AND PREVENTATIVE FACTORS IN THE NETHERLANDS, 1995-1999

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In the Netherlands two studies into cot death have been conducted since 1995. In a case control study in 1995-1996 into cot death we investigated whether new risk or preventive factors had emerged. Children between 1 week and 2 years of age who died suddenly and unexpectedly were reported. This study comprised 73 cot death cases and two controls per case. Next to well-known risk factors, it was demonstrated that dummy use, independently of other factors, seemed to be a preventive factor for cot death. Mouth breathing appeared to be associated with an increased risk.

One general advice given in Dutch well-baby clinics is to gently close the infant's lips if they sleep with their mouth open, which might prevent mouth breathing. In 1987 a nation wide advice was given not place infants prone for sleep. In 1992 the advice was modified from "not prone" to "exclusively on their back". In 1990 too much clothes and bedding were discouraged in order to prevent overheating. From 1994 onwards additional recommendations were given, namely discouraging the use of duvets, pillows and 'cot-buffers'. In 1996 a consensus was reached about preventive measures including all medical and paramedical disciplines. As a result of the study in 1995-1996, pacifiers are recommended for those infants that are bottle-fed. These preventive measures are incorporated in a brochure which is distributed at the Dutch well-baby clinics.

A second study was conducted from

September 1996 to October 1999. The National Working Group Cot Death visited parents of infants that died suddenly and unexpectedly in the age from 1 week to 2 years of age. Parents of 80 children agreed to home-interview. No controls are included in this study, but in the Netherlands every two or three years a prevalence study is carried at well-baby clinics to determine the prevalence of risk factors in the infant population.

Results are: Parental smoking (62%), primary prone sleeping (14%) and use of a duvet (40%) are still important risk factors. Primary prone sleeping is correlated with excessive crying. Since 1995 40% of the cot death cases died in secondary prone sleeping position (i.e. turned from side or back to prone). This percentage remains the same over the years. In 20% of the cases the child did not die at home, but elsewhere, i.e. at the grandparents house, baby care centre or hospital. Premature infants and infants with a low birth weight are over-represented as compared to national data. Of these infants 25% was placed prone at home and 20% had used a duvet. The incidence of very low birthweight infants (< 1500 gram) and premature infants (< 32 weeks gestational age) is nowadays low compared to 1983 (1/1000 versus 1/100), but it remains 6 times higher than in the total population (1/6000 live born infants). In the cot death cases co-sleeping was only an issue if the infant was younger than 4 months. Only a few cases were placed to sleep with a pacifier the night before they died.

The cot death incidence (1wk-<1yr) decreased from 0.25/1000 live born infants in 1995 to 0.14/1000 live born infants in 1998. We conclude that even in a low incidence country further prevention is possible.

39 CURRENT EPIDEMIOLOGY OF SIDS IN IRELAND, RESULTS FROM A CASE/ CONTROL STUDY 1994-98.

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The aim of this study is to examine current epidemiological factors associated with SIDS in the Republic of Ireland following Reduce The Risks of SIDS campaigns in the early 1990's and the associated fall in the SIDS rate from 2.1 (1980-90 incl.) to 0.8 (1993-98 incl.)/1000 live births. During the 5-year period, 1994-98, 208 infants died from SIDS of whom 163 had a detailed questionnaire

completed. A similar questionnaire was completed for 637 randomly selected control infants. Mothers of SIDS cases drank alcohol more frequently while pregnant (64% v 50% p=0.002) and more heavily (39% v 12% ≥ 5 units per week p=0.0001) compared to controls.

After the baby's birth there was no difference in the number of mothers drinking (71% cases v 68% controls), however, SIDS mothers still drank more heavily than controls (52% v 22% consuming ≥ 5 units per week p<0.0001). In the previous 24 hours more SIDS mothers consumed alcohol (37% v 18%) and also consumed a large quantity (≥ 5 units) of alcohol (20% v 2.5% p<0.0001). More fathers of SIDS also drank heavily after the baby's birth (90% v 68% consuming ≥ 5 units per week p=0.002) and with more also drinking in the previous 24 hours (38% v 22%) and also drinking more heavily (28% v 7% consuming ≥ 5 units p<0.0001) in the previous 24 hours.

Sleep position. When the (a) usual position put to sleep; (b) usual position found awake; (c) position in which baby placed during the last sleep period; (d) position in which infant found dead or awake during the last sleep period; were examined all showed a significant excess of both prone and side sleep positions. Pillow use was more frequent among cases, with a pillow usually used during the day in 18% of cases compared to 10% of controls (p=0.002), usually used at night in 28% of cases v 13% of controls (p=0.0001), and during the last sleep period in 51% of cases v 15% of controls (p<0.0001). When the amount of bedding used was examined duvet use was more frequent in cases than controls; during the day (21% v 10% p=0.0001), during the night (44% v 22% p<0.0001), during the last sleep period (53% v 20% p<0.0001). Soothers were more commonly used in SIDS cases than controls (77% v 66% p=0.01) although less SIDS cases used a soother during the last sleep period (30% v 54% p<0.0001). An important question is why parents choose lifestyle and parenting practices, such as smoking, drinking and using the prone sleeping position, that adversely impact on their infants health and how these decisions can be influenced in the future.

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UNACCUSTOMED EVENTS AND SUDDEN INFANT DEATH SYNDROME

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It is widely accepted that various infant care practices, such as the sleep position, are causally linked with the occurrence of sudden infant death syndrome (SIDS or cot death). It has also been speculated that abrupt postnatal changes to an environment or behaviour may exert excess stress and physiological demands on an infant. In this setting, the infant's learned physiological responses may be inadequate to avoid a lethal combination of events thereby resulting in SIDS. This speculation was examined using data collected from a nationwide case-control study in New Zealand. In particular, we focused on factors previously demonstrated to affect SIDS risk.

Infants sleeping in an unfamiliar house, room or bed were at increased risk for SIDS compared to infants sleeping in their usual environment after adjustment for likely confounding factors (OR: 2.60; 95% CI: 1.77, 3.80). Taking infants who usually slept non-prone and who were placed to sleep on their backs for the nominated sleep (or day of death) as the reference group, infants usually placed prone to sleep were significantly more likely to die from SIDS (OR: 5.44; 95% CI: 2.48, 11.92) as were those infants sleeping prone for the first time (OR: 15.12; 95% CI: 3.81, 59.99), after adjustment for confounders. Infants sleeping prone for the first time were at further increased SIDS risk if they slept alone for the nominated sleep/death when they normally slept in a room with an adult (chi-square=4.3, df=1, p=0.04). The effect of sleeping alone for the nominated sleep/death when normally room sharing with an adult was itself associated with increased SIDS risks after adjustment for confounders (OR: 1.96; 95% CI: 1.33, 2.88).

Unaccustomed infant care practices do appear to affect SIDS risk, as do unfamiliar sleeping environments. Many of these unaccustomed practices can easily be avoided thereby potentially saving infant lives.

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CASE-CONTROL STUDY OF SUDDEN INFANT DEATH SYNDROME SCOTLAND, 1996-9. A PREVIOUSLY USED (OLD) INFANT MATTRESS STILL SEEMS TO INCREASE SIDS RISK.

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Many environmental hazards associated with infant bedding have been proposed. A link between infant mattress and cot death is made plausible by the risk of prone sleeping. A previous study in Scotland showed a risk with routine old mattress use (1).

Objective: To investigate the relation between infant care practices for cot death victims on the *day/night of death* compared with control infants the *day/night before interview*.

Methods: This was a national study of 159 infants dying of sudden infant death syndrome (cases) and 229 controls by means of home interviews comparing methods of infant care and socio-economic factors, from 1996-9. Matched multivariate analysis used conditional logistic regression controlling for: duration of breast feeding, deprivation category, birthweight, parity, maternal age, mother in paid employment prior to birth, mother's marital status, age mother left school, mother smokes. Unmatched multivariate analysis also took account of infant age.

Results: Significantly more infants 54% (44/81) died of cot death who routinely slept on an old *infant* mattress compared with controls 29% (59/201) (OR, 3.2; 95%CI 1.7-6.0). This risk remained when multivariate adjustment was made using a matched (OR, 9.0; 95% CI 1.9, 42.8) or unmatched model (OR, 3.3; 95% CI 1.6, 7.0). On the night of death 62% of SIDS cases (24/39) who were sleeping on an *infant* mattress were sleeping on an old infant mattress, compared with 29% (38/130) of controls (OR 3.9, 95%CI 1.7, 8.8). We are still working on a satisfactory multivariate model for this data, but the risk remains.

Conclusion: Using an old infant mattress on the day/night of death increases the risk of SIDS.

1 Brooke H, Gibson A, Tappin D, Brown H. Case-control study of sudden infant death syndrome in Scotland, 1992-5. *British Medical Journal* 1997; 314: 1516-20.

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SIDS INFANTS – HOW HEALTHY AND HOW NORMAL? A CLINICAL COMPARISON WITH EXPLAINED SUDDEN UNEXPECTED DEATHS IN INFANCY

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Clinical features characteristic of sudden infant death syndrome (SIDS) suggest infant vulnerability at birth, after discharge from hospital, during life and shortly before death. The relative significance of these features amongst SIDS infants and between SIDS and explained sudden infant deaths has been investigated.

Methods. A three year case-control study conducted in 5 of 14 Health Regions in England (population ~ 17 million, 500,000 livebirths). Parental interviews were conducted for each infant who died and for four controls matched for age and time of sleep. Ascertainment was over 90% [1]. This analysis includes 325 SIDS, 72 explained SUDI and 1588 matched controls.

Results In the multivariate analysis four clinical features were associated with SIDS identifiable at birth: < 37 weeks gestation (20% vs 5% controls, OR=4.93[2.16-11.24]), <10th birth centile (16% vs 8% controls, OR=2.44[1.13-5.26]), multiple births (5% vs 1% controls, OR=7.81[1.35-45.28]) and major congenital anomalies (5% vs 2% controls, OR=4.54[1.32-15.56]) whilst explained SUDI deaths were characterised by one: neonatal problems (38% vs 26% controls, OR=4.64[1.34-16.03]).

Of those postnatal clinical features after discharge, the most significant was a history of apparent life-threatening events for both index groups (SIDS: 12% vs 3% controls, OR=2.55[1.02-6.41], explained SUDI: 15% vs 4% controls, OR=16.81[2.52-112.30]).

A retrospective scoring system based on the "Cambridge Baby Check" [2] was used to identify infant illness in the last 24 hours. This marker of illness was associated with the highest risk for both index groups (SIDS: 22% vs 8% controls, OR=4.17[1.88-9.24], explained SUDI: 49% vs 8% controls, OR=31.20[6.93-140.5])

Conclusions The clinical characteristics of SIDS and explained SUDI are similar. 'Baby Check' particularly in high risk infants, may identify seriously ill babies at risk of sudden death.

1 Fleming PJ, Blair PS, Pollard K, Platt KW, Leach C, Smith I, Berry PJ, Golding J. Pacifier use and SIDS - Results from the CESDI SUDI case-control study. *Arch Dis Child* 1999; 81:112-116.

2 Morley CJ, Thornton AJ, Cole TJ, Hewson PH, Fowler MA. Baby Check: a scoring system to grade the severity of acute systemic illness in babies under 6 months. *Arch Dis Child* 1991; 66: 100-6.

43 ARE THE RISK FACTORS FOR SUDDEN INFANT DEATH SYNDROME DIFFERENT AT NIGHT?

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Data from the New Zealand National Cot Death study were used to examine interactions between the time of death and other risk factors. 62.6% of deaths occurred in the night, the period between 10 pm and 7.30 am. The controls were allocated a time about which they were interviewed, 49.5 % of which were in the night. The risk of SIDS associated with bed sharing was higher during the night (OR=2.45, 95% CI 1.53 to 3.92) using not bed sharing during the night as the reference group than during the day (OR=0.97, 0.45 to 2.11). The odds ratios were adjusted for confounding variables. Maternal smoking (OR= 2.29, 1.52 to 3.45), the mother being unmarried (OR=2.69, 1.75 to 4.13) or the infant being Maori (2.29 1.44 to 3.65) were also associated with increased the risk of death at night. The odds ratios for these factors during the day time were 0.97 (0.45 to 2.11), 1.29 (0.81 to 2.04) and 1.15 (0.71 to 1.87) respectively. Deaths in the day time declined with age (OR (trend)=0.69, 0.56-0.86) compared with those during the night (OR (trend) 0.91, 0.77 to 1.08). Pacific Island infants were also less likely to die during the day (OR=0.16, 0.04 to 0.59). The OR for prone sleep position was 3.66 (2.51 to 5.32) at night compared with 7.63 (4.79 to 12.1) during the day using not prone in the same time period as the reference group.

Illness (OR(trend)= 2.07, 1.40 to 3.07) and sweating (OR(trend)=1.67, 1.27 to 2.20) were also associated with deaths which occurred at night but not with those which occurred in the day.

Deaths occurring at night, therefore, appear to be more strongly associated with life style practices, sleeping prone and illness whereas those occurring during the day were largely associated with prone sleep position.

44 EXAMINATION OF CYTOKINES IN LARYNGEAL SECRETIONS DURING ACUTE RESPIRATORY DISEASE.

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A large proportion of SIDS victims have signs of respiratory infection prior to death. Half of the SIDS victims have elevated Interleukin-6 (IL-6) levels in their cerebrospinal fluid, and victims with high IL-6 levels show laryngeal immune stimulation. Furthermore, such stimulation in respiratory syncytial virus (RSV) infected infants results in disturbances in the regulation of breathing. RSV infection has been associated with elevated laryngeal IL-6 and IL-1b levels and we have proposed that local production of cytokines might alter the sensitivity of the laryngeal chemoreceptors, inducing irregular breathing with hypoxemia and ultimately SIDS. The purpose of this study was to examine whether laryngeal cytokines could be related to the severity of clinical symptoms.

Laryngeal secretions from 66 infants with acute respiratory disease admitted to hospital were examined for concentrations of IL-6 and IL-1b by ELISA. The group was divided into three categories according to a score based on clinical findings; fever, respiratory symptoms, ill appearance, need for treatment. This score was compared with cytokine levels. Interestingly and surprisingly, we found that the group of children with the mildest symptoms (group I) had a tendency to higher IL-6 levels than the group with the most severe symptoms (group III) (p<0.06) and significantly higher than those with intermediate symptoms (group II) (p<0.05). Group I also tended to be younger than group III (p=0.06).

It is shown that the ability to produce cytokines is independent of age. However, the amount of cytokines usually is correlated to the severity of the disease. An exception from this is the findings of elevated cytokine levels in SIDS infants, who usually have only slight symptoms of infection prior to death. We therefore speculate that a subgroup of infants may have a tendency to overreact to trivial infections, which in its severest consequences leads to SIDS.

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**THE POTENTIAL RELATIONSHIP
BETWEEN APNEAS, APOPTOSIS &
BRAINSTEM PLASTICITY**

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Among 27 000 infants studied prospectively to characterise their sleep-wake behaviour, 33 infants died under the age of 6 months (including 27 cases of sudden infant death syndrome, 5 cases of congenital cardiac abnormality, 2 cases of infected pulmonary dysplasia, 2 cases of septic shock with multiorgan failure, 1 case of prolonged seizure and 1 case of prolonged neonatal hypoxemia).

The frequency and duration of the apneas recorded some 3 to 12 weeks prior to the infants death were analysed. Brainstem material was retrospectively collected from these 33 infants and immunohistochemical analyses were conducted, together with the determination of growth-associated phosphoprotein 43 (GAP43) as a marker of synaptic plasticity, and terminal-deoxynucleotidyl transferase-mediated dUTP nick end labeling (TUNEL) method as a marker for apoptosis. The pathological and physiological data were linked for each case for correlation analysis. A statistically significant positive correlation was noted between the number of TUNEL-positive glias of the dorsal raphe nucleus and the duration of central apnea ($p=0.049$).

Statistically significant positive correlations were noted between the number of spines of GAP43-positive neurons in the pedunculo pontine tegmental nucleus and the number of TUNEL-positive glias in the periaqueductal gray matter ($p=0.041$), and the pedunculo pontine tegmental nucleus ($p=0.041$). The dorsal raphe nucleus and periaqueductal gray matter of the midbrain and pedunculo pontine tegmental nucleus play important roles in the arousal pathway. The correlation of these specific findings at these sites with apnea suggests the possibility that these organic changes have effects on the arousal process.

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**CHANGING PRACTICES IN
CERTIFICATION OF SUDDEN
UNEXPLAINED INFANT DEATHS IN
SCOTLAND 1993-98**

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For several years debate has taken place within the international SIDS community on the most accurate definition of Sudden Infant Death Syndrome (SIDS). In Scotland this debate is becoming of secondary importance. The pathologists, who must issue the death certificate immediately following post-mortem dissection, are becoming increasingly reluctant to use the term SIDS without all test results being available. The reason for this is that a much higher proportion of sudden unexpected infant deaths now occurs in families which are socially and economically deprived, where babies are of low birthweight and where alcohol and illegal substance abuse are more common. In 1993, 100% of sudden infant deaths, apparently unexplained on initial post-mortem examination, were given death certification as SIDS compared with only 13% in 1998. The remaining 87% were variously certified as Sudden Unexpected Death in Infancy, Cot Death, Unascertained or Natural causes. Pathologists are willing to amend the death certificate and will give a final diagnosis of SIDS if all findings including death scene investigation are negative. However, this change in practice has important implications for the bereaved families and may also influence comparison of statistics and future epidemiological studies.

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**EXCLUSION OF NON-SIDS CASES FROM
A GROUP OF SUDDEN UNEXPECTED
DEATHS IN INFANCY AND EARLY
CHILDHOOD - WHICH DIAGNOSTIC
TOOL GAVE THE DIAGNOSIS**

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In the period between 1984-1998, 289 cases of sudden unexpected death in infancy and early childhood (0-3 years) from Southeast Norway were investigated at the Institute of Forensic Medicine in Oslo. In 188 cases SIDS was diagnosed, whereas 101 cases were grouped as either borderline-SIDS (43) or non-SIDS; 39 due to disease, 14 due to

accidents and 5 due to murder.

The purpose of the present study was to analyse by which diagnostic tool the borderline-SIDS and the non-SIDS were diagnosed. The most and the second most important finding were registered. In 44 cases one diagnostic tool alone gave the diagnosis.

The definition of SIDS require a negative history, negative investigation of the circumstances as well as negative autopsy results, thus the following variables were analysed: medical history, circumstances, autopsy which included macroscopical investigation, microscopy, neuropathology, microbiology, radiology and toxicology.

Results: In 10% of the cases the medical history led to the diagnosis, whereas investigation of the circumstances revealed the diagnosis in 17%. The autopsy led to diagnosis in the remaining 73%; macroscopical investigation contributing in 15% of the cases, microscopy in 25%, neuropathology in 18%, microbiology in 12%, radiology in 2% and toxicology in 2%.

Throughout the period studied our SIDS cases constituted 65% of the total population of sudden unexpected deaths. After the drop in SIDS rate in 1990, the proportion of pure SIDS has become less prominent in Southeast Norway, comprising 50% in 1998. The increasing role of borderline and non-SIDS cases is a challenge to improve the quality of investigation in cases of sudden death in infancy and early childhood. At the Institute of Forensic Medicine we strive to include compulsory death scene investigation and case conferences.

48 MUTATIONS IN THE MTDNA GENE tRNA^{GLY} IN SIDS AND CONTROLS

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Several investigations indicate involvement of mtDNA mutations in at least some cases of SIDS. The findings in our SIDS material so far are of a high substitution rate in the D-loop and point mutations in the genes tRNA^{Leu(UUR)} and ND1. The purpose of this study is to investigate the tRNA^{Gly} gene, which has a point mutation in bp 10044 assumed to be associated with sudden unexpected death. The subjects consisted of 164 cases of SIDS (included 24 cases of borderline SIDS) and 101 age matched controls (living infants). The tRNA^{Gly} gene was investigated using polymerase chain reaction (PCR) and direct sequencing. In the

SIDS group two different point mutations were detected, T10043C in one case and T10034C in six cases. In the control group three different point mutations were detected in three controls (T10034C, A10042T, A10044G). It remains to be investigated whether there is any pathological effect of the mutations. The findings may indicate either that mutations in the tRNA^{Gly} gene are not involved in SIDS, or that SIDS victims may have a higher percentage of mutated mtDNA than controls. By using direct sequencing it is not possible to determine the percentage of mutated mtDNA. It is interesting that one of the mutations (T10034) was found in six cases of SIDS but only in one control. This mutation is claimed to be a polymorphism rather than a pathological mutation, but may nevertheless be a part of a haplotype predisposing to SIDS.

1 Opdal SH, Rognum TO, Vege Å, Dupuy BM, Egeland T. Increased number of substitutions in the D-loop of mitochondrial DNA in the sudden infant death syndrome. *Acta Paediatr* 1998;87:1039-44

2 Santorelli FM, Schlessel JS, Slonim AE, DiMauro S. Novel mutation in the mitochondrial DNA tRNA glycine gene associated with sudden unexpected death. *Pediatr Neurol* 1996;15:145-9

49 ANALYSIS OF CARDIOVASCULAR AND RESPIRATORY NUCLEI IN SUDDEN INFANT DEATH SYNDROME

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It has been suggested that SIDS may be due to subtle defects in the brainstem neural circuitry controlling respiration and/or cardiovascular stability, particularly during sleep and at transitional phases between sleep and awakening.

Brainstems from 7 control cases, 10 SIDS normal birth weight (NBW) cases and 8 SIDS low birth weight (LBW) were selected from archived material. Each brainstem was embedded in resin, serially sectioned (25µm) and stained with H&E. Volumes of the arcuate and hypoglossal nucleus was estimated using the Cavalieri's Principle: the optical brick technique was used to estimate arcuate neuron and glial cell density. Total number of cells was estimated by multiplying the volume of the nucleus by the numerical density. Cross sectional area (CSA) of the solitary tract was estimated using simple, unbiased point

counting.

For the arcuate nuclei there was no significant difference in the volume: (control and SIDS NBW ($p=0.407$) or control and SIDS LBW ($p=0.240$)), total numerical density: (control and SIDS NBW ($p=0.962$) or control and SIDS LBW ($p=0.613$)), total number of neuron and glial cells: (control and SIDS NBW ($p=0.661$) or control SIDS LBW ($p=0.201$)). There was no statistically significant difference in the volume of hypoglossal nuclei between control and SIDS NBW ($p=0.917$) or between control and SIDS LBW cases ($p=0.345$). There was no significant difference in CSA for either the left or right solitary tracts between any of the groups. However, SIDS LBW cases demonstrated an increase in CSA with age for both the right ($p=0.001$) and left ($p=0.003$) solitary tract.

Subtle delay/arrest in the brainstem neural circuits has been hypothesised to impinge upon the stability of respiratory and cardiovascular functions in SIDS infants. It is possible that abnormalities e.g. metabolic defects or defects in neurotransmitter production or function, within those nuclei responsible for cardiovascular functions, may be present at a level not detectable by quantitative morphometric analysis.

50 DETECTION OF PYROGENIC TOXINS OF STAPHYLOCOCCUS AUREUS AMONG GERMAN SIDS INFANTS

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Introduction: Pyrogenic toxins of *Staphylococcus aureus* were detected in > 50 % of frozen or fixed tissues from SIDS infants from Scotland, France and Australia [Zorgani et al., 1999]. This study assessed histological specimens to determine if a similar pattern was present in a German cohort ($n = 20$) of SIDS cases.

Materials and methods: Formalin-fixed paraffin-embedded samples of thymus and/or spleen were dewaxed and rehydrated. After homogenisation of the tissues, cells were examined for presence of staphylococcal enterotoxins A, B and C and toxic shock syndrome toxin (TSST) by flow cytometry and the supernatant by ELISA as described previously [Zorgani et al., 1999]. Because of the age of the specimens (collected between 1992-1995), a sample was considered positive in the flow cytometry

assay if 3% or more of the test cells showed fluorescence above that of the control cells to which only fluorescein-labelled anti-sheep antiserum was added.

Results: The ELISA method did not detect toxins in any samples. By flow cytometry, tissues from 13 / 20 (65%) SIDS cases were positive for one or more toxins (range 3-31.2% positive cells)

Discussion: As in the previous study, toxins were not detected in formalin fixed tissues 18 months of age or older. In the previous study, specimens were considered positive if 10% of test cells had fluorescence values greater than their respective controls; however, the percentage of positive cells in toxin-containing specimens decreased significantly after 4-5 years. The proportion of toxin-positive specimen in this study (65%) was similar to the Australian series when that data was reassessed using the criteria of this survey (21/30, 70%). The proportion of German SIDS infants in whom pyrogenic staphylococcal toxins were identified is similar to that for infants from other parts of Europe and Australia.

Zorgani et al. *FEMS Immunology Medical Microbiology* 1999; 25: 103-108.

51 THE EFFECT OF INTERLEUKIN 10 (IL-10) ON INFLAMMATORY RESPONSES INDUCED BY PYROGENIC TOXINS IMPLICATED IN SIDS

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We proposed that some SIDS deaths might result from uncontrolled inflammatory responses, particularly those induced by pyrogenic staphylococcal toxins, during a developmental stage in which infants are less able to control inflammation because of low levels of night time cortisol. The cytokine IL-10 plays an important role in control of inflammation. The objectives were: 1) to determine if toxic shock syndrome toxins (TSST) and staphylococcal enterotoxins C and A (SEC and SEA) induced IL-10 as well as pro-inflammatory cytokines; 2) if IL-10 levels induced were sufficient to reduce production of pro-inflammatory cytokines implicated in pathogenesis of toxic shock, interleukin 6 and tumour necrosis factor α (TNF).

Leukocytes obtained from blood donors were stimulated as described [Al Madani et al.,

1999] by 0.1 mg ml⁻¹ of the individual toxins. After 16 hr incubation at 37°C, TNF was assessed by bioassay and IL-6 and IL-10 by ELISA. Various concentrations of human recombinant IL-10 were examined for inhibition of TNF and IL-6.

IL-10 induced by the toxins ranged from 8-40 ng ml⁻¹ at 16 hr. The donor with the lowest level of IL-10 (8 ng ml⁻¹) had the highest increase in TNF and IL-6 responses. The recombinant form exerted suppressive effects on both TNF and IL-6 production. The lowest level of IL-10 that reduced IL-6 production by 50% was 25 ng ml⁻¹; more than half the donors produced levels of IL-10 sufficient to reduce IL-6 production. None of the donors produced levels of IL-10 (100 ng ml⁻¹) needed to reduce TNF production.

Genetically controlled low IL-10 responses are associated with adult respiratory distress syndrome and severity of Epstein Barr virus infection. IL-10 was reported to protect mice against staphylococcal toxins and from endotoxin induced shock. The genetics of IL-10 production in families in which there has been a SIDS death is currently under investigation.

Al Madani et al. *FEMS Immunology Medical Microbiology* 1999; 25: 207-219.

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SUDDEN INFANT DEATH SYNDROME: BACK TO BASICS

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Sudden death occurs in every age group from fetal to adolescent to adult. In infancy, the frequency of sudden death and of the absence of an anatomical cause for death are higher than in any other age group. The unique feature of sudden infant death syndrome (SIDS) is the developmental vulnerability that characterizes infants in the first six months of life. The peak incidence of SIDS is between one and six months of age and developmentally an infant of this age is quite different than a child of 12-18 months of age. This is more evident in the brain and neuromuscular system than in any other system of the body.

Therefore, recent suggestions to change the definition to include older children creates significant difficulties. Tampering with basic definitions is dangerous because it jeopardizes the validity of data comparisons, before and after such changes. Raising the age also detracts from the importance of

understanding developmental factors. Structural and functional developmental maturation is critical because it is the only consistent vulnerability in all cases of SIDS. In our SIDS Registry at The Hospital for Sick Children, from 759 cases we have selected small cohorts with appropriate age-matched controls. We have documented delayed maturation of dendritic spine development in the brainstem, delayed myelination of the vagus nerve and delayed fiber type maturation in the diaphragm.

In SIDS, the maturation of these anatomical structures related to cardio-respiratory-sleep functions is delayed, compared to age-matched non SIDS infants, suggesting relative immaturity and greater vulnerability to environmental factors such as sleep position, exposure to cigarette smoke, elevated ambient temperature, mild infections and other factors.

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BEDSHARING AND OVERNIGHT MONITORING: FROM THE LABORATORY TO THE HOME SETTING

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Epidemiological studies have identified bedsharing as an important issue in SIDS. Physiological studies, focussing on possible mechanisms, have been in sleep laboratories and have included only mothers and infants. This pilot study was preparation for a home based study to better reflect diversity of sleeping environments and encourage usual childcare practices.

Objectives:

1. To measure infant physiological variables and to video sleep positions and infant-adult interactions overnight without significant disturbance to the infant or parents.

2. To identify physiological and behavioural indices that may indicate infant stress during bedshare sleep.

Study design: Mothers and/or fathers and infants (new-born to 5 months) who regularly bedshared (>5hrs/night) were recruited from postnatal organisations and advertisements. Supervised, physiological and video monitoring was performed with 9 infant/

mother pairs and 1 infant/mother/father group sleeping overnight in the sleep laboratory. The physiological recordings measured respiratory pattern, respiratory flow, inspired CO₂, SaO₂, heart rate and temperature – core, peripheral and environmental. Parents were given a questionnaire to evaluate the study. This protocol was used unsupervised with 1 infant/ mother and 2 infant/mother/father groups in participants' own homes.

Results: Questionnaires showed all parents were “absolutely satisfied” with the execution of the study and 8/9 laboratory participants indicated they would have been ‘interested’ or ‘keen’ to participate in a home study. All recordings were achieved as easily in the home, as in the sleep laboratory.

Adverse cardio-respiratory events were identified in 2/13 infants: one where high environmental temperature was coupled with close parental contact. Another where the infant repeatedly pulled bedding over its face, resulting in inspired CO₂ of 5%. No other adverse effects were identified.

Conclusions: Comprehensive physiological and behavioural overnight studies can be successfully carried out in the home. Early results show a wide range of movements and positions of babies in the bedsharing scenario.

54 BED-SHARING AND THE MICRO-ENVIRONMENT OF SLEEP IN EARLY INFANCY: PHYSIOLOGICAL EFFECTS IN THE INFANT

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Overheating and rebreathing have been suggested as possible contributory factors to

SIDS. Asphyxia and overlaying have been suggested as additional factors when infants bedshare with parents.

Aim: To compare infant microenvironment and thermal physiology whilst bedsharing and whilst sleeping in a crib in the same room as mother (“room-sharing”).

Methods: Polygraphic recordings of infant and environmental temperature, inspired CO₂, sleep state, respiration, ECG, oxygen saturation and infrared video were made of 10 mother infant pairs (5 routine bedsharers, 5 room-sharers) on two consecutive

nights (randomized to 1 night bed-sharing (BS) then 1 room-sharing (RS), or vice versa) at monthly intervals from 2 to 5 months of age in a thermally-controlled sleep laboratory.

Results: Complete physiological and video recordings of 19 pairs of BS and RS nights (38 recordings) were obtained. Infant sleep patterns were no different between BS & RS. All infants slept supine, and were fully breast-fed. Insulation of bedding was higher (6.3 tog vs 4.6 tog, $p = 0.015$), and the temperature under the bedding and around the infant's head was 1 - 2.5°C higher on BS than on RS. Oscillations in rectal temperature with sleep state (higher in Rapid Eye Movement sleep) were no different between BS and RS. Infant skin (shin, abdomen, forehead) temperatures were higher, but the nadir of rectal temperature was lower on BS nights. Skin temperatures, but not rectal temperatures, were higher when infants slept in direct skin to skin contact with their mothers. Inspired CO₂ was no higher on BS than RS nights, and the highest value (2.4%) was for a swaddled RS infant.

Conclusions: Despite higher environmental temperatures, infants could thermoregulate as effectively when bedsharing as when alone. Close mother-baby contact during the night did not result in CO₂ rebreathing or impaired thermoregulation in healthy infants.

55 VASOCONSTRICTOR RESPONSES FOLLOWING SPONTANEOUS SIGHS AND HEAD-UP TILTS IN INFANTS SLEEPING PRONE AND SUPINE.

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Autonomic dysfunction or maturational delay is a feature of some infants that have subsequently succumbed to SIDS. In the prone position, some autonomically-mediated physiological responses are depressed. The array of autonomic function tests in infants is limited to those not requiring co-operation on the part of the individual. A recent study has suggested that measurement of cutaneous vasoconstriction by laser flow Dopplometry (LDF) following a spontaneous sigh may be a useful tool for assessing autonomic function in infants.

Aims: To compare the effects of sleep position, age, and sleep state on the degree of peripheral vasoconstriction measured by

LDF during: 1) test conditions; 60° head-up tilt, and 2) basal conditions; a spontaneous sigh.

Methods: The cutaneous vasoconstrictor responses following a rapid (2-3 s) 60° head-up tilt and a spontaneous sigh were measured in 36 healthy infants at 1 and 3 months age. Infants were studied during quiet sleep (QS) and active sleep (AS) and in the supine and prone sleep positions. Respiratory pattern was recorded by inductive plethysmography. The vasoconstrictor response was determined by a measure of cutaneous blood flow by LDF.

Results: The mean reduction in blood flow (vasoconstriction) was 52% following the tilt, and 33 % following the sigh. Prone positioning of 1 month old infants, as compared to supine, reduced the degree of vasoconstriction following the tilt ($P = 0.03$) and sigh ($P = 0.03$). The supine to prone reduction was: tilt, -11% in QS and -25% in AS and; sigh, -26% in QS and -15% in AS. The degree of vasoconstriction following the sigh was greater in 3 month compared to 1 month-old infants (+26%, $P = 0.04$). This older age effect was also apparent in response to the tilt (+12.0%, $P = 0.07$) although was not significant. Sleep state did not effect the degree of vasoconstriction but influenced transmission so that latency to minimal vasoconstriction was 1 second shorter in AS than QS.

Conclusions: This study provides data on two simple measures of sympathetic activity during sleep that have not previously been described in any detail in infant studies, and add more evidence that autonomic activity is reduced in the prone position compared to supine during sleep.

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56 SLEEPING POSITION AFFECTS AROUSABILITY OF PREMATURE INFANTS.

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It is well recognised that the prone sleeping position and prematurity both represent risk factors for the Sudden Infant Death Syndrome (SIDS). Failure to arouse from sleep in response to a life-threatening event has been hypothesised to contribute to a multifactorial pathogenesis for SIDS. This

study investigates the effects of sleeping position and postnatal age on sleep arousal in a group of healthy premature infants.

Thirteen premature infants born at 31 to 35 weeks (w) gestation (mean 33 ± 0.4 w) who had faced no significant neonatal morbidity underwent three daytime polysomnographic studies. Studies were performed at ages 36-38w gestation, 1-3w post term, and at 2-3 months (m) post term, with the third study coinciding with the peak SIDS incidence. Each infant underwent two sleeps, one in the prone position and the other supine at each study. A non-invasive air-jet stimulus, applied alternatively to the nares was presented in both positions, in both active sleep (AS) and quiet sleep (QS). The pressure presented was altered, and arousal thresholds calculated based on a modified double staircase method. Data was analysed using 2 ways repeated measures ANOVA.

The prone sleeping position significantly increased arousal thresholds in AS in all 3 studies ($p < 0.05$). Furthermore, at the 2-3m study, arousal thresholds in QS were elevated when infants slept prone ($p = 0.03$). A state related difference in arousal threshold was evident at the 2-3w ($p = 0.01$) and 2-3m studies ($p = 0.03$), with thresholds elevated in QS compared to AS in infants whilst sleeping supine.

This observed association of the prone sleeping position, the largest risk factor of SIDS, with decreased infant arousability may add weight to the hypothesis that failure to arouse from sleep contributes to the pathogenesis of SIDS.

Table: Arousal thresholds (cm H₂O, mean \pm SEM) in the prone and supine sleeping positions.

(This project was supported by SIDSaustralia)

57 THE EFFECTS OF PRONE SLEEPING AND ANTENATAL MATERNAL SMOKING ON THE AROUSABILITY OF THE TERM INFANT

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Sudden Infant Death Syndrome (SIDS) is believed to be multifactorial and a failure to arouse from sleep has been proposed as a final mechanism. In this study we examined the effects of the two major modifiable risk factors for SIDS: sleeping position and

maternal smoking, on arousal from sleep in healthy term infants.

In this study, we investigated arousal responses in 24 healthy term infants, 13 from non-smoking mothers and 11 from smoking mothers (>5cigarettes/day). Infant groups were not different for birth weights, gestation at birth, or APGAR scores at 1 and 5 minutes. Infants were studied at 2-3w and 2-3m with daytime polysomnography, sleeping in both prone and supine positions. Arousal responses were measured in response to a non-invasive pulsatile air-jet stimulus applied to the nares during active sleep (AS) and quiet sleep (QS). Data were analysed by repeated 2-way ANOVA, and all data are presented as mean \pm SEM.

In the combined group of infants (n=24) arousal thresholds were elevated in QS compared to AS when infants slept both prone and supine at 2-3m, and when prone at 2-3w (p<0.01). Arousal thresholds were elevated in the prone position, in both AS and QS, at both 2-3w and 2-3m (p<0.05). In infants from smoking mothers arousal thresholds in response to our stimulus were elevated and spontaneous arousals decreased in QS when sleeping supine at 2-3m (p<0.05), when compared to infants from non-smoking mothers.

This study demonstrates that arousal is impaired in infants sleeping in the prone position in both sleep states. Maternal smoking appears to alter the arousal mechanism as both spontaneous arousal from sleep and arousal in response to a somatosensory stimulus are impaired in the supine position at the age when SIDS incidence is highest.

	AS PRONE	QS PRONE	AS SUPINE	QS SUPINE
Non-smoking				
2-3w	264 \pm 30	347 \pm 52	175 \pm 21	246 \pm 36
2-3m	257 \pm 40	443 \pm 62	107 \pm 22	181 \pm 32
Smoking				
2-3w	206 \pm 31	272 \pm 42	157 \pm 22	202 \pm 38
2-3m	154 \pm 23	409 \pm 57	106 \pm 15	384 \pm 74 *

* smoking vs non-smoking p < 0.05

(This project was supported by SIDSaustralia)

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EVIDENCE AS TO WHY PHENOTHIAZINES ARE ASSOCIATED WITH SIDS

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Introduction: Phenothiazines, such as promethazine, available in over-the-counter infant medications have been implicated in apparent life-threatening events (ALTEs) and SIDS, however the mechanism of action is unclear.

Hypothesis: Phenothiazines may impair airway protective responses in sleep, exposing infants to life-threatening laryngeal chemoreflex (LCR) stimulation.

Aim: To examine the effects of a commonly used promethazine-containing medication on airway protective reflexes in sleeping piglets.

Methods: Responses to pharyngeal and oesophageal fluid simulation during active sleep (AS) were recorded in 21 control and 21 promethazine piglets (1.5 mg.kg⁻¹). Computer recordings of AS (electroencephalogram, movement and behaviour), swallowing (fluid-filled catheter), breathing (pneumogram and nasal airflow), heart rate and oxygen saturation (SaO₂) were made. 1.5 mL boluses of 0.9% NaCl or HCl (pH2 or pH3) were infused into the pharynx, upper and lower oesophagus. The data was analysed using the χ^2 test and a repeated measures design ANOVA, probability values of p<0.05 were considered significant. Ethics Committee approval was given.

Results: A total of 320 infusions were administered in AS. The results (mean \pm SEM, and % occurrence) are given in Table 1. The significant differences between the control and promethazine piglets for each level of fluid infusion are denoted by * (*p<0.05).

Table 1.

	Pharyngeal infusion (n=148)		Upper oesophageal infusion(n=94)	
	Control	Promethazine	Control	Promethazine
Lower oesophageal infusion(n=78)				
Swallow rate (swallow.min ⁻¹)				
	8.8 \pm 0.6	5.8 \pm 0.2*	3.3 \pm 0.4	3.0 \pm 0.3
		3.3 \pm 0.4	3.2 \pm 0.3	
SaO ₂ (% change)				
	-1.3 \pm 1.1	-6.6 \pm 0.8*	-1.6 \pm 0.5	-1.8 \pm 0.5
		-1.1 \pm 0.4	-2.9 \pm 0.8	
Heart rate (change bpm)				
	-4.1 \pm 2.8	-11.1 \pm 1.4*	-6.7 \pm 3.5	-5.4 \pm 0.8
		-4.1 \pm 0.8	-4.3 \pm 1.5	
Arousal (% occurrence)				
	57%	57%	42%	

	12%*	24%	25%
Apnea (≥5 secs)			
(% occurrence)	43%	62%*	13%
	22%	22%	36%

Conclusion: Infant doses of promethazine profoundly altered airway protective and cardio-respiratory responses in normal, healthy sleeping piglets following pharyngeal fluid stimulation. These results suggest that pharyngeal fluid insults (such as high reflux or post-nasal secretions) are a mechanism for the association observed between promethazine use, and the occurrence of ALTEs and SIDS. The current cautions on the use of promethazine-containing preparations in infants are supported by the findings of this study, and we recommend that greater enforcement is needed to prevent over-the-counter sale of such drugs, especially for young infants.

59 CEREBRAL CIRCULATORY RESPONSES TO REPEATED AND CONTINUOUS HYPOXIA IN SLEEPING LAMBS

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Rapid-eye-movement (REM) sleep is remarkable among sleep-wake states for elevated cerebral blood flow (CBF) and for greater risk of cerebro-vascular injury. Possibly the brain is more vulnerable in REM because cerebral vasodilatory reserves are limited in this state (Grant et al 1998), leaving it exposed to the cardiovascular instability that is characteristic of normal REM and which is exaggerated during sleep disrupted by apnoea. This study examined the hypothesis that the pronounced basal vasodilation of REM limits vasodilatory responses to hypoxia. We: (a) contrasted the response of the cerebral circulation during REM and non-REM sleep to transient, episodic arterial oxygen desaturations designed to mimic sleep apnoea (*HYPOXIA IN SLEEP*); and (b) determined the changes of CBF associated

with REM and non-REM sleep cycles occurring against a background of continuous hypoxia (*SLEEP IN HYPOXIA*).

Lambs (n = 8) were instrumented to record beat-to-beat cerebral blood flow (CBF) using an ultrasonic flow probe implanted around the superior sagittal sinus (Grant et al 1995), and implanted with catheters to record cerebral perfusion pressure (CPP) and electrodes to define sleep-wake states. Arterial oxygen saturation (SpO₂) was recorded with a pulse oximeter. CBF, CPP, and cerebral vascular resistance (CVR=CPP/CBF) were contrasted between REM and non-REM sleep occurring naturally during normoxia (FiO₂ 0.21) and during hypoxia induced by reducing FiO₂ to 0.10 either (a) transiently (60 sec) within sleep epochs; or (b) continuously (1 hr) across sleep epochs. Under baseline (normoxia) conditions, CBF was significantly greater (15±1 vs. 13±1, P<0.02 mean ± SE) and CVR was significantly less (4.2±0.2 vs. 5.6±0.5, P<0.02) in REM than in non-REM. During transient (60 sec) hypoxia, significant increases of CBF from control values occurred in both REM (35±6 percent, P<0.001) and non-REM (23±7 percent, P<0.01). Though the CBF increase was greater in REM than in non-REM, so too was the fall in SpO₂ (REM 30±1 vs. non-REM 22±2, P<0.01). Plotted against SpO₂ to account for the deeper desaturation occurring in REM (Figure). CBF and CVR exhibited a similar sensitivity to hypoxia (*slope*) in REM and non-REM, while maintaining the characteristic sleep state-related differences (*position*) over a wide range of arterial oxygenation. Moreover, there was preservation of the significantly greater CBF of REM compared with wakefulness (W) and non-REM under conditions of continuous hypoxia.

These experiments show that the major cerebral blood flow differences of sleep and wakefulness (REM > W > non-REM) are preserved in hypoxia, regardless of its duration. Thus, the vasodilatory mechanisms that contribute to the marked cerebral vasodilation and the elevated cerebral perfusion of REM remain effective during hypoxia.

STUDY	ACTIVE SLEEP		QUIET SLEEP	
	PRONE	SUPINE	PRONE	SUPINE
36-38 w	304 ± 41	190 ± 24	275 ± 39	218 ± 36
2-3 w	278 ± 36	199 ± 33	385 ± 58	289 ± 47
2-3 m	248 ± 64	76 ± 10	453 ± 68	287 ± 72

Grant, D.A., Wild J, Franzini, C., Walker, A.M. Continuous measurement of superior sagittal sinus blood flow in the lamb. *Am J Physiol* 1995, 269: R274-R279.

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60 MECHANISMS CAUSING THE SUDDEN DEATH OF INFANTS WHILE SHARING A SLEEP SURFACE WITH OTHERS

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Several epidemiological studies have indicated that when an infant shares a sleeping surface with others the risk for SIDS is increased. Still other studies have suggested that particular aspects of the typical bedsharing environment (eq. pillows, soft sleep surface, bulky overbedding) create unsafe conditions for a sleeping infant. We conducted a 4 year study (1994-97) of all infant deaths (<2 years old) diagnosed as Sudden Infant Death Syndrome, accidental suffocation or "cause of death undetermined" in a defined geographic region (St. Louis and St. Louis County, USA) inhabited by diverse socioeconomic groups. Death scene investigations were performed to determine potential causal mechanisms. All infants were less than 1 year of age (mean age+109 days). Fifty-six of 119 infants (47.1%) died while sharing a sleep surface with an average of 1.4 +/- .07 bedmates. The shared sleep surfaces included adult beds or mattresses, sofas, and cushioned chairs. Forty-three of the 56 were diagnosed as SIDS (77%); 10 were accidental suffocations (18%) and 3 were "undetermined" (5%). Of the SIDS and "undetermined" deaths, 12 (27%) were found with either head or face covered by soft bedding. In 13 of the 56 shared sleep surface deaths (23%) there was evidence that the infant would have been unable to escape from an asphyxiating environment because the infant's head or body was either wedged against or under a sleeping a bedmate's body (7 cases) or an inanimate object (6 cases). We conclude that a large proportion of sudden infant deaths in a typical US population including SIDS, occur while sharing a sleep surface. Also, in 39% of such cosleeping deaths respiratory impairment leading to asphyxia (10 deaths) possibly with associated overheating (head/face covered in 12 deaths) appeared to be a primary cause of death. Finally, when we consider how

often it was that a non cosleeping person arrived by chance and observed the dead infant beneath a cosleeper, a situation that other wise might never have be documented, we conclude that our findings for occurrence of this particular fatal mechanism likely underestimated its true incidence.

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61 THE DEVELOPMENT OF MOVEMENT IN INFANTS

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Newborn infants are under the influence of the asymmetrical tonic neck reflex (fencer's position) when stressed which tends to make them turn the face from side to side. By 4-6 weeks of life this is beginning to be replaced by the symmetric tonic neck reflex (crawling position) which causes them to bob the face up and down in the midline when stressed. This presents a problem of airway obstruction in prone.

At about 4-6 months age infants begin to roll from supine to prone, initiating the roll by throwing one leg over the other. For a short time, usually 1-3 weeks, they are unable to return to supine and so are vulnerable because of their prone position.

At about 6 to 8 months infants begin to move in prone, frequently creeping backwards despite wanting to move forwards. This usually lasts for 1-2 weeks and such infants are in danger if they move back under bedclothes.

These dangerous situations can be minimised.

1. No infant should be left unobserved in prone before they can easily turn to supine.
 2. Infants who can roll to prone but not back again should sleep in sleeping bags (to reduce the likelihood of one leg crossing the other, or have other means to restrict movement (e.g. swaddling, wedges, or Dutch style sleeping bags with straps).
 3. Bedclothes should not be used for infants until they have learned to crawl forwards.
- Video recordings will be used to demonstrate these movements.

62 HAZARDOUS SITUATIONS FOR SMALL INFANTS: - CAR SEATS AND STROLLERS ETC.

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The upper airway of a small infant is through the nose unless the infant is crying or gasping The large tongue fills the mouth

and until the mandibular ramus has lengthened and the tongue has descended with the jaw easy oral breathing is not possible.

In addition the mandibular articulation with the skull is mobile and the jaw can slide posteriorly. Thus the tongue which sits in the jaw can be taken back to compromise the upper air passage from the nose to the larynx. After the infant is about 6 months old this slide can no longer take place and internal upper airway restriction is unusual. When a very small infant is supported in an upright position the head usually falls forward and the chin rests on the chest. In some infants the weight of the head is sufficient to push the mandible backwards and thus restrict, or block air entry to the lungs. This may lead to oxygen lack and a stoppage of breathing. Babies have been found dead in this situation. Immediate resuscitation is needed for any babies who have stopped breathing in this position. The most efficient way to give this is by adult mouth to infant nose.

Small babies should not be put into car seats or strollers that do not allow their heads to rest in an extended position.

They should be taken out of the car seats and allowed to lie flat when they are out of the car.

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THE CESDI SUDI STUDY: COT DEATHS OUTSIDE THE COT

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Although sudden infant death syndrome (SIDS) is referred to as 'cot' death, a proportion of these deaths occur outside this environment. The prevalence and risk associated with the different sleeping environments in which these deaths were discovered has been investigated.

Methods A three year case-control study conducted in 5 of 14 Health Regions in England (population ~ 17 million, 500,000 livebirths). Parental interviews were conducted for each infant who died and for four controls matched for age and time of sleep. Ascertainment was over 90% [1][2]. This analysis includes 325 SIDS and 1300 matched controls.

Results Just over half the deaths (54.7%) were discovered in a cot compared to three-quarters of the control infants (74.3%) who

woke up in a cot after the reference sleep. A similar proportion were found in a pram, bouncy chair or car seat (7.2% SIDS vs 8.1% controls). Using these 'baby-designed' environments as a reference group there was a significant risk associated with infants found in bed with the parents (25.8% SIDS vs 14.7% controls, OR=2.47 [95% CI: 1.74-3.52] this will be dealt with in a separate presentation) and an even greater risk for those infants who slept in an adult bed without the parents (4.7% vs 0.3%, OR=18.99 [95% CI: 4.84-72.92]). Of these 15 deaths, 14 were in a room unattended, 2 of these infants were discovered on the floor, 2 under the bedcovers at the bottom of the bed and 2 were extremely overwrapped. A highly significant risk was also associated with infants found sleeping with an adult on a sofa (6.3% vs 0.5%, OR=23.96 [95% CI: 7.08-81.10]). The narrative account suggests that for 4 of these 20 deaths the infant was wedged between the parent and the back of the sofa. Of the 10 SIDS mothers and 10 partners, 7 had not intended to fall asleep on the sofa, but for 9 this practice was not unusual. In 5 of these deaths the co-sleeping parent had consumed up to 2 units of alcohol and a further 3 had consumed much more than this. There was no risk associated with infants who slept on a sofa alone (1.3% vs 2.2%, OR=0.68 [95% CI: 0.22-2.14]).

Conclusions In this study more than 1 in 10 deaths occurred whilst the infant slept alone on an adult bed or slept with an adult on the sofa. These deaths could be avoided if parents are issued with the appropriate advice.

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DANGEROUS SLEEPING ENVIRONMENTS OF INFANTS UNDER TWO YEARS OF AGE

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All SIDS deaths that occur within a 3 hour radius of Melbourne, Victoria are investigated by a representative from the Victorian Institute of Forensic Medicine

(VIFM). This retrospective study is based on information collected from Event Scene Investigations performed during 1995, 1996 and 1997. The aim of this project is to examine the sleeping environments of infants who died suddenly and unexpectedly. The definition of a dangerous or hazardous sleeping environment is debated. For the purpose of this study it is defined as any environment which increases the risk of injury or death to an infant. Of the 99 infants in the group, in 94 cases the cause of death was SIDS, 4 asphyxial deaths and 1 death which was described as unascertainable. A faulty cot was present in 5 cases. 33% of the 99 infants were discovered lying prone with their face down in bedding. 43% of infants were sleeping with at least one other person, with the majority of these infants (32/43, 74%) being under three months of age. Additional factors such as age, type of sleeping surfaces, overheating and bedding covering the head are discussed.

65 **THE INFANT POSITIONING PROJECT: A PROFESSIONAL EDUCATION INITIATIVE.**

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Aim: To increase the prevalence of face-up sleeping in maternity hospitals.

Background: Much of the increased protection from sudden infant death syndrome (SIDS) in New Zealand (NZ), has been achieved with a change from prone to side rather than back for positioning babies for sleep. High levels of side sleeping persist. An education initiative was designed to influence infant positioning practices in maternity hospitals and, indirectly by example, parent practices in homes.

Method: A national assessment was made of infant positioning practices in hospitals by means of a maternity management survey of "usual" and "recommended" practice and an audit of "actual" practice. An education resource of research evidence and expert comment was developed and distributed to all participating hospitals. After six-months a follow-up survey and audit was undertaken to assess any change.

Results: Responding hospitals represented 82% of all live births in the country. The management survey showed that most hospitals had no written policy, audit process or staff guidelines for infant positioning practices. Side sleeping was both

widely practiced and promoted, influencing more than 50% of babies born. Both back and side positions were observed in similar proportions for both normal and special care babies, younger (<48 hours) and older babies and in smaller and larger hospitals. Hospitals giving "back only" as the "recommended" and "usual" infant sleep position for normal care babies had equal levels of back and side sleeping observed in the audit of "actual" practice. The results of the post intervention survey, yet to be completed will be presented in this paper.

Conclusion: There was low awareness of "back is best" by maternity professionals in NZ. Response to the assessment report and education resource has been excellent. It is hoped that this carefully designed intervention will result in the confident promotion of face-up sleeping as best for healthy babies from birth and special care babies from discharge.

66 **Safe Sleeping Environments for Infants: A CPSC Perspective**

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Background and Purpose. The U.S. Consumer Product Safety Commission (CPSC) is an independent regulatory agency within the U.S. Federal Government. The agency was created in 1973 and since its inception has emphasized protecting infants and children from the unreasonable risk of injury and death associated with consumer products. These products include cribs, portable cribs, bassinets, bedding, and other products used as, or found in, infants' sleeping environments. The purpose of this paper is to: (1) review actions taken by CPSC to make infant sleeping environments safer, including the use of mandatory and voluntary safety standards, safety alerts and public warnings, and (2) present the results of two CPSC studies on the hazards of soft bedding for infants. One study examines the risk of certain bedding use for SIDS infants found with their heads covered compared to SIDS infants found without their heads covered. The second study examines the characteristics of infant deaths in cribs compared to infant deaths in other sleeping environments.

Methods. Data on head covering is from a CPSC study conducted from 1992-1994 at 18 sites in 9 states were reanalyzed to examine

factors associated with sudden infant death with head covered. The study procedures included structured interviews as soon as possible after the infant's death, mannequin placement by the caregiver who found the baby, and photographs of the mannequin placement. The methodology for this study has been reported previously [1].

Data on deaths in various sleeping environments will be described by searching three CPSC databases: the Death Certificate (DTHS) database that includes product-related deaths purchased from all 50 states; the Injury and Potential Injury Incidents (IPII) database that contains deaths reported through sources such as medical examiners, coroners, newclips, and consumer complaints; and the In-Depth Investigations (INDP) database that includes on-site investigations into selected injuries and deaths. We will examine data from two time periods, 1980 and 1997, for infants under 12 months.

Results. Results for the head covering study found that approximately 8% of the infants were found with their heads completely or partially covered, as documented by photographs of mannequin placement. Most of the infants with their heads covered were found covered by blankets or comforters. However, one infant's head was completely covered by a jacket and one infant was covered "from waist to head" by a pillow. Four of these infants were found in the prone position and two in the supine position. One infant, the oldest of the group at 10 months, was placed prone to sleep but found with his head and body covered in the supine position. Infants found with their heads covered were, on the average, 5.1 months old compared to infants found without their heads covered at 2.8 months old ($t = 5.44$, $df = 204$, $p = .000$). Significantly more head-covered infants were covered by comforters compared to infants without their heads covered ($P^2 = 11.34$, $df = 1.$, $p = .01$) but no significant difference was found between groups in the use of blankets or in the use of sheets.

Data used to compare the characteristics of deaths in various sleeping environments are currently being analyzed and will be included in the presentation.

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SHOULD THE INFANT SLEEP IN MOTHER'S BED?

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The role of co-sleeping is an unanswered question in SIDS. Since biblical times this has been considered a risk factor, and there are certainly well documented cases where death from 'overlying' has occurred. In Western society, where solitary infant sleep is considered a normal and desirable arrangement, babies sleep alone and separate from the parents. Yet co-sleeping is culturally normal in Japan, where cot death rates are among the lowest in the world. For the majority of non-western contemporary people, bed sharing is the predominant sleeping arrangement especially in socio-economically-disadvantaged groups. Infants are brought up in a busy environment, almost invariably sleep in the mother's bed, and for many hours of the day are in close contact with her body.

A study in Cape Town, found that 94% of black infants sleep with their mothers compared with 4% of white babies. Anecdotal evidence from many experienced clinicians supports the view that SIDS is less common in ethnic African households. We recently calculated the rates based on notifications to the Central Statistical Services and found an incidence of 0.09/1000 in blacks, 0.29 in whites and 1.11 in babies of mixed race. In a prospective study, Wolf and Ikeogou, reported an incidence of 0.2/1000 in a Zimbabwean township population. The evidence suggests that there may be potential benefits to bed sharing. The bodies of infants are highly dependent on and responsive to a caregiver on whom, for a considerable period of time, their survival depends. It may be safer for the infant to sleep in the parent's room. "For babies to endure increasingly long periods of solitude after birth is biologically unreasonable". It would seem entirely biologically reasonable for the young infant to sleep in close proximity to its mother, and perhaps this is actually protective. This aspect requires further study in communities where co-sleeping is common.

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BACK TO SLEEP AND SIDS
PREVENTION: IS POSITIONAL
PLAGIOCEPHALY A REAL PROBLEM?

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Since 1992, when the American Academy of Pediatrics officially endorsed the practice of supine sleeping position for babies, as a simple measure to help reduce the risk of SIDS (sudden infant death syndrome), enough data has accumulated to support the practice as one of unquestioned benefit and efficacy in SIDS prevention. However, persistent lying in any one position, especially supine, has other attendant risks, which tend to be ignored by the paediatric health care community. Concomitant with the rise in popularity of supine sleeping positions, there has been a worldwide epidemic of referrals to paediatric neurosurgical and craniofacial centres, of children with occipital plagiocephaly. In Auckland, in one of the major craniofacial centres in Australasia, we have seen a rise in the rate of referral of over 300% in the past two years. Our concerns revolve around two issues: 1. In the first instance the paediatric healthcare community seems either unwilling to recognise the problem, or reluctant to acknowledge it, for fear of undermining the very worthwhile message that supine sleeping is best in terms of SIDS prevention. Valid parental concerns are brushed aside with unwarranted reassurances, which engender anger and resentment when the predicted self-correction of skull shape fails to materialize. Most practitioners believe that the natural history is self correction, but not all children with positional plagiocephaly will self-correct; a significant proportion will be left with visible deformity and in 2-4% this is severe enough to warrant craniofacial surgical correction. 2. The frequency of occurrence of OP (occipital plagiocephaly) tends to breed a contemptuous familiarity amongst frontline health care workers and there is a real risk of missing other diagnoses such as sutural synostosis or torticollis, which require early intervention rather than expectant optimism. There are several simple strategies available for recognizing the risk of OP, preventing its development, or ameliorating the deformation once present, but it is no longer acceptable to deny that a problem exists.

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RISK FACTORS AND SUDDEN INFANT
DEATH SYNDROME: AN OVERVIEW OF
PARENTING PRACTICES IN THE
REPUBLIC OF IRELAND.

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Aim: The aim of this study is to examine parental and childcare practices pertinent to Sudden Infant Death Syndrome. Risk factors for Sudden Infant Death Syndrome highlighted by this study raised the question as to how these results can be incorporated into childcare guidelines.

Method: The information presented here is the preliminary results of a case control study conducted between the years 1994 to 1998, with 208 SIDS cases and 637 controls yielding a population sample of 845 women. Controls were matched for date of birth and geographical location.

Results: Mothers of SIDS cases were younger than the control mothers. (Mothers of cases who were less than 20 years of age accounted for 7% as opposed to 3% of the control mothers. 25% of the case mothers were in the age group 20 to 24 years as opposed to 8% of the controls). Forty three per cent of mothers of cases were single compared to 12% of controls. Of the cases 59% had medical card status with 22% of the controls, 26% of the case mothers were unemployed as opposed to 5% of the controls. Sixty seven per cent of the mothers of the cases belonged to social class 4 to 6 in comparison to only 33% of the controls. Only 10% of the mothers of the cases obtained tertiary education as opposed to 26% of the controls. In the cases 29% of the fathers left school before 16 years of age as opposed to 11% of the controls, and only 10% of the case fathers received tertiary education as opposed to 31% of the controls. Of the fathers of the cases 32% were unemployed and 69% belonged to social class 4 to 6. The corresponding figures for the controls were 8% and 44% respectively. Results also show that in the cases the percentage of women smoking is much higher (74%) than the controls (28%). The amount of cigarettes smoked by the mothers showed that in the cases 47% smoked 11-20 cigarettes per day as opposed 34% of the controls during pregnancy. The pattern remained the same following delivery of the baby. Sixty three per cent of the fathers of the cases smoked during pregnancy as opposed to 27% of the controls. This pattern remained unchanged after birth. Mothers drank alcohol in 64% of cases as opposed to

50% of the controls. Almost 40% of the case mothers took greater than 5 units of alcohol per week while pregnant as opposed to 12% of the controls. After the baby was born 52% of the case mothers took greater than 5 units of alcohol. This figure increased as opposed to the controls whereby only 22% took alcohol. There was no significant difference between the number of fathers drinking between cases and controls.

Discussion and Conclusion: The data presented from Ireland's case control study demonstrates that childcare practices vary amongst families whose infants die from Sudden Infant Death Syndrome. The issue remains as to how best to implement an appropriate advisory package to address the issues of parental practices paying particular attention to the Risk factors for Sudden Infant Death Syndrome especially smoking and alcohol. The percentage of women smoking is still increasing in six EU countries including Ireland.

70 TRAINING BEREAVED PARENTS FOR PEER SUPPORT

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Ireland.*

Parents newly bereaved by the death of their infant from S.I.D.S. continually request (through I.S.I.D.A.'s register) that they be put in touch with other parents who have recently experienced the same trauma. However it is important that such contact be productive to both parties.

In order to safeguard both parents making the request and the supporting parents I.S.I.D.A has devised a residential training programme for parents. This paper presents an outline of the training given to parents to act as befrienders over two residential weekends. It describes areas covered i.e. normal grieving, basic counselling skills among other issues. Also discussed are the actual structures used in providing the service and the supports put in place for befrienders. The criteria used in selecting befrienders are also discussed.

An evaluation of the training and befrienders assessment of their need for support will also be presented.

71 NEW INITIATIVES FOR SUPPORTING BEREAVED PARENTS

Ann Deri-Bowen

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In 1997, 403 babies died suddenly and unexpectedly in England, Wales and Northern Ireland. In 88% of these cases the Foundation for the Study of Infant Deaths had contact either with the family directly or with a professional working with the family.

With the changing profile of bereaved parents the FSID Information and Support Committee, which includes Paediatricians, Counsellors, Psychiatrists, Psychologist, statistician, and representatives of other professions, has constantly reviewed strategies for offering support. The presentation will highlight the following new initiatives and expand on the reason for their introduction:

- Providing 'Support for Bereaved Parents Days' which encourage parents to reflect after at least a year on their own personal experience and share with others.
- Health Visitors involved with a bereaved family have been contacted after the death by regional staff. The aim is to provide information and support the health professional in their role of supporting the family.
- Bereaved families were invited to meet FSID and other bereaved families over a cup of tea and have free entry to a museum. Many newly bereaved parents, not known to FSID, attended and the day provided an opportunity for support which would have historically been provided by Groups of Friends.
- A free phone card for the 24 hour helpline has been offered to all bereaved parents since 1998 and has increased the support offered. The presentation will look at the number of parents who have used the card during the year and comments from users.
- Bereaved parents attending the Annual National Conference have been 'paired' with Befrienders which has provided an additional welcome and a friendly face.

72 BEREAVEMENT RESPONSE TO THE DEATH OF A CHILD

Ian Mitchell

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Canada*

Parental bereavement, including the death of a child due to SIDS, produces major and long-lasting effect on the parents. Studies

of bereavement needs have not generally used a population-based approach. We sent 2 copies of a questionnaire on bereavement to the parents of all children (including still births) less than 19 years who died in a 6 month period in Alberta (700). 114 questionnaires were returned and 7 parents (6.1%) indicated their child had died of SIDS. Three parents had attended the SIDS group and had found it helpful.

Responses are not divided by diagnoses, as we did not link the anonymous questionnaire response with the cause of death. Parents requested information on bereavement but did not indicate that any one time was better than another. A specific request was for more information on bereavement affecting siblings. The commonest sources of support were immediate family and friends, but health care practitioners also were perceived as supportive. Psychosocial professionals, clergy, funeral directors and police officers were found to be helpful by a majority, but there was a significant number in each profession that was not thought to be helpful by the parents. 78% of the parents would like a health care professional to contact them, and they varied in their suggested time. 46.5% suggested within 2 to 3 weeks, 29.8% suggested around anniversary of death, and 18.4% around special holidays. There were a number of barriers to receiving services such as travelling distance (19%), cost (16.7%), and work commitments (14.9%). Interestingly, 27.2% of the parents did not feel the need for services.

A population-based assessment of needs can help design services for bereaved parents whatever the diagnosis. Traditional bereavement services have often been focused on families whose child is already known to health care professionals.

73 BABIES OF THE DREAMING – ABORIGINAL FAMILIES SUPPORTING EACH OTHER IN BEREAVEMENT

Lyn Briggs

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VAHS provide a state wide service that includes a medical, mental health and dental services, community health research and education, and a Women's & Children's Program. The address will outline the way VAHS supports families that have experienced the grief and loss of losing a child. The history of colonial and post-colonial Australia is such that many Aboriginal families have suffered this kind

of grief in ways that you may not have even heard of. For example, Government Policy for many decades involved the removal of children from their Aboriginal families and placing them in institutions for the rest of their life. Most never knew their real parents. And their mothers, fathers and extended families suffered the same heartbreak that losing a child to SIDS can bring. The losses for the Aboriginal community go beyond SIDS. Another element that is noteworthy is the cultural diversity of indigenous communities in Australia, and hence the need to respect the sensitivities and cultural practices of a range of communities. Aboriginal communities have been under sustained pressure for a long period of time. Survival is a major focus. The VAHS approach tries to acknowledge this, and therefore takes a holistic approach when caring for the families in our community.

The VAHS became actively involved with SIDS Day in 1997. Since then a number of activities have been conducted each year during SIDS week. This is yet another way that the VAHS provides support for families. A significant effort has been made to raise awareness of SIDS in a culturally appropriate way. From this small community a substantial fundraising contribution for the SIDS Foundation has also been made. Major events like the development of the Babies of the Dreaming banner and the Candle Memorial Day will be outlined.

74 SUDDEN DEATH LIAISON OFFICER PROGRAM. A POLICE INITIATED SUPPORT SERVICE FOR BEREAVED PARENTS THAT ENSURES BEST PRACTICE IN REPORTING PROCEDURES FOR SUDDEN INFANT DEATH SYNDROME.

J. Joyce, B. Graydon

Queensland Police Service, Australia

The Queensland Police Service is leading the way in providing a professional and caring service to bereaved parents. This ensures correct reporting procedures of Sudden Infant Death Syndrome.

The Sudden Death Liaison Officer (SDLO) program was implemented in a small area of Queensland in November 1996. Since that date, the program has been adopted in other regions and included into the Police operations manual as best practice guidelines. The program has now been endorsed at international levels.

Police Officers are tasked with investigating

the deaths of infants. Traditionally no thought has been given as to who should attend these high grief situations. Too often, inexperienced Police have been assigned these tasks. The negative impact that this can have has been well documented. The SDLO program provides the family with a professional and caring officer, who builds a rapport, provides information, and becomes a central focal point for them after their ordeal. The positive impact this has had on bereaved families cannot be overstated.

The reasons for the program's success are many. Paramount to this success however has proven to be the provision of professional service delivery the families deserve, and the correct reporting of accidental deaths which may have previously been recorded as SIDS.

Additionally, Police are no longer over-exposed to child death. This is due to the coping mechanisms built into the program. The SDLO program has been described as one of the finest policing initiatives ever seen and has generated enormous interest throughout the world. The program has introduced the highest possible standard of Police professionalism in the area of death investigation.

75 INTEGRATED EMERGENCY RESPONSE MODEL

Michael Corboy

SIDSnew south wales, NSW, Australia

Over many years, Sergeant Michael Corboy of the New South Wales Police Service has been lecturing Police on the processes, legal requirements, emotional impact on parents and coping mechanisms for Police in relation to attendance at SIDS deaths. Michael, who's own daughter Erin died on 1986, is also Chairman of SIDSnew south wales. Over these years Police, Ambulance Officers and support services from both SIDS organizations and government authorities provided many cross-over services when attending to SIDS deaths. In recent times when many other charities are competing for funding that in the past went to SIDS organizations and the changing nature of SIDS charities with the expansion of services, it is becoming increasingly difficult to cover all aspects from a support services aspect. In a new look at the entire process relating to services provided by all organizations whether Government, Emergency Services or Support Organizations, an Integrated Response Model can assist all support

organizations from both a resource perspective and a funding perspective. Training of Support Services staff, providing 24 hour a day telephone response, calling out support service volunteers and the recruiting of volunteers have all become increasingly difficult.

In this paper Michael will discuss and propose an Integrated Emergency Response Model where not only funding and resources can be directed toward the training of volunteers but also a greater collaborative approach can be taken. Directing resources toward greater integrated training of Police and Ambulance Officers as well as Hospital staff can greatly assist SIDS organizations with both proper use of resources and finances. Michael will discuss processes, cultural/organizational change and barriers to his Integrated Response Model.

76 POLICE INVESTIGATION INTO THE SUDDEN AND UNEXPECTED DEATHS OF INFANTS. THE WAY FORWARD

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The first contact for bereaved parents following the sudden and unexpected death of their infant is often with uniformed police officers, many of whom are parents themselves, but most have no experience in dealing with bereaved parents. In England, Wales and Northern Ireland, there are 44 police forces, all with different guidelines in dealing with these deaths.

During 1997, a number of problems were identified by parents and professionals regarding the handling of these deaths by police. Complaints included :-

- Bereaved parents were denied access to their infant following confirmation of death, and parents were only allowed to hold or touch their infant while closely supervised by police officers.
- Parents were not informed when their child was being taken to another hospital or region for a post mortem examination.
- The body of their infant was not being released by H.M. Coroner for the funeral.

As a result of these complaints, Sussex Police recognised that these problems needed to be addressed. They met with the author, an FSID Regional Co-ordinator, a bereaved parent and a part-time serving Police Officer, and consultations were made into a Joint Agency Protocol for Unexplained and Unexpected Infant Death. This involves all Child Protection

Committees, H.M. Coroners, the Home Office, F.S.I.D. and health professionals working together. Initiatives include:-

- A Detective Sergeant, will attend each death preferably from the Child Protection Team (C.P.T.) with consideration being given to a CPT officer attending as an alternative to uniformed police, whose attendance should be kept to a minimum.
- Parents or carers should be allowed to see and hold their infant while being observed discreetly by a professional.
- Professionals must endeavour to conclude their investigations expeditiously, as the funeral must not be delayed unnecessarily.

These guidelines form a basis for us to encourage other forces to update their protocols in dealing with these deaths. The guidelines are available to view.

77 CHILDREN'S PROTECTION WORKERS AND SIDS RISK REDUCTION. AN EXPLORATORY PROJECT TO REDUCE THE RISK OF SIDS IN FAMILIES KNOWN TO THE CHILDREN'S PROTECTION SERVICE.

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Between 1989 and 1996, 36 deaths occurred of infants aged under one year of age in families known to the Child Protection Service in the Department of Human Services, Victoria, Australia. Nineteen of these 36 infant deaths were diagnosed as SIDS.

In 1997, a ministerial advisory committee, the Victorian Child Deaths Review Committee, recommended that Children's Protection Workers, who investigate notifications of child abuse and neglect receive training "...to provide information on prevention strategies that can be disseminated to young parents with young infants who are subject to protective investigation, and assists these workers in coping with SIDS deaths among their caseloads." Annual Report of Inquiries into Child Deaths: Protection and Care 1997. Victorian Child Death Review Committee. Victoria. p21.

The paper describes this exploratory program in health promotion for families at high risk and discusses the implementation and practice issues arising, both from the perspective of health promotion and the children's protection service.

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MORTALITY OF BABIES ENROLLED ON A SUPPORT PROGRAMME FOR VULNERABLE BABIES OR ANXIOUS PARENTS

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Since 1989, the Foundation for the Study of Infant Deaths has funded the Care of Next Infant (CONI) programme to provide support for families with children born following a cot death. CONI has been widely taken up and is used by 85% of the community health trusts in England, Wales and Northern Ireland. By 1st January, 1999, 5922 babies had been enrolled, although as participation on the programme is optional, this is not the complete population of subsequent siblings. Due to demand from clinicians the programme was made available for other families who were assessed locally as needing additional support e.g. following ALTE, family history of cot death, previous infant death of known cause. 729 babies have been enrolled in this group. The postperinatal mortality of babies on the scheme in the initial 5922 is 8.3/1000 live births. To date 8 have died of the additional 729 enrolled on the wider programme, 4 amongst 231 babies enrolled because of a close family history of cot death.

These are very high death rates but appear to be about half the rate of previous deaths in the same families. Studies of these baby deaths reveal that only a small proportion are truly unexplained and possibly preventable factors have been identified. Where suitable regimes have been implemented with subsequent children, no further deaths have occurred. It appears that families enrolling on this scheme are a high risk group identified by the primary care team and by the parents themselves.

Satisfaction rates recorded by both parents and the health visitors show that the scheme is greatly appreciated.

Our present objectives are to obtain total data in some areas to further quantify the beneficial effects of the service. We should like to discuss the implementation of similar scheme elsewhere to evaluate our findings.

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RISK FACTORS AND SUDDEN INFANT DEATH SYNDROME: AN OVERVIEW OF CHILD HEALTH IN THE REPUBLIC OF IRELAND.

Mary McDonnell

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Aim: The aim of this study is to highlight factors that may influence infant health. The data from Ireland's case control study demonstrates differences amongst those infants who die from Sudden Infant Death Syndrome and those in the general population.

Method: The information presented here is the preliminary results of a case control study conducted between the years 1994 to 1998 with 208 SIDS cases and 637 controls yielding a sample of 845 children. Controls were matched for date of birth and geographical location.

Results: Two per cent of mothers of SIDS cases received no antenatal care with 22% of them waiting until they were more than 17 weeks pregnant to receive care as opposed to 14% of the controls. Twenty four per cent of the cases received less than 14 weeks maternity leave as opposed to only 15% of the controls. In the cases 12% of the mothers returned to work when the child was less than 4 weeks of age in comparison to 4% of the controls. Seventy one per cent of the cases and 74% of controls were cared for by their mothers during the day however in 19% of the cases both the mother and father were recorded as the primary carer during the day as opposed to only 4% of the controls. At nighttime 62% of the cases had both parents as carers as opposed to only 27% of the controls. SIDS cases were found to come from larger families with 4% of the mothers having 6 or more children as opposed to only 0.5% in the controls. In 3% of cases the mothers had a previous stillbirth as opposed to 0.8% of the controls. Four per cent of the cases were a twin with 11.7% born before they were 37 weeks gestation as opposed to 4% of the controls. In 13% of the cases the birthweight was less than 2500 gms as opposed 3% of the controls.

Discussion and Conclusion: The discussion will explore the issues of importance in relation to the antenatal care of mothers and potential parenting practices so that their infant's health can be maximized to ensure a better outcome.

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UNEXPECTED INFANT DEATHS: THE VALUE OF DEATH SCENE INVESTIGATION AND MULTIDISCIPLINARY REVIEW

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The proportion of sudden unexpected deaths in infancy (SUDI) attributed to accidental asphyxia or to non-accidental injury (NAI) by a parent or carer remains controversial, and the importance of a careful history and scene investigation have been emphasised (1).

Aim: Investigation of all infant deaths in Avon (population 940,000).

Methods: Information was collected, from 1985-1998 inclusive, on all SUDI in Avon by a paediatrician or research health visitor, at a home visit, within 24 hours after discovery of the death, followed by a full post-mortem examination, and a multidisciplinary case review meeting (2). SIDS was defined as: "sudden unexpected death of an infant, which remains unexplained after a full autopsy, review of clinical history and circumstances of death". Detailed examination of the death scene whenever possible was added from 1992.

Results: Interviews and case review meetings were completed for 280/285 (98%) of the deaths, post-mortems for 100%.

In 1985-1991, 228 SUDI occurred, including 204 SIDS (2.3 / 1000 live births). Of "explained" SUDI (total 24), 5 were attributed to NAI (2%), 2 to accidental suffocation (1%), and 17 (7%) to other causes, (e.g. infection). In 1992-1998, 58 SUDI occurred, including 34 SIDS (0.7 / 1000 live births). Death scene examination was completed for 41 (71%) deaths. Of "explained" SUDI (total 24), 6 were attributed to NAI (10%), 6 to accidental suffocation (10%), and 12 (21%) to other causes, (e.g. infection).

Conclusions: Despite a marked fall in the number of SUDI, (especially SIDS) "fully explained" deaths remained constant (1 in 3,500 births) as did those attributed to NAI (1 in 16,000 births). Death scene examination has led to raised awareness of the possibility of accidental suffocation. These studies demonstrate that investigation of the scene and multidisciplinary case review are practical and valuable for all sudden unexpected deaths in infancy.

1. Editorial (anon). Unexplained deaths in infancy. *Lancet* 1999; 353:161.

2. Fleming PJ, Blair P, Bacon C, Bensley D,

Smith I, Taylor E, Berry PJ, Golding J, Tripp J. The environment of infants during sleep and the risk of sudden infant death syndrome: results of 1993-5 case-control study for confidential enquiry into stillbirths and deaths in infancy. *BMJ*. 1996; 313:191-5.

81 HEALTH CARE VISITS BY CHILDREN FROM BIRTH TO TWO YEARS IN AN URBAN HEALTH CENTRE

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Counseling parents about sleeping position and supporting infant care activities are important services to provide for the prevention of SIDS (sudden infant death syndrome) and other causes of post neonatal mortality. Frequent visits to the health care provider during the first 6 months of life are essential. To determine opportunities that providers have to give this information, a baby track program was started and the infants were tracked upon registration at an urban Health Center until their second birthday.

Objectives of the study:

- 1). Determine the pattern of health care visits for children from birth to age 2 years in an urban Health Center.
- 2). Identify factors relating to the frequency of visits to the Health Center.
- 3). Relate number and timing of visits to the infant's being up to date with immunization at 3, 6, 9, 12, and 18 months.

Methods: Infants born to mothers cared for in the antepartum practice at a Health Center were tracked from the time they were registered in the Center as newborns until age two years. Demographic data as well as immunizations, numbers of visits, and reasons for visits were collected and updated monthly from reports from the Center's information system.

Results: Preliminary results of children born during the previous nine months reveal that 74.2% of infants visit the health care provider before 2 weeks of age. Ninety one percent see the health care provider within the first month of life. Eighty five percent of first visits have the only diagnosis as well infant. Present findings show that 75.8% of infants are up to date with their immunizations at 3 months of age. Further data are being analyzed.

82 INFANT CARE PRACTICES IN VICTORIA, AUSTRALIA, 1997-1998: A POPULATION SURVEY TO EVALUATE THE EFFECTIVENESS OF ENHANCED SIDS RISK REDUCTION MEASURES.

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In June 1997, the National SIDS Council of Australia launched the 'KIDS&SIDS. Three ways to reduce the risk.' community education program. This program recommends that parents 'put baby on the back to sleep; ensure that baby's head remains uncovered during sleep and keep baby in a smokefree environment before birth and after.'

To evaluate the effectiveness of the program, a population based study was undertaken to establish current infant care practices and assess the impact of the revised recommendations on SIDS risk reduction. Parents who had given birth to live infants in Victoria during April 1997 and May 1998 were surveyed using a brief questionnaire. The questionnaire was administered by Maternal and Child Health nurses during the first routine home visit to the family, around ten days after the birth. In each of the surveyed months over 2000 responses were received. This represents approximately 50% of the population of live births during these months.

The paper reports on infant care practices in the state before and after the implementation of the revised reducing the risk of SIDS program. The results provide us with a window in time on which to evaluate future change in infant care practices. The conclusions have indications for the multiple etiologies of SIDS.

83 GETTING THE REDUCE THE RISK ADVICE TO DISADVANTAGED POPULATIONS - A MOBILE INFORMATION PROJECT

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In the UK, as elsewhere, the incidence of SIDS has become concentrated in recent years amongst families living in conditions of socioeconomic disadvantage. Concern that these families have not heard or heeded the

Reduce the Risk message led to the development and launch, by FSID, of a mobile information project in impoverished areas of inner London in 1998, to take the message more forcefully into the communities in which it is most needed.

The project consists of a mobile information unit (VW van) staffed by two information officers, who site the van at various inner London venues three days per week, including street markets, playgrounds, health clinics, supermarkets and other public sites, and proactively engage the interests of passers-by in the Reduce the Risk message and other infant care advice.

The van staff, selected to reflect the diversity of cultural and ethnic populations in the inner city, are managed by a project coordinator who also researches, plans and publicises the sites for the van.

The paper will report on the first 12 months of operation of this unique project, including: level and nature of usage, assessment by local health professionals, and a user survey including the finding that 78% of people who used the van's services learned something new about infant care that they had not known before.

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FATHERS DO SURVIVE SIDS

Graeme Baker

SIDS Canterbury, New Zealand

The reaction of fathers, mothers and other children, to the unexpected death of the youngest family member, are all individual and follow differing paths and timeframes. The future direction the family proceeds is changed from that day.

A father's 'responsibilities in life', sometimes tend to overshadow the real needs that we men as individuals are requiring to have met. I have been fortunate to participate in several gatherings where as a group of men we have had the opportunity to share about the death of our child and listen to others tell their story. Equally important has been the opportunity to talk to other men one to one. These have been a valuable part of surviving. This workshop is for men only, and provide an opportunity to share experiences.

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PARENTS & THE MEDIA

Helen Cormack

Scottish Cot Death Trust, Greenock, Renfrewshire, Scotland.

Each time new research on SIDS emerges, each time a health promotion is launched, a new poster commissioned, the media

request an interview with a parent whose baby has died of SIDS. The reliving of parents' experiences in this forum is not one to be taken on lightly and parents who agree to be interviewed are often unaware of the effect the interview will have on their grief and recovery.

This workshop aims to look at preparation for such an interview, what is likely to happen during it and the care which parents should take of themselves following the interview. Some parents who have never considered offering their perspective may find that with some forethought they could become involved in this way. The differences between TV, radio and print media will be discussed. It is anticipated that there will be a sharing of experience during the workshop.

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INDIGENOUS AND HIGH RISK COMMUNITIES

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An Indigenous population is defined as a population that is native to a specific area. One of the most interesting things about most indigenous populations is that they often call themselves "the people". They are often culturally and linguistically intact. Most American Indian and Alaska Native (AI/AN) are both. There have been cases of almost total assimilation into the greater U.S. society, cases of cultures remaining intact and cases of total extinction after contact. Acculturation and assimilation have increased risks for many diseases and increased mortality for various causes. This is often due to change in diet and level of activity, abuse of alcohol and tobacco, loss of self esteem, loss of social structure and a loss of traditional healing practices not yet fully replaced by western medicine.

While infant mortality has decreased dramatically for AI/AN over the past one hundred years, SIDS rates have declined less dramatically and is one of the areas where this is noticeable. AI/AN infant mortality is second only to the African American population, is higher for post-neonatal mortality and is highest for SIDS. This has put them into a high risk community profile for SIDS. While infant mortality rates have declined for AI/AN, some AI/AN communities experience rates are comparable to developing nations. The SIDS rates range from 112.7 per 100,000 live

births to 366.1 per 100,000 live births. In one area, 47% of the infant deaths were due to SIDS. In all but three of the 12 areas of Indian Health Service, SIDS was the leading cause of infant death and in the other three it was the second after congenital anomalies. The ratio of SIDS for all infant deaths among AI/AN to the White population has increased to 2.8. For postneonatal SIDS deaths it is 2.9.

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AT RISK GROUPS AND SOCIOECONOMIC DETERMINANTS

RG English

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Although infant mortality in the United States is at a record low of 7.2 per 1,000 live births, the U. S. still ranks 24th in infant mortality when compared to other industrialized nations. Infant mortality rates vary significantly among and within racial and ethnic groups. The greatest disparity exists for African Americans; whose infant death rate (14.2) is nearly 2 + times that of white infants (6.0). The overall American Indian rate of 9.0 does not reflect the diversity among Indian communities, some of which have rates approaching twice the national rate. Similarly, the overall Hispanic rate of 7.6 does not reflect the diversity among this group which had a rate of 8.9 among Puerto Ricans (CDC/NCHS, 1996). Although we have done a good job of reducing infant mortality overall, we still do not understand why there is a disparity in rates for certain racial and ethnic groups. When you control for socioeconomic status and education, the gap is still there. Because this disparity occurs in a wide range of causes (low birth weight, injuries, infections, chronic diseases, and maternal mortality – which is four times greater for black women); we need a new way of looking at this dilemma. Problems such as environmental exposures, institutional racism, and psychosocial factors not only influence the health outcomes of the individual, but lead to what is obviously a uniform gap in populations in terms of their health status. Cultural competency and other innovative strategies will be explored.

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SITISI : PLIGHT AND RESPONSE OF PACIFICANS IN AOTEAROA

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For sometime Sudden Infant Death Syndrome (SIDS) or SITISI was considered a rare and low priority problem among Pacificans worldwide. However, recent findings in Aotearoa have shown that at least 33% of Pacific infant deaths since 1991 have been due to SIDS; in addition, the incidence of SIDS among Pacificans has been on the increase since 1986. These findings have necessitated the development of a Pacific response. This have occurred in Aotearoa where a National SIDS Programme, implemented in 1991, has led to decreasing rates amongst Pakeha only. This paper reports the context of these discoveries and the response of Pacificans to control yet another epidemic amongst migrants. The importance and initiation of community-based strategies is central to the Pacificans' response to SITISI and its determinants.

89
REDUCING THE RISK OF SIDS FOR ABORIGINAL INFANTS IN AUSTRALIA: DEVELOPING COLLABORATIVE STRATEGIES

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Deaths from SIDS in Aboriginal infants were nearly 5 times higher for boys and nearly 7 times higher for girls when compared with other Australian infants. Since the introduction of the Reducing the Risk of SIDS community health program in 1990 in Australia, the number of infants dying of SIDS in the non-Aboriginal community has dropped by more than 75%, from approximately 500 in 1989 to about 120 in 1998. There has not been a similar reduction in SIDS among Aboriginal babies. SIDSaustralia has undertaken to address this issue through collaborative work with aboriginal health services and aboriginal communities. The strategy has a two pronged focus: the grass roots up and the top down. SIDSaustralia and its member organisations are reaching out to Aboriginal groups in their own areas and at the same time they are also in contact with the health

authorities. The aim is to establish the most effective ways of working together to develop and disseminate culturally appropriate health information and to fund and support these efforts to reduce the risk of SIDS and improve the safety of sleeping environments for Aboriginal infants.

This paper describes the strategy and discusses its implementation so far. It has important implications for the development of health promotion approaches within indigenous communities.

90 COMPETENT PROFESSIONAL CARE AT TIME OF A SIDS DEATH PREVENTS A LIFETIME OF DYSFUNCTION.

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Compassionate professional care at the time of a SIDS death, which empowers parents to make decisions, involves them in all aspects (legal, psychological, and practical) of the death of their child, supports them in caring for, and involving, their other children and provides professional facilitated bereaved groups for parents and children within six months of the death will, the author contends, prevents dysfunctional families in the aftermath of the death.

This paper presents a programme of care provided at the Childrens Hospital, Dublin where parents are supported intensively and empowered from the time of the SIDS death until the funeral. Afterwards they are provided with on going care in the form of parents bereavement groups. A short description and an evaluation of these groups (1996 –1999) will be included in the presentation. The involvement of siblings is vital for the future mental well being of these children. The author (1997), who interviewed bereaved children to obtain their views, carried out a survey of the issues significant to children. The results of this survey will be used to support the necessity of involving children. Excerpts from a video made with the children discussing the aspects of the sibling's death which were handled badly or well, in their view will be shown. For families from other areas, where babies are not brought to a children's hospital, I.S.I.D.A. (through its register) has evolved 'A Model of Care' for professionals – with a 24 hour hotline to advise professionals on the optimum care for families at the time of the death. The presentation will include a short synopsis of the workings of this 'Model of Care'.

91 INTEGRATED SUDI DEATH SCENE PROTOCOL IN CHRISTCHURCH

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The Maori SIDS Prevention Team has worked for 6 years in the NZ SIDS environment on prevention strategies and support for SIDS families in the Maori community. This issue, the death scene investigation, is an issue for all SIDS families. There are some isolated examples of good service for SIDS families in New Zealand from which we have learned. The present investigation of a SIDS death, carried out by frontline policemen and a pathologist under the auspices of the Coroner, has multiple problems that complicate issues for confused and emotionally battered SIDS parents. These can be easily and usefully modified by the inclusion of medical and social support at the death scene and by providing long term support of SIDS families.

An integrated national death scene protocol is being developed, with a change in focus away from a purely forensic investigation to one which is family focused and balanced with the inclusion of medical and social support. The greatest advances in social support offered to families are currently being made in the Christchurch region. The South Island Maori SIDS Co-ordinator will describe the process of unifying the professional SUDI team; the development of safe and supportive investigative practices for SUDI families and the agencies involved; the importance of debriefing the investigative team together to learn from each death and build codes of best practice and describe the type of multi-disciplinary team needed to provide long term effective support for SUDI families.

92 PSYCHOBIOLOGICAL CONSIDERATIONS

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Psychobiological research on the long-term consequences of genotype-phenotype interactions during the perinatal and early infant periods of development has a long history. There has been a recent resurgence of interest into investigations of the effects of early experience on subsequent risk for

disease, e.g., maternal diet, smoking and stress during pregnancy. Epidemiological data gathered from studies of infants who have succumbed to SIDS clearly points to a vulnerability, which also has its origins during the perinatal period. The at-risk infant's inability to respond to potentially life threatening physiological challenges is likely shaped by both pre and postnatal experience.

Results from studies conducted in our laboratory and others will be reviewed and discussed in an attempt to generate testable hypotheses regarding the effects of experience on neurobehavioral capacities. Data will be presented showing changes in sleep state distribution and baseline autonomic functioning as a function of sleep position. The interaction of postprandial influences with positional changes on "basal" physiological activity will also be discussed. Such baseline differences in autonomic nervous system activity may reflect the capacity to respond to postnatal stressors or challenges. Additionally, these functional changes form the context in which the infants may develop or learn responses to life threatening stimulation. Finally, data will be presented quantifying the ability of infants to respond to cardiorespiratory and cardiovascular challenges as a function of risk status.

93 DEFENSIVE BEHAVIOUR SAVES MOST BABIES' LIVES

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Humans pass through a critical developmental period at 2-4 months in which a shift occurs from reflexive control of behaviour to cortically mediated "learned" control. During that transition, the infant passes through a state which developmentalist Myrtle McGraw called "disorganized" (1943); during that period 95% of crib deaths occur. A small proportion of babies do not achieve the transition successfully. These are babies who have diminished reflexes to respiratory occlusion in the first 2 months and thus do not have sufficient learned control by the age of vulnerability to behaviorally adjust their heads, especially when in the prone position, to recapture their respiratory passages for breathing. Before the age of vulnerability, their reflexes are life-preserving; after the critical age, their acquired responses are self-

protective. Crib death occurs, in this view, as a consequence of a neuromuscular and behavioural deficiency, likely related to pre- and perinatal as well as subsequent environmental insufficiencies that are in principle controllable.

94 CHILDCARE AS AN ADAPTIVE SYSTEM AND SIDS PREVENTION: RE- ARTICULATING THE INFANT'S DIS- ARTICULATED CAREGIVING ENVIRONMENT

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Mother-infant co-sleeping and all of the various physiological and behavioral subsystems which support this arrangement evolved in tandem, specifically to enhance infant survival and to maximize parental reproductive success. Millions of mothers worldwide know that strong emotions and a certain amount of common sense underlie and motivate co-sleeping, even though parents (and researchers) may be unaware that co-sleeping is the biologically appropriate sleeping arrangement which induces important behavioral and physiological changes in the participants. Researchers have yet to appreciate, however, that the "continuum of outcomes" associated with various forms of mother-infant cosleeping, most notably bedsharing, will never be understood unless the variables that underlie the mutual physiological regulation that accompanies it are interpreted in relationship to each other, within the overall system within which each variable is expressed. Using data from our three mother-baby cosleeping laboratory studies, and more recent ethnographic home studies, I suggest that the "he said, she said" interpretations of bedsharing will never be resolved, nor an accurate understanding of infant sleep biology and healthy sleep environments realized unless new analytic techniques are used which can accommodate the simultaneous transactions that occur, or fail to occur, when the breast feeding mother sleeps alongside and interacts with her infant during the night. The concept of "bedsharing" should be the beginning point for SIDS analyses, not the endpoint. Reference only to sleep location or arrangement reveals nothing about the physical structures, social conditions, or psychological content of the interactions occurring in the bed (for example) which altogether determine outcomes. Simply to

assume that any cosleeping (or bedsharing) environment provides explicit, inevitable dangers rather than hidden or real or potential benefits, is to confuse dangerous conditions (which can be eliminated in many cases) with biological adaptation. My research continues to suggest that for a small subclass of SIDS prone infants cosleeping with breast feeding, even when practised in beds, should provide increased protection from SIDS.

95 INFLUENCE SLEEP POSITION EXPERIENCE ON ABILITY OF PRONE SLEEPING INFANTS TO ESCAPE FROM ASPHYXIATING MICROENVIRONMENTS BY CHANGING HEAD POSITION.

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Several studies have found that back or side sleeping infants who are unaccustomed to prone sleeping are at much higher risk for Sudden Infant Death Syndrome (SIDS), when placed prone for sleep than infants who regularly sleep prone. Moreover, when such unaccustomed infants die of SIDS they are more likely to be found with their faces down and covered by bedding than infants who regularly sleep prone. As an explanation for these findings, we hypothesized that infants who are unaccustomed to prone sleeping have greater difficulty in changing head position to avoid an asphyxiating sleep environment when they sleep prone and face down. We studied 37 healthy infants while awake and while sleeping prone. Eighteen were unaccustomed to prone sleeping (mean age=110 days) and 19 were accustomed (mean=122 days). To create an asphyxiating microenvironment we placed infants to sleep prone on soft bedding, face down, with a 2 inch deep circular depression beneath their heads. We recorded Inspired ($CO_{2,i}$) and end tidal CO_2 , EKG, O_2 saturation, respiration and head movements. In a standardized test of gross motor development, infants who were unaccustomed to prone sleep were found to be less advanced than accustomed to prone infants. When sleeping prone, face covered by bedding, all infants experienced mild asphyxia due to rebreathing expired air ($CO_{2,e}$ up to 5%; O_2) and all aroused and attempted to change head position. Infants could be categorized by their use of either of 3 head repositioning strategies. (1) rapid side to side movements of the face against the

bedding ("nuzzling") with occasional brief head lifts. This did not result in significant permanent change in head position or lower $CO_{2,i}$. (Score = 1). (2) "nuzzling" and head lifts which occasionally were combined with a head turn, always to the same side, right or left. This sometimes resulted in a permanent change in head position and reduced CO_2 (Score =2). (3) a sudden head lift, combined with a large head turn (including both turns to right and to left) which resulted in a prompt, permanent change in head position and fall in $CO_{2,i}$. (Score =3). Each infant was scored 1, 2 or 3 depending on the strategy used. Unaccustomed to prone sleep infants scored lower than "accustomed" infants ($p < .001$). Twelve of 18 "unaccustomed" infants had scores of 1 as opposed to 2 of 19 "accustomed" infants. Only 2 "unaccustomed" infants had a score of 3, as opposed to 9 of 19 "accustomed" infants. Infant age had little or no effect on scores. We conclude that: 1) inexperience in prone sleeping is associated not only with mild delay in gross motor development but also with decreased ability to escape from asphyxiating sleep environments caused by rebreathing expired air. 2). The ability to coordinate head lifting, an innate reflex, with head turning, is acquired and perfected through practice, in other words "learned" through experience. 3) These observations potentially explain the increased SIDS risk and occurrence of the face down death position in unaccustomed to prone sleeping infants.

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96 A STUDY OF NIGHT-TIME INFANT CARE PRACTICES: A COMPARISON OF ROOM-SHARING AND BED-SHARING IN A GROUP OF MOTHERS AND THEIR INFANTS OF LOW RISK FOR SIDS

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Aim: Little is known about how parents care for their babies at night. Bed-sharing is a practice which appears to carry different risks depending upon parental characteristics and the sleeping environments in which it occurs. This study investigated night-time behaviour of 10 non-smoking, breastfeeding mother-infant pairs. **Methods:** Polysomnographic and infra-red video recordings in a sleep laboratory commenced when babies were about 4 weeks old, and continued monthly for 5 months.

Five pairs were routine bed-sharers (RBS) and five were routine room-sharers (RRS). Each month, pairs were randomised to one night bed-sharing then one night room-sharing, or vice versa. Behaviour and interactions were analysed using a behavioural code.

Results: Mother and baby sleep/wake states demonstrated some concordance. For the majority of time when babies were awake, mothers were awake; and when babies were in Quiet sleep, mothers were asleep. All mothers spent more time awake when their baby was in active sleep on bed-sharing nights compared to room-sharing nights. Babies initiated most interactions. RBS pairs demonstrated more interactions than RRS pairs on both night conditions, and RBS mothers responded more quickly to baby initiated interactions compared to RRS mothers. RBS pairs breastfed twice as frequently as RRS pairs on both nights, but feeds were of shorter duration. Mothers most commonly placed their infants supine to sleep. The prone position was only used when infants were settled to sleep on their mothers' chest. Bed-sharing mothers more frequently faced their infant, and were in close physical contact, often within 20 cm of their baby. Bedding on both night conditions was most commonly placed at the level of the infants' shoulders, with one or both arms free. When bed-sharing, mothers more frequently secured the duvet under their arm which prevented it moving over their shoulder during sleep and accidentally covering their baby's head.

Conclusions: No adverse effects of bed-sharing were observed. Studies investigating bed-sharing must define the conditions precisely. Recommendations regarding bed-sharing should distinguish between the effects of potentially hazardous sleeping environments and close contact between mother and baby.

97 EXHALED AIR ACCUMULATION IN THE INFANT SLEEPING ENVIRONMENT AND THE PREVENTION OF SUDDEN INFANT DEATH.

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The relationship between SIDS and the microclimate at the face is examined. Attention is given to the inhalation of previously exhaled air or re-breathing. Studies of the physics of airflow at the face and the physiology of re-breathing are

reported. Statistical data concerning SIDS and environmental conditions are presented. It is found that exhaled air can accumulate at the face of a sleeping infant. The accumulated exhaled air can have an excess of carbon dioxide and a deficiency of oxygen. Transport of these gases is affected by jet action of the nose, temperature, humidity, pollution (which affects aerosol formation) and other conditions. A simulator for studying sleeping environments is described. It is found that the carbon dioxide content of inhaled air can be above the industrial threshold limit of 0.5% with values of over 2% occurring.

Physiological mechanisms are identified whereby re-breathing of vitiated air can account for a proportion of SIDS cases. It was found that a sleeping infant acclimatized to an atmosphere with excess carbon dioxide may suffer from reduced lung ventilation rate on subsequent exposure to a normal atmosphere.

The associations between SIDS and particular environmental conditions are found to be consistent with re-breathing as a cause of SIDS. It is recommended that sleeping infants have an unobstructed passage of exhaled air away from the face. Detailed derived safety precautions are given. It is suggested that studies of SIDS deaths should include physical modeling of the sleeping environment and investigations for evidence of re-breathing.

1 Corbyn J.A. (1999) Air movement in the human sleeping environment and sudden infant death. Ph.D. Thesis, Murdoch University, Western Australia.

2 Corbyn J.A. (1993) Sudden infant death due to carbon dioxide and other pollutant accumulation at the face of a sleeping baby. *Medical Hypotheses*, 41:483-495

98 INFANT CARE PRACTICES AMONG ALBERTA CREE, CANADA

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Higher SIDS among Aboriginal populations has been confirmed by information gathered from data based records. Details on precise risk factors within contemporary society of this higher SIDS population have remained unrecorded. A prospective study using anthropological methodology conducted among Cree Aboriginals in Alberta, Canada, identified that aspects of infant care include positive components, such as, supine sleeping and breast feeding which may

protect infants from SIDS. Risk factors which may counteract positive practices, include maternal smoking (ante, post-natal) and the infant's exposure to secondary smoking by one or more persons within the infant's surroundings, tightly swaddled infants in extremely warm houses, and co-sleeping (by smoking mothers). The risk factors may represent a "bundle" of perturbations within the infant's environment too disparate to be overcome by the protective factors of supine sleeping and breast feeding.

This Canadian Cree study surveyed over fifty percent of contemporary aged mothers living exclusively in a reserve setting. A total of 70 Cree women took part in the research project. Environmental studies within the infant's surroundings identified high levels of bacteria and fungus which appears to be a result of houses which are not adequately suited for the climate (up to -50F in winter months) and the cultural behaviour of the inhabitants.

Death records for the years 1990-1994 were used to obtain relative risk data. Calculation of SIDS incidence per 1000 live births by maternal age group among Aboriginal and non-Aboriginal Albertans yielded the following results. The highest SIDS incidence was observed within the youngest age group for both the Aboriginal (4.1) and non-Aboriginal (0.9) populations, respectively. Incidence among mothers aged 19-24 years declined in each population, to 3.9 among Aboriginals and 0.6 among non-Aboriginals. Among the oldest maternal age group (25+ years of age) only a slight decline in incidence was observed among Aboriginals (3.8), whereas among non-Aboriginals the incidence declined to 0.3 SIDS deaths/1000 live births.

Calculation of relative risks among Aboriginal maternal age groups failed to demonstrate ratios significantly different than 1.0 (<19 to 19-24, 1.05; <19 to 25+, 1.08; 19-24 to 25+, 1.03). In contrast, among non-Aboriginals the risk ratio among the youngest maternal age group relative to mothers 19-24 was 1.57 and relative to mothers 25+ years of age was 3.5 times greater. Thus, within each population the highest incidence and relative risk occurred in the youngest maternal age groups and declined with the age of the mother. Age category with age category comparisons of relative risk between the populations demonstrated greater risk among Aboriginals (<19, 4.6 times greater risk; 19-24, 6.5 times greater; and 25+, 12.7 times greater risk than comparably aged non-

Aboriginal mothers). The greater relative risk among Aboriginals is consistent with earlier reports.

98A BEDSHARING PRACTICES OF DIFFERENT CULTURAL GROUPS

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Bedsharing between parent(s) and their infant is a practice carried out by many but the benefits and/or risks are not fully understood. Several studies have suggested that bedsharing may increase the risk of SIDS for the infant and that the risk may vary between ethnic groups. However, there is very little information documented as to what bedsharing actually is.

In this qualitative study, 13 families from 4 different cultural groups (Pacific Island, Maori, Parents' Centre and young single mothers) were interviewed, in their own homes, and about their bedshare practices and their reasons for bedsharing. The interviews were largely unstructured with few prompts, to avoid channelling the responses into culturally prescribed categories. The material was analysed with the aid of NUD.IST software to identify themes and patterns.

We found actual bedshare practices and reasons for bedsharing were diverse, but some common themes emerged within cultural groups. Many outcomes for families appeared as universal themes. The results from this study indicate that the term 'bedsharing' does not describe a coherent practice. Infants who bedshare are exposed to diverse situations. Research that identifies specific risk bedshare behaviours may explain the variable risks among different cultural groups and help to identify safe ways of bedsharing.

99 CHILD CARE DECISIONS OF DEPRIVED PARENTS - WHAT MATTERS TO THEM?

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Babies living in deprived conditions are much more likely to become ill and die. Many risk factors for sudden death in infancy are more prevalent in poor homes, and some such as parental smoking are potentially modifiable.

In this study we compared the factors influencing childcare decisions in poor and affluent homes. Subjects were 73 families living in a deprived inner city area (Jarman score 64.1) and 58 affluent families from a suburban area (Jarman score -6). All were white, and the babies were born at term. Interviewers from the local areas were trained, and used a structured interview to collect information on social and economic factors, life stresses, social support, Edinburgh post natal depression score and childcare practices. In addition, the development of body temperature patterns and urinary cortisol excretion were measured on the babies.

The deprived group were significantly younger mothers, living predominantly in poor rented accommodation, often unemployed with low family income.

Mothers in deprived families were significantly less likely to breast feed, and the majority smoked heavily. They had significantly less social support and very many more life stresses. There was significantly more postnatal depression in the deprived mothers.

Deprived mothers made it clear that smoking is a coping strategy for the stresses of poor living, and that it allows them better to care for their babies. Intervention targeted just at stopping smoking, even if successful in their aim, may not reduce mortality in the way expected.

Mothers require interventions to reduce life stresses to a level that may be tolerated, and were able to circulate specific recommendations as to how this could be achieved.

100 SUDDEN INFANT DEATH SYNDROME (SIDS) AND INFANT CARE PRACTICES IN SASKATCHEWAN CANADA.

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The SIDS rate in Saskatchewan is higher than the other provinces in Canada (1.2/1000). Sleeping position, sleeping quarters, ethnicity (native/non-native), clothing, exposure to smoke, co-sleeping, and breast feeding are some of the factors known to affect SIDS. There is little information regarding infant care practices that relate to SIDS in Saskatchewan. In an attempt to elucidate these factors, we reviewed

documents in the Chief Coroners Office with the diagnosis of SIDS for the period 1982 to 1994. We then selected 80 live infants from the representative communities as they visited for routine care in the Pediatric Outpatient Department (OPD) and matched for race, sex, age, gestation and birth weight to infants who died of SIDS. The data collected for both groups included sleeping quarters (safe or unsafe), sleep position, layers of clothing, co-sleeping, breast feeding, and autopsy reports for SIDS group. Unsafe sleeping quarters included sleeping in playpens, strollers, bean bags, the sofa, water beds, etc. Circumstantial information (smoking, alcohol, drugs) was collected surrounding death and OPD visit. Autopsy and circumstantial data were used to classify death. Logistic regression and univariate discriminant analyses were used for statistics.

Results: There were 258 SIDS and 80 controls. In SIDS there were 157 males (60%) ($P=.007$) and 101 females (40%). The mean age of death was 14.7 ± 10 wks (\pm SD), 111 (45%) were natives ($P=.008$), 72% were found in prone position ($P=.0001$). 23 deaths (9%) were of undetermined etiology. Unsafe quarters ($P=0.01$) increased the death risk. The risk increased ($P=.00001$) when exposed to smoke. Three or more layers of clothing increased the risk ($P=.0001$). Undesirable circumstances also increased the risk of death ($P=0.00001$). Co-sleeping and breast feeding were protective ($P=0.005$). Odds of dying increased 15 times with >3 layers of clothing. Native infants had a 5.5 times greater risk of than non-native. 72% of the control infants were sleeping supine. **Summary:** The increase in the SIDS rate in Saskatchewan is in part related to increased death in native infants. Improvement in infant care practices should decrease SIDS even further. A strategy to improve infant care practices should be adopted.

101
INFANT SLEEPING PRACTICES IN NORTH QUEENSLAND: A SURVEY OF INDIGENOUS AND NON-INDIGENOUS WOMEN.

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Background: Sudden Infant Death Syndrome (SIDS) is the most common cause of postneonatal death in Queensland (0.98 per 1000 live births, 1994-1996). SIDS rates have fallen dramatically in the non-indigenous population due to aggressive risk reduction education. Indigenous SIDS rates in Queensland have not been estimated until recently. Other states of Australia report indigenous rates to be 3-5 times higher than non-indigenous and a recent review of SIDS deaths in North Queensland suggests the rate in the indigenous population is up to 6 times that of the non-indigenous population. This may be because education campaigns are not reaching the indigenous population.

Aim: To assess awareness of SIDS risk factors in the indigenous and non-indigenous population of Townsville, North Queensland, Australia.

Methods: A cross-sectional study is being conducted using the relevant sections of the West Australian Infancy and Pregnancy Survey 1997-1998, developed by the TVW Telethon Institute for Child Research, Princess Margaret Hospital, Perth, Western Australia. The survey will assess the prevalence of SIDS risk factors, including demographic data, smoking, infant feeding, sleeping position, bedding, and bed sharing. The survey will additionally assess suggestions for appropriate SIDS education modalities. A random sample of 40 young indigenous women with children less than 2 years of age and 40 non-indigenous controls will be surveyed. The study has the full support of the indigenous community in Townsville. Incidence, medians and univariate association between indigenous and non-indigenous groups will be performed where appropriate using SPSS.

Results: The results of the survey will be presented.

Conclusion: If results suggest it is needed and having canvassed appropriate media and other education modalities amongst

indigenous women, it is hoped a risk reduction campaign can be then be designed to better target indigenous women in North Queensland.

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WHAT DO ABORIGINAL MOTHERS KNOW ABOUT REDUCING THE RISK OF SIDS?

SJ Eades, AW Read, The Bibbulung Gnarneep Team.

TVW Telethon Institute for Child Health Research, Perth, Australia.

The SIDS rate for Aboriginal infants in Western Australia continues to be high, being 5.6 for infants born in 1996, compared with 0.6 for non-Aboriginal infants. The Bibbulung Gnarneep ("Solid Kid") project was a population-based cohort study which collected information on a large number of variables relating to Aboriginal mothers, children and families during a series of five interviews. The fifth interview which took place when the index child turned two years old, included questions about mothers' knowledge of the SIDS prevention campaign. All families resided in Perth and suburbs and 130 mothers remained in the study for the fifth interview.

81% of the mothers were aware of the campaign. Mothers were asked what advice they remembered with 37% noting "do not overwrap baby", 26% "no smoking around baby", 21% "do not lay baby on tummy", 14% "lay baby on back", 14% "something about sleeping position", 10% "lay baby on side" and 6% "lay baby on back or side". Less than 2% of mothers remembered advice about using a firm mattress or about breastfeeding with less than 1% remembering advice about smoking in pregnancy. Mothers were also asked the source of their knowledge about SIDS prevention with 60% replying television, 42% newspapers, 42% brochures, 41% family or friends, 39% radio, 35% hospital were baby born, 32% general practitioner and 32% magazines. When asked, "What is the best way to provide SIDS information to mothers?", 33% replied "in hospital where baby born", 27% noted television, 22% brochures, 15% home visits, 11% general practitioners and 7% antenatal classes.

This is valuable information to use for a focused SIDS prevention campaign in this community. The Bibbulung Gnarneep Team have commenced by producing a suitable brochure but funding is required for further efforts, including the production and distribution of a video. Clear messages are required regarding the SIDS risk factors and

one of the best places to communicate these is in hospital directly after baby's birth.

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"REDUCE THE RISK" - EFFORTS TO IMPROVE EFFECTIVENESS IN REACHING ABORIGINAL PEOPLES IN CANADA

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In *Towards a Healthy Future, the Second Report on the Health of Canadians (September, 1999)*, the Federal, Provincial and Territorial Ministers of Health in Canada acknowledged that although Canadians enjoy one of the highest standards of health in the world, this standard is not shared equally by all members of its society. For example, although our Canadian SIDS rate is low, and has decreased on average, it remains significantly higher in the Aboriginal population.

The Foundation is working with the Federal Government to more effectively inform Aboriginal people about Sudden Infant Death, and ways they can reduce the risks. Health Canada is conducting a series of dialogue circles in many Aboriginal communities. Our foundation is sponsoring the production of two videos targeting Aboriginal peoples, one to educate and promote awareness, the other to assist with grief support following the loss of a baby to SIDS. We have recruited a physician epidemiologist to our board of directors who has extensive experience with northern Aboriginal people, to assist our foundation's leadership to better recognise and be more sensitive to the needs of this population. Our foundation has established some partnerships with representatives of our native peoples, and will move to expand and enhance these relationships, so we can more effectively reach those who need our support the most.

104
TELEPHONE SUBSIDY ENHANCES PARTICIPATION OF SOCIOECONOMICALLY DISADVANTAGED FAMILIES WITHOUT TELEPHONES IN COLLABORATIVE HOME INFANT MONITORING EVALUATION (CHIME)

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CHIME enrolled 4 infant groups: healthy

terms, preterms <1750 g birth weight, siblings of SIDS, and idiopathic apparent life-threatening events. Families without telephones appeared to be severely socioeconomically disadvantaged and therefore at highest risk for adverse health outcomes pertinent to the CHIME study, but were ineligible for enrollment in CHIME without a home telephone. We hypothesized that providing a telephone subsidy to establish and maintain phone service and enrolling these subjects (TELSUB) in CHIME would result in the TELSUB achieving protocol compliance rates equivalent to socioeconomically disadvantaged control subjects (CON) able to afford telephones. Thirty-one TELSUB from Ohio and Hawaii were enrolled. The research protocol was identical for all CHIME enrollees, including periodic telephone contact with study personnel. Following completion of CHIME, TELSUB were compared with 55 CON matched for study group, site, birth weight, maternal race, age, and education (28% <12th grade education). TELSUB achieved comparable completion rates to CON for the polysomnogram, cry recording, and developmental follow-ups. In addition, TELSUB were significantly more compliant with home memory monitor use (Table, Mean +/- SD). Mean cost of the subsidy was \$402/TELSUB, just \$3.32/day of total monitor use. In summary, the additional socioeconomic barrier to health care access in families without a telephone may be reversible. When this additional barrier increases risk for health-damaging outcomes pertinent to study objectives, telephone subsidy may be a cost-effective intervention yielding participation rates at least equivalent to controls. Future studies should address whether these results are unique to CHIME or applicable to other research projects and other clinical settings.

*NICHD HD 28971, 29056, 29060, 29067, 29071, 29073, 34625

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SUDDEN INFANT DEATH SYNDROME IN NATIVE AND NON-NATIVE POPULATION: TRENDS OVER 19 YEARS

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Sudden infant death syndrome (SIDS) is the leading cause of post-neonatal mortality in Canada. In Alberta, since 1977, all sudden unexpected deaths (SUD) in infancy are

reported to the Medical Examiner, there is a scene investigation, autopsy and review of medical records. We reviewed the files of all SUD and abstracted information from those confirmed as SIDS, reviewing trends in SIDS in native Canadians and others. There has been a fall in the number of non-native SIDS despite an increase in population but no fall in Native deaths. We examined factors which may differ between Native and non-Native infants. There was a tendency for more of the Native mothers to be smoking both during pregnancy and at the time of the infant's death and for more of the Native fathers to be smokers. More of the Native infants were first born. Native parents were more likely to use a bed type (such as an adult bed) other than a crib or bassinet. Natives were significantly less likely to be sleeping alone, on a firm bed surface or to be found in a prone position. While further investigation into reasons why Native SIDS numbers have not fallen, these data suggest publicity and education in the Native community on bed type, sleep position and smoking habits focused on the first time parents is needed. Native leaders in the area of childcare should be informed of these findings.

**106
TAKING CARE OF BABY – A JOINT PROGRAM BETWEEN ABORIGINAL ORGANISATIONS AND SIDS NORTHERN TERRITORY TO DEVELOP CULTURALLY APPROPRIATE RESOURCE MATERIAL**

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The first culturally appropriate resource for Aboriginal communities was prepared in 1994 by Aboriginal women undertaking a course in bi-cultural studies at Nungalinga College in Darwin. It was called the 'Best For Baby' banner and was used within Aboriginal communities between 1995 and 1999.

On average about six deaths are attributed to SIDS in the Northern Territory each year. However in 1997 there were 12 SIDS deaths, of which 10 were Aboriginal babies. A National report released in January 1999 found that deaths from SIDS were nearly five times higher for indigenous boys and seven times higher for indigenous girls.

Due to this high death rate there was some urgency to re-establish relationships within the indigenous communities and to work

towards providing culturally appropriate programs. In March 1999 SIDSnorthern territory formed an Aboriginal Health Project Group with representatives from the groups listed above. This project group reviewed the existing brochure and decided to update it with a clearer and more current Reducing the Risks message. The brochure now called 'Taking Care of Your Baby' was re-launched in June 1999. New posters have also been produced as part of the resource.

The third and major part of this program is the production of a video based on the brochure. The video is being produced in the six major NT Aboriginal languages and with the brochures and posters, will be distributed to communities throughout the Northern Territory. The video will also be shown on the remote community TV services.

A key factor in the success of this program has been the development of a working relationship with indigenous and non-indigenous workers keen to reduce infant mortality. All organisations involved in this project agree that by working together we have ensured an increased acceptance of this material by Aboriginal communities. This paper outlines how the project worked and the outcome to date.

**107
EXAMINATION OF SIDS RISK FACTOR ATTITUDES AND BEHAVIORS AMONG RACIALLY DIVERSE MOTHERS IN A HIGH RISK, RURAL POPULATION**

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Data was collected (1998-1999, n=319) in a five county rural area of Missouri with a high incidence of infant mortality. Mothers of infants two years and younger were interviewed in clinics. The average age of women interviewed was 24. The racial composition of participants was 69% Caucasian, 30% African-American, and 1% Hispanic. Approximately 69% had completed high school, 36% were employed, and 46% were married. Women were asked about their attitudes and behaviors relating to SIDS risk factors (sleep position, smoking around infants, and breastfeeding) and whether information had been given to them in the clinic on each topic. Receiving information

on sleep position was associated with attitude toward sleep position (* $p < .05$ information given was associated with attitude). However, women did seem to already have correct attitudes toward smoking and breastfeeding, which were not significantly associated with information given. Examining racial differences, for the three risk factors measured attitude was associated with behavior in the Caucasian population (+ $p < .05$ attitude was associated with behavior). In the African-American population, positive non-smoking behaviors and negative breastfeeding behaviors related to factors other than measured attitudes. Education and attempts to change attitudes were important. However, other cultural factors both positive and negative, must also be considered.

108 CLINICAL ASPECTS

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109 UNNATURAL DEATHS AS A CAUSE OF SIDS

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Publicity given to parental prosecutions for asphyxiating infants up to 50 years after such deaths were ascribed to Sudden Infant Death Syndrome (SIDS), and to cases of Munchausen Syndrome by Proxy (MSBP), have led to public suspicion that most SIDS deaths are in fact filicide. Generalisations have also been made ascribing second deaths in a family to filicide.

The validity of such claims was examined by literature review. This considered papers linking filicide and SIDS, as well as discussing forms of death that are not obvious at postmortem, such as asphyxiation and poisoning. Information relating to second deaths in family, MSBP and the social and psychological factors identified in filicide were also examined. Material was found on Medline and in the library of the FSID, dating back to the 1940s. There was no detailed series of cases which supported assertions that the proportion of SIDS deaths due to initially undetected unnatural events exceeded 10% even at current reduced rates of incidence. Many authors relied on personal opinions without documentation, referred to single cases, or extrapolated the estimates of others to their

own results. By contrast, a carefully documented UK study concluded that maltreatment, as broadly defined, was the main cause in 6% of the SIDS deaths.(1)

An important issue was the second death in a family. Investigations of second deaths did not support the view that most were filicide. Mathematically, the chances of a second death in a high risk disadvantaged family differ little from the chance of a single death in an affluent family.

Full death scene investigation, paediatric postmortem and local case enquiry should be mandatory for all sudden infant deaths. This would identify the small proportion of deaths that are filicide, and enable support for all parents including the vast majority who are innocent of all blame.

1. Limerick S. Not time to put cot death to bed. *Brit Med J* 1999; 319:698-670

110 THE DIFFERENTIAL DIAGNOSIS OF IMPOSED SUFFOCATION OR SIDS? AN APPROACH TO SOLVE THE QUESTION

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Recently Meadow (1) has suggested that the presence of frank blood from the nose and/or mouth may be suggestive of imposed suffocation. Twenty-seven out of 70 children who had been killed by their parents, were reported to have been found with blood apparent in the mouth, nose or on the face. On examination by medical staff, stale blood was seen on 20 of those 27 children. Meadow stresses that care was taken to establish that the finding was of frank blood, rather than the common sero-sanguineous froth that can be present in moribund children, particularly when subject to resuscitation.

We have examined 202 cases of SIDS and 119 cases of sudden explained death in infants and small children, between January 1984 and July 1999. Frank blood from the nose and/or from the mouth has been described in 14 cases of SIDS and in one case of pneumonia. White-red froth in the nose and/or the mouth had been recorded in 17 cases of SIDS and in two cases of pneumonia.

In a recent case of imposed suffocation the general practitioner that first came to the death scene, observed sero-sanguineous froth from the nose and the mouth. He was questioned during the trial whether it could have been frank blood, but denied. This particular mother had lost four subsequent infants suddenly and unexpectedly. During

all events she had been alone with the infants and the autopsy had revealed no cause of death. The first three deaths were not followed by death-scene investigation. However, after the fourth death a thorough scene investigation was performed. In the garbage a plastic bag was found with lip marks from the baby. Furthermore, two small blood spots and other biological material had the same DNA-profile as the dead infant. Also the fingerprints from the mother was found on the plastic bag. These technical proofs led to conviction.

Based on our experience it seems that for the time being it is not possible to differentiate between imposed suffocation based on autopsy findings, such as the presence of frank blood from the nose and mouth. We therefore think that death scene investigation should be performed in all cases of sudden infant death.

1. Meadow R. Unnatural sudden infant death. Arch Dis Child 1999; 80: 7-14

**111
INTRA-ALVEOLAR PULMONARY
SIDEROPHAGES, ACUTE PULMONARY
HAEMORRHAGE AND NASAL
HAEMORRHAGE: MARKERS FOR
IMPOSED SUFFOCATION?**

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We have reported¹ the finding of abundant iron-containing macrophages (siderophages), indicative of previous haemorrhage, in the lung alveoli of four New Zealand infants who died suddenly. All had previous severe "apparent life-threatening events" and caregivers were convicted of causing their deaths. We know of similar findings in other infant deaths occurring in suspicious circumstances. We found diffusely-distributed alveolar siderophages in 5% of 158 infants with diagnoses of SIDS. Most of the many causes of intra-alveolar haemorrhage in infancy are easily excluded by history or at autopsy, but in younger

infants previous perinatal haemorrhage may be difficult to exclude retrospectively. We concluded that the lungs of all infants dying suddenly should be stained for iron and that the finding of substantial numbers of siderophages demands further investigation and if no accidental or natural cause is found should cause suspicion of imposed suffocation. The finding is not specific for imposed suffocation and its absence does not exclude the possibility.

Recently, it has been suggested that the severity of acute haemorrhage in the lungs in sudden infant deaths also can be used as a marker for imposed suffocation or overlaying.² Pulmonary haemorrhage occurs more frequently in younger infants and those co-sleeping. Bleeding from the nose or mouth has been reported as a very common feature of imposed suffocation and occurs, but probably less frequently, in SIDS. 15% of 385 cases in the New Zealand Cot Death Study were reported to have nasal bleeding and were significantly younger, more likely to have slept supine, and to have bed-shared.

The finding of abundant intra-alveolar siderophages in sudden infant deaths provides a marker for suspicion of imposed suffocation, but more study of acute pulmonary haemorrhage and nasal haemorrhage is required to show that these have diagnostic and medicolegal significance.

1. Becroft DMO, Lockett BK. Pathology 1997; 29: 60-3.

2. Yukawa et al. J Clin Pathol 1999; 52: 581-7.

**112
PHYSIOLOGICAL RECORDINGS IN
SIDS, ALTES AND IMPOSED APNOEA**

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	VARIABLE	TELESUB	CONTROLS
Total Hrs, Wks 2-5	190 +/- 157	(P=.025)	116 +/- 132 #>10
Hours/ Wk (2-5)	81%	(p=.033)	56%#
Days Used in 6 M	121 +/- 87	(p=0.003)	64 +/- 63

Event recording or documented monitoring is a valuable tool for the identification of mechanisms for SIDS and/or ALTE as it allows the recording of data during these events. Published studies have shown that (a) a significant proportion of infants with recurrent ALTE initially considered idiopathic after a complete clinical workup (63% of those with further events) had potentially preventable mechanisms such as seizure-induced hypoxaemia, changes in skin perfusion but without hypoxaemia, or parentally induced or fabricated events identified with documented monitoring; (b) during documented ALTE in which no specific mechanism could be identified, abnormal prolonged hypoxaemia was the only consistent finding, whereas prolonged apnoea occurred in only 5, and bradycardia in only 4, of 22 events, (c) in recordings obtained during SIDS, 7 of 9 patients were already gasping at or within 2.7 min. after the first monitor alarm, whereas prolonged apnoea was the reason for the first monitor alarm in only 3 infants; (d) during imposed apnoea (suffocation), the changes in signals recorded included a clear increase in the amplitude and irregularity of the breathing movement signal which preceded the occurrence of hypoxaemia and was associated with an initial sinus tachycardia and artifact on the electrocardiogram and on the pulse waveform signal from the oximeter, suggesting massive body movements, followed by prolonged severe hypoxaemia and/or (often nodal) bradycardia. In the latter cases, however, documented monitoring can mostly only raise a suspicion of suffocation, which should be confirmed by covert video surveillance whenever possible.

Samuels et al., Arch Dis Child 1992;67:162-170
Poets et al, J Pediatr 1993;123:693-701
Southall et al., Pediatrics 1997;100:735-760
Poets et al., Pediatr Res 1999;45:350-354

113 BEREAVED CHILDREN – THEIR NEEDS

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The author of this paper established bereavement services for children in the Children's Hospital, Dublin 1 over 10 years ago.

Approximately 60 deaths occur in the hospital each year. All bereaved children are offered a support programme.

This paper will discuss the needs of bereaved children, for information, involvement and

freedom to express emotions. These topics will be illustrated by slides of children's drawings on these topics. The difference between children grieving an anticipated death or a sudden death unexpected death will be discussed.

A short video showing the author working with bereaved children will illustrate different techniques. This video was made with children from a very deprived area who have poor expressive skills and shows that deprivation and poor social skills are no barrier to helping children express their grief.

114 THE RELATIONSHIP BETWEEN VACCINES, BREASTFEEDING, TEMPORARILY DYSFUNCTIONAL RETICULOENDOTHELIAL SYSTEM, E.COLI LIPOPOLYSACCHARIDE ENDOTOXAEMIA AND SIDS

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Veterinary studies show E.Coli to be the major cause of death, (including SIDS) in calves, Rhesus monkeys etc. The one published study in human infants yielded similar results (Bendig, J and Haenel, H.: 1969). Bettelhem K et al., established (1988) E.Coli association with SIDS, and Oppenheim B et al (1994) antibody evidence of systemic endotoxaemia in SIDS. Capps R.B. et al (1955) stated DPT caused temporary liver dysfunction in infants similar to that caused by viral hepatitis.

Anser S and Habig W (1990) showed DPT vaccine endotoxin significantly disrupts P-450, and other microsomal and cytosolic enzyme activities (which detoxify endotoxin) in mice. Rook, G.A.W (1997) details other ways vaccines disrupt the immune system. The effect of neonatal endotoxin encephalopathy was stated by Reisinger, R.C. (1973) and demonstrated by Gilles, F.H. et al (1974). Reisinger RC's 'A final mechanism of cardiac and respiratory failure' (1974) stated that platelet injury by endotoxin may result in a dramatic rise in serotonin. Serotonin can initiate coronary chemoreflex causing profound bradycardia, hypotension and cardiac collapse. Tissier. H (1900 and 1925) reported that bottle-fed babies have much higher levels of intestinal E.Coli than breastfed babies, a fact subsequently demonstrated by others. Hauck F.R. (1996) stated bottle-fed babies had three times the risk of SIDS as breastfed babies.

Pourcyrous, M et al (1998) detailed severe cardio-respiratory symptoms of apnoea, bradycardia, and oxygen desaturation (compatible with E.Coli endotoxaemia) following administration of DPT vaccines, and Hib, HBV and IPV together. Although immunological findings suggested bacterial infection, no foci could be found. Woodruff P.W.H. et al (1973) showed absence of foci is consistent with evidence of endotoxaemia of intestinal origin as a result of reticuloendothelial system damage. Many articles establish that breastfeeding reduces E. Coli colonisation. Svanborg C (1995 and 1999) expands dramatically medical understanding of breastmilk's immunological policing properties.

1 Reisinger, R.C.: A final mechanism of cardiac and respiratory failure. Pub. In SIDS 1974. Proc. Of Camps International Symp. on SUD in Infancy. Also congressional record S.1745, September 20, 1973. Website: erols.com/drrobert.sids

2 Pourcyrous, M. et al., Interleukin-6, C-Reactive Protein, and Abnormal Cardiorespiratory Responses to Immunization in Premature Infants. Pediatrics Vol. 101 No. 3, March 1998.

115 IMMUNISATION: A PROTECTIVE FACTOR AGAINST SIDS

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In the UK, the recommended immunisation programme for all three immunisations (Haemophilus Influenzae type B, oral polio and diphtheria, tetanus and pertussis) are given at 2,3, and 4 months of age. Despite a complete lack of epidemiological evidence, the media have raised public concern that routine childhood immunisations may increase the risk of SIDS.

Methods A three year case-control study conducted in 5 of 14 Health Regions in England (population ~ 17 million, 500,000 livebirths). Parental interviews were

conducted for each infant who died and for four controls matched for age and time of sleep. Ascertainment was over 90% [1][2]. We have details on infant immunisations for 303/325 SIDS and 1234/1300 matched controls.

Results Of the control infants, 66.6% had begun or had completed their immunisation programme, compared with 48.8% of the SIDS. In a univariate comparison, taking age into account, this difference was highly significant (OR=0.23 [95%CI:0.14-0.37]) and was not affected by controlling for socio-economic status or maternal smoking during pregnancy. This comparison remained significant in the multivariate analysis taking into account all other factors (OR=0.25 [95%CI:0.09-0.67]). For those infants who had commenced their immunisation programme, the median age and the interquartile range of ages at which the first immunisation was given were virtually the same for the SIDS and controls (SIDS: 60 days [IQR: 56-70 days], Controls: 59 days [IQR: 55-63 days]). The median time from last immunisation to interview or death was also similar in the two groups (SIDS: 28 days [IQR: 16-68 days], Controls: 29 days [IQR: 13-70 days]). In the 48 hours before death 7/303 SIDS infants (2.3%) were immunised compared to 41/1234 control infants (3.3%) in the 48 hours before the reference sleep.

Conclusion There was no evidence that recent immunisation was associated with an increased risk of SIDS, and indeed the data suggest that immunisation may have a protective effect.

1 Fleming PJ, Blair PS, Pollard K, Platt WM, Leach C, Smith I, Berry J, Golding J. Pacifier use and SIDS - Results from the CESDI SUDI case-control study. *Arch Dis Child* 1999; 81:112-116.

2 Leach CEA, Blair PS, Fleming PJ, Smith IJ, Ward Platt M, Berry PJ, Golding J. Epidemiology of SIDS and explained sudden infant deaths. *Pediatrics* 1999;104:e43.

Topic	Information Given		Correct Attitude		Correct Behaviour	
	Caucasian	African American	Caucasian	African American	Caucasian	African American
Sleep position	87%	87%	71%	60%*	52%+	44%+
Smoking around infants (smokers only)	90%	92%	97%	99%	40%+	69%
Breastfeeding	95%	90%	89%	82%	35%+	17%

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116
Immunisation is not a Risk Factor for SIDS

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Introduction: This investigation explores the vaccination status of two age and gender matched case control studies for Sudden Infant Death Syndrome (SIDS) in Germany and whether vaccination is a risk factor for SIDS.

Methods: The pilot phase was located in the area of 3 forensic medicine centers (Hamburg, Hannover and Muenster) between October 1996 and July 1997. The ongoing study (main study) is a nation wide multicenter study. Autopsies are carried out in 14 forensic medicine centers and questionnaires are filled in by interviewing the parents. During the first period investigations of 56 SIDS victims were compared with 181 controls. From the present main study we present the preliminary data from 77 SIDS cases and 203 controls.

Results: In the pilot phase 68% of the controls and 50% of the cases received immunization (Odds ratio (OR): 0.47, 95% Confidence interval (CI): 0.25 – 0.91). Investigating the influence of the different vaccinations we found that in the pilot phase haemophilus influenza B immunization was given to 42.7% of the controls and 26.8% of the cases (OR: 0.47, CI: 0.23 – 0.96). However looking at tetanus, polio, pertussis, hepatitis B and BCG we found no significant differences. In the ongoing study 46.2% of the controls and 50.8% of the cases are vaccinated (not significant). In the currently running study no differences were found in the vaccination status of the cases or controls until now.

Discussion: From this preliminary results we conclude that it is not likely that the vaccination schedule as presently recommended in Germany is a risk factor for SIDS in our data. From the ongoing study we expect 600 cases and more detailed information for further analysis.

117
MICROBIOLOGICAL STUDIES OF SHEEPSKIN BEDDING

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Microorganisms have been isolated from New Zealand sheepskin bedding on four different media. The number of fungi found on used bedding and on SIDS-associated

bedding is the same but the number of bacteria is higher on the latter. The forty-five (to date) isolates are being characterized by using conventional methods and by 16s ribosomal DNA PCR methodology. The studies are focused on organisms that are human pathogens and that transform arsenic compounds in the bedding.

118
THE CESDI SUDI CASE-CONTROL STUDY: NO EVIDENCE TO SUPPORT THE "TOXIC GAS" HYPOTHESIS FOR SIDS

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In 1989 Richardson proposed that a contributory factor in SIDS might be the production of toxic trihydride gases, arsine, stibine and phosphene by fungal degradation of flame retardants or plasticisers added to the PVC of mattress covers. The hypothesis predicted: i) SIDS infants would be sleeping on older mattresses, those previously used by other infants, and those with PVC covers. ii) higher tissue antimony concentrations in infants sleeping on PVC mattresses with higher concentrations of antimony, and iii) if parents wrapped PVC mattresses in impermeable covers (e.g. polythene) SIDS would be prevented.

Methods. Information was collected for all three years of the CESDI SUDI case-control study (1) on the type, age and coverings of mattresses used by infants who died and control infants. For the third year, samples of mattress covers and filling were subject to mycological and chemical analyses, and tissue and hair samples were collected from infants who died, together with hair samples from mothers of SIDS and control infants, plus hair samples from control infants (2).

Results. The fungus implicated by Richardson (*Scopularis brevicaulis*) was rarely found on mattresses and never on a SIDS mattress; no association was found between mattress antimony concentrations and those of tissue or hair; mattresses with integral PVC covers were associated with a slightly lower risk of SIDS, regardless of antimony content. Higher concentrations of hair antimony in infants than mothers represented prenatal accumulation, not post-natal exposure. The use of older mattresses by some SIDS families was accounted for in a multivariate analysis by the lower socio-

economic status and larger sibships of the SIDS infants compared with the controls. Identical proportions (2%) of SIDS and control infants slept on mattresses which had been wrapped in polythene sheeting, and 3 SIDS deaths occurred on such wrapped mattresses.

Conclusions. No evidence was found to support the “toxic gas” hypothesis.

1 Fleming PJ, Blair P, Bacon C, Bensley D, Smith I, Taylor E, Berry PJ, Golding J, Tripp J. The environment of infants during sleep and the risk of sudden infant death syndrome: results of 1993-5 case-control study for confidential enquiry into stillbirths and deaths in infancy. *BMJ*. 1996; 313:191-5.

2 Fleming PJ, Blair P, Cooke M, Warnock D, Berry PJ, Smith I, Thompson M, Ward-Platt M, Hall D. Studies to establish whether antimony or other chemicals added to cot mattress covers are of significance in the aetiology of sudden infant death. Appendix III, In: The Report of the Expert Group to Investigate Cot Death Theories: Toxic Gas Hypothesis. Dept Health London. ISBN185839 874 6. 1998

119 SCREENING FOR LONG QT INTERVAL

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The incidence of Sudden Infant Death Syndrome (SIDS) appears to have recently declined after the identification of several behavioral risk factors and their subsequent modification through public campaigns. Nonetheless, SIDS remains the leading cause of mortality in the first year of life after the neonatal period and effective preventive measures are still lacking due to the poor understanding of the underlying mechanisms. There is a consensus that SIDS is multifactorial, but despite the many hypotheses proposed, none has yet been proven. In 1976 we proposed that a prolongation of the QT interval on the electrocardiogram (ECG) may increase the risk for life-threatening arrhythmias and contribute to SIDS. In order to test that hypothesis we recorded the ECG on the 3rd-4th day of life in 34,442 newborns and followed them prospectively for one year. The QT interval was analyzed with (QTc) and without correction for heart rate. A one-year follow-up was obtained in 33,034 infants. There were 34 deaths, of which 24 were due to SIDS. The SIDS victims had a longer QTc compared to the one-year survivors (435 ± 26 vs 400 ± 20 ms, $p < 0.01$), and to the non-SIDS victims (392 ± 26 ms, $p < 0.05$). Moreover, 12 of 24 (50%) SIDS victims and none of the non-SIDS victims had a

prolonged QTc (≥ 440 ms). When the absolute QT was determined for the same range of cycle lengths it was found that 12/24 (50%) of SIDS victims had a QT value exceeding the 97.5th percentile. The Odds ratio of SIDS for infants with a prolonged QTc (≥ 440 ms) is 41.3 (95% confidence interval 17.3-98.4). This large prospective study based on more than 33,000 infants provides the first demonstration that QT interval prolongation, on the standard ECG recorded on the 3rd-4th day of life, is a risk factor for SIDS. Neonatal ECG screening may allow early identification of a significant percentage of infants at risk for SIDS and the institution of preventive measures may be possible.

120 BUILDING SOCIAL CAPITAL STRATEGIES TO REDUCE SIDS IN COMMUNITIES OF COLOUR

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The risk of an infant dying from SIDS is greater among communities of color and historical oppression and disenfranchisement. In the United States, SIDS mortality rates in these communities (e.g. African-American, Native Americans) have not responded to the ‘Back to Sleep’ campaign to the same degree as the majority population. Most SIDS risk reduction campaigns focus on changing individual behaviors rather than the larger issue of how SIDS relates to a particular community’s overall health. By overlooking this broader perspective, SIDS risk reduction campaigns continue to be ineffective in communities most affected by SIDS. In order to succeed in our goal of reducing the risk of SIDS in these communities, we must first recognize the common threads found in these groups and examine the societal conditions contributing to their ‘at-risk’ status.

To meet the challenge of working with families and communities in the most affected groups, we must assist in increasing the ‘social capital’ of the community. Social capital has been defined as those features of social organization - such as the extent of interpersonal trust between citizens, norms of reciprocity, and density of civic associations - that facilitate cooperation for mutual benefit.

Since 1995, the Oakland Healthy Start Fetal/Infant Mortality Review (FIMR) has generated case summaries of all fetal and infant deaths within a defined project area in Oakland,

California. Case studies of SIDS deaths illustrate situations where social capital building strategies could greatly improve the health outcomes of families. Linking social capital to improved outcomes in SIDS risk reduction is an area in need of more attention and development. FIMR is currently exploring social capital building strategies in communities of color in hopes of reducing the risk of SIDS and improving the community's overall health.

121
**THE EFFECT OF HOME-BASED
MOTIVATIONAL INTERVIEWING ON
THE SMOKING BEHAVIOUR OF
PREGNANT WOMEN. A PILOT
RANDOMISED CONTROLLED TRIAL.**

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Fifty percent of cot deaths are attributable to smoking. Routine antenatal contact is an opportunity to provide effective help (1). A cost-effective strength or style of intervention has still not been established (1).

Objectives were to teach a midwife motivational interviewing (MI)(2), pilot a trial with pregnant smokers, and develop an instrument to document the process.

Design was randomised-controlled, intervention-normal care.

Subjects were 100 self-reported smokers booking at the Queen Mothers Hospital, Glasgow from March-May 1997.

Intervention involved 2-5 *home-based* MI sessions.

Outcome measure was self-reported smoking corroborated by cotinine in residual routine early and late pregnancy blood samples. All sessions were audio-taped and 49 interviews from 13 randomly selected clients were transcribed for process analysis. Rollnick(2) supervised Miller's rating scale to describe therapist and client behaviours. Reproducibility was examined using 3 independent raters. Postnatal telephone interview sought client opinion. Routine midwives were consulted by focus group.

Results: 100/133 smokers (75%) were enrolled, 27 refused and 6 lived outside Glasgow.

One intervention client had an intrauterine death, another left Glasgow, 38/48 (79%) had

at least 2 counselling sessions, eight had one, and two had none. More than 75% of interviews showed satisfactory MI. The rating scale was reliable (intraclass correlation coefficient >0.5). Self-report at booking (100/100 available) corroborated by cotinine (93/100) compared with late pregnancy self-reports (*intervention*-47/48, *control*-49/49) and cotinine (*intervention*-44/48, *control* 44/49) showed no significant difference between groups. All clients interviewed (36/48) would recommend the programme. Routine midwives were supportive.

Conclusions: A midwife provided satisfactory home-based counselling for pregnant smokers. Procedures for a full efficacy study have been established.

1 Lumley J, Oliver S, Waters E. Smoking cessation programs implemented during pregnancy. (Cochrane Systematic Review) Cochrane Library, Issue 3, 1998. Oxford: Update Software.

2 Miller WR, Rollnick S. Motivational Interviewing. Preparing People to Change Addictive Behaviour. 1991, New York: Guilford Press.

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**IMPACT OF THE BACK TO SLEEP
CAMPAIGN ON SIDS RISK FACTORS IN
THE UNITED STATES, 1990-97**

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From 1990-97, the SIDS rate in the United States declined by more than 40%, from 130.3 to 77.1 SIDS cases per 100,000 live births. This decline coincided with the American Academy of Pediatrics recommendation to place infants non-prone in 1992 and the "Back to Sleep" campaign in 1994. Prone prevalence declined by more than 70% during the time period, from 73% in 1992 to 21% in 1997. This paper uses linked birth/infant death data to examine the SIDS risk factor profile both before and after the Back to Sleep campaign and to look at the changing impact of maternal smoking on SIDS epidemiology in the US. From 1990-97 SIDS declined more rapidly for nonsmokers (38%) than for smokers (25%) for a 45 state reporting area. In 1990 SIDS rates for mothers who smoked were 3.0 times those for nonsmokers (295.9 and 98.1,

respectively); by 1997 rates for smokers were 3.7 times those for nonsmokers (221.4 and 60.4, respectively). SIDS risk factors were fairly consistent between the before and after periods. Adjusted SIDS risks were higher in both 1990 and 1996 for male infants, those born preterm or small for gestational age, and those whose mothers were teenagers, less educated, unmarried, multiparous, smokers, African American, American Indian, and US-born (compared to foreign born). However, upon close examination, important differences do emerge. For example, the odds ratios for teenage childbearing, late or no prenatal care, and preterm delivery decreased (though not always significantly) during the time period, while odds ratios for maternal smoking increased. Adjusted odds ratios for moderate smokers (1-9 cigarettes/day) were 1.93 in 1990 and 2.23 in 1996; respective odds ratios for heavy smokers (10+ cigarettes/day) were 2.14 and 2.29. Although further progress is needed in communicating the "Back to Sleep" message, particularly to minority women, in the absence of prone sleep position, maternal smoking emerges as one of the main preventable risk factors for SIDS.

123 TEACHING & LEARNING STRATEGIES FOR MARGINALISED GROUPS IN SOCIETY

Catherine Henniker

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The reducing the Risk of SIDS Health Promotion message has been heard and adopted by a large number of middle class Australians. However, SIDSnew south wales is faced with promoting the Reduce the Risk of SIDS message to the "hard to reach" groups in our community. These people may have limited education, be poor, young, unemployed, ethnic, aboriginal, and/or isolated from large urban areas. The new task of SIDS educators is to reach these groups with the RTR message.

While literate and articulate groups may easily understand a lecture format, those who make up this "target" or "hard to reach" group will require other teaching and learning approaches.

The proposed workshop will explore a variety of identified learning styles and introduce active learning strategies. Participants in the workshop will enhance their skills in meeting the needs of the marginalised members of society.

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DEVELOPMENT OF A TEACHING PACKAGE FOR ACCIDENT AND EMERGENCY NURSES ON THE MANAGEMENT OF SUDDEN DEATH IN INFANCY FROM A PERSONAL INVOLVEMENT.

Carolyn Stead

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Accident and Emergency staff need to be well informed about Cot Death in order to be able to cope and to help bereaved parents. No one should be expected to cope with such a traumatic situation without being fully trained beforehand (Murphy 1990). My second child Dominic fell victim to Sudden Infant Death Syndrome in February 1996 aged 3 months. At that time and until recently I worked as a Staff Nurse within the Accident and Emergency (A&E) departments of the Leeds Teaching Hospitals NHS Trust. This presentation will describe how, using my own experiences as a bereaved parent and A&E Staff Nurse I produced a teaching package for A&E nurses, which would enable them to feel more confident when responding to the sudden and unexpected death of a baby. This was a way of making my sons short life meaningful and of gaining something positive from his death.

1 Murphy. S.Coping with Cot Death (1990) London Sheldon Press

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BABYSITTERS OF TODAY PARENTS OF TOMORROW - WORKING WITH SCHOOLS TO INFORM, EDUCATE AND PROMOTE THE 'REDUCE THE RISKS' MESSAGE.

Lin Roche

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Deaths, London, UK*

The Foundation for the Study of Infant Deaths (FSID) is taking new initiatives to provide infant care information and advice to 14-15 year olds. With Britain having the highest rate of teenage pregnancies in Europe and teenage girls representing the major growth in smokers, the 'Reduce the Risks' message needs to be targeted at a younger audience. The presentation will look at the work done in the Yorkshire Region, which has a population of 3,846,890. It has 9 Local Education Authorities with 202 schools for children in the chosen age group. During a 3 year period (1996-1999) there

have been 75 individual classroom sessions, 3 whole school assembly presentations and 9 health promotion days. The purpose of the visit is to:

- Raise awareness of the 'Reduce the Risk' information,
- provide a stimulating interactive session with the use of posters, video and leaflets,
- distribute the "Are you babysitting tonight?" leaflet,
- use practical demonstrations of how to put a 'doll' to bed - on the back, 'feet to foot' with blankets and sheets, also demonstrate overheating by dressing the doll and using a room thermometer,
- briefly discuss what happens when a baby dies and the professionals involved and look at the possible employment situations for them in the future.

The presentation will conclude with evaluations and feedback from teachers and pupils. For example many of the students both boys and girls have been looking after very young babies.

126 "REDUCE THE RISK" CAMPAIGN IN NORWAY

H.Eriksen

Norwegian SIDS Society, Oslo, Norway

The Norwegian SIDS Society wants to inform all Norwegians of the risk factors involved with SIDS. We got the idea at the Rouen Conference (Rosemary Claus-Gray, Missouri, USA) and have started a campaign where the parents of newborns (60,000 a year) receive a baby body with the text "This side up" and a RTR brochure. The midwife presents the gift when she talks with parents before they leave the hospital.

Good cooperation with the staff of our maternity wards is crucial, therefore we are offering "Reduce the Risk" seminars to the staff of hospital maternity wards. So far, we have been warmly welcomed everywhere although some staff members are still skeptical to supine sleeping. We have also arranged a national "Reduce the Risk" seminar for health professionals as a starting point for the campaign, and reduce the risk leaflets are now available in Lappish and Urdu as well as Norwegian.

To evaluate the campaign, the level of knowledge among women giving birth was assessed. Before the campaign, a two-page questionnaire was mailed to 10,000 mothers when their infants were 6 months of age. The questionnaire contained questions on baby care, i. e. sleeping position, feeding, clothing and other risk factors such as smoking.

Answers will be compared to those obtained in a similar survey in which 10,000 mothers will be contacted after the campaign. This questionnaire may also serve as a basis for future epidemiological monitoring of the occurrence and the effects of risk factors for SIDS. This evaluation project is completed by Medical Birth Registry of Norway. We want to share with you our experiences after 6 months of this nationwide campaign. We will also present results of the first part of the evaluation of the campaign, assessing the initial level of knowledge among women giving birth.

127 CHILD DEATH REVIEW: AN EFFECTIVE COMMUNITY BASED APPROACH TO IMPROVE SIDS INVESTIGATION, INTERVENTION AND RISK REDUCTION EFFORTS.

Theresa Covington

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Child Death Review Teams have been established in 49 of the 50 states in the U.S. as well as in a number of other countries, including Australia, England and Canada. The State of Michigan in the United States has developed a program that supports voluntary local review, at the county level, of all child deaths in the state, including approximately 140 SIDS deaths each year. These reviews have been very effective in improving the quality of death scene investigations, compliance with new state-wide autopsy and scene investigation standards, the provision of bereavement support and other services to SIDS families, the identification of the risk factors involved in the deaths, and the development and implementation of local and state risk reduction initiatives.

The child death reporting system captures comprehensive data on all SIDS deaths, including death scene analysis, risk factors, autopsy findings, and family history. This information is presented to the governor and state legislature, to influence public health policy. For example, information on sleep position from the 1998 state report found that of the 104 babies who died of SIDS, 40 were sleeping in cribs, 83 were sleeping in prone position, and 45 were co-sleeping. Only five of the infants were sleeping in cribs, on their backs, alone. This information was used to support state-wide public health risk reduction programming.

This presentation will describe the elements of designing and implementing an effective

and comprehensive child death review program; describe steps taken to obtain widespread support and participation; describe the process of conducting a review of a sudden and unexplained infant death; describe the state death investigation standards; describe risk reduction interventions proposed and implemented following review; and present findings from the review of SIDS deaths in Michigan.

128 FRAN'S SUCCESSFUL FAILURE

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Background: Many pregnancy smoking interventions are fraught with contradictions. In NZ, we have smokefree environments legislation, increasing tobacco taxation, high profile anti-smoking media campaigns, national training programmes and a national "Quit Line" telephone counselling service. Yet smoking in pregnancy persists at around 30% and persists as the main risk factor for SIDS. As we gear up to deal with the smoking risk we need to go beyond simple information strategies and brief advice to stop, and design interventions that are based on an understanding of the struggle to change for women who carry the greatest burden of disadvantage from smoking - women like Fran.

Aim: To expose some of the contradictions for smoking in pregnancy interventions challenge effectiveness, using Fran's experience as a case study.

Results: Fran was a participant of Smokechange - a study of personalised help to change smoking in pregnancy. Challenged by high nicotine dependence, a crumbling relationship with her smoking, alcohol-dependent, abusive partner, and more, Fran failed to achieve much behavioural change during her 12 months as a participant of the study. However, she went on to succeed with cessation independently and without relapse just three months after finishing the programme. Although a "failure for the study", Fran attributes her subsequent success to the support of her Smokechange Educator, Paula. In her own words "My good thoughts about myself started with Paula. Paula got me ready for quitting."

Discussion: This case study showed that readiness was an important pre-requisite to smoking cessation and that it was influenced by intervention. Cessation rates are the usual

markers of success and programmes tend to recruit "ready to quit" people then support them through the final stage of cessation. Without appropriate programmes the "not ready" people are left to time or chance. The sad contradiction is that, it is the "not ready" women like Fran who most need appropriate interventions because they carry the greater risk to themselves and their babies.

129 EVALUATION OF A STRATEGY TO PREVENT SUDDEN INFANT DEATH SYNDROME (SIDS)

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Diverse strategies, mainly advising changing infant sleeping position from prone to supine and to a lesser extent promoting breastfeeding and a non-smoking environment, have contributed to dramatic reductions in the incidence of SIDS. "Proyecto Vínculo" (Project Link) involved collaboration with New Zealand to increase awareness of SIDS risk factors in Argentina. However a recent survey of infants born at the Hospital Italiano de Buenos Aires showed only 40% were sleeping supine at three months despite promotion of such advice. To further promote supine sleeping, the "Tarjeta Cuna" (Crib Card) strategy was devised. A specially designed card carrying key messages for SIDS prevention and infant health (safe sleep position, breastfeeding and not smoking) will be displayed in all newborn cribs. This study will test the hypothesis that the "Tarjeta Cuna" strategy will increase the uptake of these SIDS risk reduction messages. Families with healthy full-term newborns will be randomized into study and control groups. Study group members will receive conventional messages about SIDS prevention traditionally provided by our practice, together with "Tarjeta Cuna". Control group members will receive the same conventional messages as the study group, but without the "Tarjeta Cuna". At twelve weeks a questionnaire about baby and family habits will be mailed to participants. The percentage of three-month old infants that sleep in the supine position will be the main outcome measure. Assuming that exposure to the "Tarjeta Cuna" will increase the percentage of infants sleeping supine from

40% to 60%, and that data loss will be 15%, a sample of 250 families will be recruited (alpha = 0.05 and beta = 80%, Epiinfo Version 6.04c Statcal program).

130 SUDDEN INFANT DEATH SYNDROME (SIDS) AND THE JERVELL AND LANGE-NIELSEN SYNDROME (JLNS) IN NORWAY.

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Twelve out of 24 infants who later died from SIDS had a prolonged QT interval (1). Jervell and Lange-Nielsen syndrome (JLNS) is an autosomal recessive disorder that comprises deafness and long-QT interval associated with syncopal episodes. The syncopal episodes are a consequence of abnormal ventricular repolarisation, and can induce sudden cardiac death due to ventricular arrhythmias.

Several genetic markers for long-QT syndrome, included markers for JLNS, are known. A previous study has shown that three families with clinically diagnosed JLNS, all from the middle region of Norway, have the same homozygous 5 bp deletion of the KVLQT1 gene on chromosome 11 (2). KVLQT1 encodes a potassium channel involved in the current responsible for cardiac repolarisation. The 5 bp deletion in the KVLQT1 gene encodes a S2-S3 membrane spanning segment of the channel, and will cause a frameshift which is likely to cause disease. This deletion abolishes a HhaI restriction enzyme site (2).

This study was set up to investigate whether this mutation could be found among Norwegian SIDS victims, especially SIDS victims from the mentioned region. 20 SIDS from the middle region and 140 SIDS from the southeastern region of Norway were studied. PCR was performed to amplify the DNA product from the S2-S3 domain of the KVLQT1 gene from blood and spleen tissue. The HhaI restriction enzyme was then added. In normal controls, digestion with the enzyme yields fragments of 98 and ~80 bp. In a mutant, the 5 bp deletion abolishes the cut site for the enzyme, resulting in a fragment of ~180 bp.

All SIDS studied so far does not show the 5 bp deletion. Not all families with JLNS of Norwegian origin show a common haplotype (2). A lack of deletions at the site studied does therefore not rule out long-QT syndrome as an explanation for some cases of SIDS.

1 Schwartz PJ, Stramba-Badiale M, Segantini A, Austoni P, Bosi G, Giorgetti R et al. Prolongation of the QT interval and the sudden infant death syndrome. *N Eng J Med* 1998;338:1709-14

2 Tyson J, Tranebjærg L, Bellman S, Wren C, Taylor JFN, Bathen J et al. IsK and KvLQT1: mutations in either of the two subunits of the slow component of the delayed rectifier potassium channel can cause Jervell and Lange-Nielsen syndrome. *Hum Mol Gen* 1997;6:2179-85

131 DUMMY SUCKING AND ORAL BREATHING IN NEWBORN INFANTS

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Aim: Mitchell's study (1) gave some credit to the old hypothesis of Cozzi's on dummy sucking as a preventive strategy against SIDS (2). However, the relationship between dummy use and SIDS, although confirmed by subsequent studies, is still widely considered a bias, probably because the possible mechanisms of protective effects of dummy sucking in normal infants has not been fully investigated. Therefore, we tested the hypothesis that a dummy can serve as an oral airway during early life.

Methods: Three nasal occlusion tests without dummy and three with dummy were performed for each of 20 healthy term infants (aged 2-5 days). Following the first adequate air entry, nasal occlusion was continued up to 90 seconds provided the infant did not start crying and provided the pulse oximeter did not show a drop in oxygen saturation (SaO₂) to £ 80%. The response to nasal occlusion was considered normal when mouth breathing started without movements or crying.

Results: Table shows the main clinical findings:

	Without dummy	With dummy* P	
Average response time (sec.)	11.3 ± 0.5 SE	17.6 ± 1 SE	<0.001
Infants with normal response (No)	9	19	<0.01
Tests with normal response (%) †	21	51	<0.001

* Infants were able to breathe through the mouth around the dummy;

† no differences between infants awake or sleeping.

Figures show the correlation between type of response and average amount of desaturation (DSaO₂) from baseline following

prolonged nasal occlusion tests (values are means \pm SEM).

Note no difference between normal and abnormal responses in dummy sucking infants and significant greater DSaO₂ when dummy slipped out of the mouth during the test.

Conclusion: In normal infants, dummy sucking enhances the ability to switch from nasal to oral breathing and sustain an adequate oral ventilation. Dummy serves as an oral airway.

1 Mitchell EA et al. Dummies and sudden infant death syndrome. *Arch Dis Child* 1993, 68:501-504

2 Cozzi F et al. A common pathophysiology for sudden cot death and sleep apnoea. "The vacuum-glossoptosis syndrome". *Med Hypothesis* 1979; 5: 329-338.

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PACIFIER AND DIGIT SUCKING INFANTS III: PHYSIOLOGICAL EFFECTS.

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Pacifier use is associated with a decreased risk of SIDS [1], and is widely believed to suppress digit sucking in infants, but little is known of the relative prevalence and physiological effects of these two forms of non-nutritive sucking (NNS) during early infancy.

Methods. Overnight polygraphic recordings of sleep state, respiration, ECG, oxygen saturation and infrared video were made of 10 mother infant pairs (5 routine bed-sharers, 5 room-sharers) on two consecutive nights, at monthly intervals from 2 to 5 months of age in a sleep laboratory. Each month, mother baby pairs were randomized to 1 night bed-sharing then 1 room-sharing, or vice versa. 'Episodes' of pacifier, own digit and mother's digit sucking (>1 minute) were identified and compared with 2 state-matched control periods, before and after each such episode [2].

Results: Full recordings, on 74 nights (749 hours), showed 329 episodes of NNS on 54 nights. During episodes, median oxygen saturation was higher ($p=0.0037$), desaturations were fewer ($p=0.030$), and interquartile range of respiratory rate was greater ($p=0.0007$). Median respiratory rate was slightly, but not significantly, lower. Median and interquartile range of heart rate were not significantly different during episodes. The effect of sucking upon median oxygen saturation depended on the type of sucking involved, with mothers' digit

sucking being associated with the greatest increase in median oxygen saturation. Mean durations of infant movements and noises were reduced during sucking episodes, particularly during mothers' digit sucking.

Conclusion: Pacifier use is associated with improved oxygenation, but the same effect is seen with digit sucking. Loss of digit sucking may compromise pacifier-using infants on nights without the pacifier.

1. P.J.Fleming, P.S.Blair, K.Pollard, M.W.Platt, C.Leach, I.Smith, P.J.Berry, J.Golding. Pacifier use and SIDS - Results from the CESDI SUDI case-control study. *Arch Dis. Child* 1999; 81:112-116.

2. K.Pollard, P.J.Fleming, J.Young, A Sawczenko, P.Blair. Nighttime non-nutritive sucking in infants aged 1 to 5 months: relationship with infant state, breast feeding, and bed- versus room-sharing. (In press) *Early Human Development* 1999.

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PRONE SLEEPING AFFECTS CIRCULATORY CONTROL IN INFANTS

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Background: The mechanism of death in SIDS remains unclear. A recent report of infants dying from SIDS, while attached to a cardiorespiratory monitor, showed that a progressive bradycardia, with continued breathing movements, was the pre-eminent terminal event and has suggested that circulatory failure is an important part of the lethal sequence of events. Vasomotor tone has a critical role in circulatory control by regulating, and altering, blood volume distribution while maintaining blood pressure. This study looks at the effect of prone sleep on circulatory control in a group of healthy infants, during an overnight sleep, at 7-8 weeks, factors increasing the risk of SIDS.

Methods: 75 full-term healthy infants were studied during an unsedated overnight sleep at a mean of 7.6 weeks post delivery. Recordings were made while the infants were sleeping in the prone and supine positions and repeated following a head up tilt to 60 degrees while sleeping in both prone and supine positions. Physiologic variables measured included blood pressure, heart rate, and anterior abdominal wall and anterior shin skin temperature.

Results: Systolic blood pressure is lower (78.4mmHg.v 81.8mmHg, $p<0.05$), and peripheral skin temperature (33.9°C v 33.6°C, $p<0.05$) is higher, while heart rate and anterior abdominal wall skin temperature are

unchanged during prone, compared to supine sleep, in the horizontal position. While in a 60 degree head up position there was a greater reduction in blood pressure (-3.8% v-1.7%, $p<0.05$), and a greater rise in peripheral skin temperature (+0.3°C v +0.1°C, $p<0.05$), and heart rate (130.7 v 127.5, $p<0.05$), when in the prone position compared to the supine position.

Conclusion: These results suggest that prone sleeping has a measurable effect on circulatory control, compared to supine sleeping, with a reduction in vasomotor tone resulting in peripheral vasodilation, a higher peripheral skin temperature, a lower blood pressure, and a higher resting heart rate. As vasomotor tone is critically important in circulatory control, this may be a factor in how the prone sleeping position increases an infants risk of SIDS.

134 EFFECTS OF RISK FACTORS FOR SIDS ON THE DEVELOPMENT OF HEART RATE PATTERNS

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Most cot deaths occur at an age when an infant's physiology is changing rapidly. We have previously shown that there are large individual differences in the development of body temperature patterns, and that infants with risk factors for SIDS both develop body temperature patterns later and change the body temperature more during infections.1, 2.

Changes in body temperature are a part of a complex of physiological changes in endocrine secretion, respiration and cardiovascular control. In this study we have examined the relationship between body temperature and heart rate patterns in normal infants and those with risk factors for SIDS. Overnight body temperature and heart rate patterns were recorded in 119 normal and 48 infants with IUGR, sleeping at home every week from 6 to at least 16 weeks of age, including the night after immunisation against Diphtheria, Pertussis and Tetanus. All infants developed an adult-like body temperature pattern abruptly, but at different ages. The onset of an adult-like body temperature pattern was associated with a marked fall in sleeping heart rate from 128 ± 2 bpm to 118 ± 2 bpm ($P<0.01$). The heart rate of IUGR infants was significantly ($P<0.01$) higher before the adult like temperature appeared, and the heart rate of

babies with smoking parents significantly lower once the adult like temperature pattern developed.

In all babies heart rate is significantly elevated the night after immunisation, with a significantly larger increase in IUGR infants and the normal birth weight infants of smoking parents.

Risk factors for SIDS therefore have marked effects upon cardiovascular control at the age when most cot deaths occur.

1 Lodmore, M.R., Petersen, S.A. & Wailoo, M.P. (1992) Factors affecting the development of night time temperature rhythms. *Arch Dis Child.* 67:1259-1261

2 Tuffnell, C, Petersen, S.A. & Wailoo, M.P. (1995) Factors affecting rectal temperature in infancy. *Arch Dis Child.* 73:443-446

135 GASTROESOPHAGEAL REFLUX AND APNEA OF PREMATURITY: IS THERE A RELATIONSHIP?

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Background: A causal relationship between GER and AOP has repeatedly been suspected. Failure to prove this may have been for technical reasons, i.e. that most GER in preterms is non-acidic and thus difficult to detect with pH-monitoring, the current "gold standard" for GER detection. We used the new, pH-independent multiple intraluminal impedance (MII) technique (1) to detect GER. **Methods:** Ten infants (median GA at birth 29 wk (range 24-32), birth weight 860 g (600-1865), age at study 30 d (13-93), weight at study 1670 g (980-2200)) with recurrent AOP underwent 6 h recordings of MII, pulse oximeter saturation (SpO_2), pulse waveforms, ECG, nasal airflow and breathing movements. MII and respiratory signals were independently analyzed. A reflux episode (RE) was defined as a fall in impedance in at least the 2 most distal channels, an apnea as a pause in breathing movements of >4 s, a desaturation as a fall in SpO_2 to $<80\%$ and a bradycardia as a fall in heart rate to <100 /min.

Results: A total of 226 RE occurred, with a median rate of 16.5/infant (range 8-62). This compared with 1341 apneas, 85 desaturations and 31 bradycardias. 41 (18%) of the reflux episodes occurred within 20 s before, and 48 (21%) within 20 s after an

apnea. The majority of RE had no temporal relationship with a respiratory event. Conversely, only 4 desaturations and 1 bradycardia were associated with a RE. **Conclusion:** GER was common in these infants, but occurred independent of AOP. These data do not support the hypothesis that GER and AOP are related events.

1 Skopnik H, Silny J, Heiber O, Schulz J, Rau G, Heimann G. Gastroesophageal Reflux in Infants: Evaluation of a New Intraluminal Impedance Technique. *J Pediatr Gastroenterol Nutr* Vol 23, No 5, 1996

136 The effects of maternal smoking and diet on growth and cardiorespiratory development telemetred from the home during sleep in infants.

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A number of studies demonstrate that infant lung function relates to antenatal smoking, many presuming a causative role¹. Infants of mothers who smoke are of lower birth weight and are considered to be at increased risk of SIDS, wheezing, asthma². One aim of this study was to determine whether dietary and socio-economic factors might influence the relationship of smoking to infant cardiorespiratory function and growth.

From a cohort of 655 infants whose mothers had detailed antenatal, demographics and serum cotinine levels measured, 175 were studied at home at 3 weeks and 3 months of age. Cardiorespiratory measurements were made overnight, from which breathing frequency, *Tme* (maximal expiratory flow) and chest-abdomen phase angle were derived.

Infants of mothers who smoked from the initial cohort had disproportionate growth at birth (*e.g.* head circumference/crown rump, $p < 0.001$). In the studied cohort mothers were older, of higher social and educational status and this effect was not found. They also had better diets than those declining the study (higher VitC, Se & Fe, $p < 0.001$). The monitored infants of maternal smokers were disproportionately grown by 3m, although of similar weight. These mothers were younger (23.9 vs 26.8 yr $p < 0.001$) and their diets were deficient in

carotenoids (1252 vs 1963 μg , $p < 0.001$) and β -carotene (786 vs 1251 μg , $p < 0.001$) compared to non-smokers. The dietary deficits occurred during the first trimester and were followed by increased levels during the third trimester. The only difference in cardiorespiratory function in infants of smokers was a lower phase angle at 3m. However, when infants of the mothers with the highest ($n=10$) cotinines (220 mg/ml) were compared with those with none, *Tme* was decreased at 3w ($p < 0.01$) and 3m ($p < 0.05$). This effect was more pronounced with low VitC but did not relate to birthweight. However, low levels of VitC in non-smokers was also related to a lower *Tme*. There are growth and restrictive airways effects in infants of heavy smokers that are related to diet. Furthermore the organ and growth specific effects of dietary deficits in early gestation followed by increased dietary intake in later pregnancy may also have to be taken into account³. There appear to be independent dietary effects on respiratory development. Thus diet may modify or contribute to affects previously attributed to smoking. Socio-economic factors were clearly a strong influence on smoking, diet and outcome.

1. Blair PS *et al*, 1996, *BMJ*, 313:195-198.

2. Tager IB *et al*. 1995, *Am J Respir Crit Care Med*, 152:977-983.

3. Clarke L, Heasman L, Juniper, DT, Symonds ME. *Br J Nutrition* 1998;79:359-364

137 IMMUNISATION DOES NOT ALTER INFANT SLEEP-WAKE ACTIVITY

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Whether the temporal association between time of immunisation and time of sudden infant death (SIDS) constitutes a causal relationship has been debated in the literature. The most recent epidemiological reports have concluded that immunisation does not increase the risk of SIDS and, indeed, may lower the risk. However, immunisation rates in Australia remain sub-optimal, with only 70.4% of all infants fully immunised by 2 years of age (Australian Childhood Immunisation Register, 1998). The aim of this study was to investigate the effect of immunisation on the developmental profile of infant sleep. Sleep-wake data were recorded for ninety nine healthy term infants (gestational age 38-42 weeks; 44 male, 55 female) around the time of their first and second diphtheria-tetanus-pertussis (DTP)

immunisations (at 3 and 5 months, respectively). A 24-hour sleep-wake chart was completed by parents once in the week prior to immunisation, and twice in the two weeks following immunisation. Sleep-wake data were available from each immunised infant and from infants within the group at matched post-conceptual ages who were not immunised in that time period. The number of sleep bouts per 24 hours, total time asleep in 24 hours, length of longest sleep bout, and amount of night waking were measured. Results showed that there was no significant difference in these parameters between the immunised and control infants in the weeks following immunisation, at the time of either the first or second immunisation. Our results suggest that the maturational stage of the sleep-wake system is not significantly altered by DTP immunisation.

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THE USE OF A BEREAVEMENT ASSESSMENT TOOL WITH FAMILIES AFTER THE SUDDEN DEATH OF A CHILD: IMPACT ON QUALITY OF CARE.

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In a previous study we found that few bereaved families received appropriate care or support from primary healthcare professionals, and many professionals felt ill-equipped to provide such care despite wishing to do so (1,2). Subsequently, teaching and support has been offered to professionals, and an information pack developed, including a bereavement assessment tool (based on stress theory) and information booklets for parents and health visitors.

Objectives: To test the efficacy of an intervention guide for Health Visitors supporting bereaved families: from the families' and the health visitors' perspectives.

Design: A prospective, 2-year, population-based randomised controlled trial in one English Health Region (population 7 million). Districts (2-300,000 people) were matched for socio-economic and urban/rural factors, and randomised for Health Visitors to receive or not receive the assessment tool. Data was collected on all sudden deaths in childhood (1 week to 12 years), and questionnaires sent to parents six months after the death, and to their health visitors 3 months after the death.

Results: Informed consent for contact was given for 122/167 families in which a child died suddenly; 72 (59%) parents, and 110 (75%) health visitors responded. Both the study and control families reported high levels of formal and informal support (median 6 HV contacts/family in both groups); 66% health visitors had received training in bereavement care. Many health visitors expressed the need for information and training on the needs of siblings, as well as more clinical supervision and support for themselves. Anxiety and depression scores in parents were not affected by the intervention, but 95% health visitors found it useful and 81% considered it should be generally available to professionals caring for bereaved families.

Conclusions: Care of bereaved families has improved. The bereavement assessment tool facilitates provision of high quality care, but health visitors would appreciate more support. The needs of bereaved siblings require greater emphasis.

1. Dent A, Condon L, Blair P, Fleming PJ. A Study of bereavement care after a sudden and unexpected death *Arch Dis Child* 1996;74:522-526
2. Dent A, Condon L, Blair P, Fleming PJ. Bereaved Children-Who cares? *Health Visitor* 1996;69:270-271

139
LESSONS FROM AN ANCIENT STORY OF GRIEF FOR THE NEW MILLENNIUM

Judy Freiman
Bereavement Counselling, Woollahra, Sydney, NSW, Australia

A gift of wisdom from an ancient millennium to a new one: I'd like to speak to you of a story written about 3000 years ago. The story is called Demeter & Persephone and traces the journey of a mother's grief over the loss of her child. This story is as relevant today as it was then. Amidst all the changes in our increasingly complex world- a world which presents us with unique challenges, often focusing on the differences between us rather than the similarities, offering up one sophisticated bereavement model after another, it is reassuring to reflect on an ancient Greek myth and find a magnificent guide for our parental grief.

Despite the unique challenges we face in the course of our grief, there are some things not contingent on externals, personal histories, or the details of the loss. Some are contingent on simply being human. There is some place in us where we're the same, always were, always will be and this gives our grief a sense of belonging, a community

and ultimately a sense of normality. Demeter's journey not only instructs us, but her journey is consolingly familiar to our own, because she makes mistakes, falls in the pit and learns how to crawl back out again.

This is the stuff of true inspiration. Her journey is an archetypal one, the journey we all make when our child is lost to us- a journey we'll make as long as we are human beings and as long as we have hearts that love and at times break.

140 CARE AND ASSISTANCE AFTER SIDS AND CHILDREN-ACCIDENTS

*D Nordanger, K Dyregrov, A Dyregrov
Centre for Crisis Psychology, 5037
Solheimsviken, Norway*

In the first part of a three year project, a survey was distributed to 481 local authorities and city-districts in Norway. The respondents, mainly community physicians, were invited to describe different aspects of the local care and assistance for parents bereaved by SIDS and children accidents. The following aspects were covered by pre-coded questions: a) The kind of assistance provided, b) care-givers involved, c) lines of responsibility and co-ordination, d) time-framing of the assistance, e) existing written routines for the assistance, and f) existing assistance for children/siblings. Under open questions respondents presented their own judgements regarding obstacles and facilitators for better bereavement services. In a second part, a survey was distributed to all families known to have lost children in SIDS and by children accidents in Norway between 1.7.1997 and 1.1.1999 (N=132). The survey investigated 1) the kind of assistance received, 2) provided by whom, 3) time-framing of the assistance, 4) assistance for children/siblings in particular and 5) the parents' evaluation of the assistance. Social support and eventual self-help strategies were also included in the questionnaire. Psychosocial health/functioning was mapped by three standardised scales. Responding to open questions parents described what they had experienced as the most valuable care, and what to their opinion ought to characterise assistance after such events.

Apart from describing the "state" of the bereavement services in Norway and the experiences and needs of the bereaved, results contains comparisons on different levels: Differences between the two groups regarding received help and psychosocial

functioning are described, co-variations between provided and received help and different demographic variables are investigated, and likewise co-variations between measures of psychosocial health and aspects of received help. In sum, this forms a basis for the aim of the project; to develop guidelines for the structure and content of assistance after such events.

141 GRANDPARENT BEREAVEMENT - CHALLENGE AND CHANGE

Alison Stewart

*Dept Nursing & Midwifery, Otago
Polytechnic, Dunedin, New Zealand*

Bereavement research and clinical practice have focused on parents, and more recently siblings, of infants who die suddenly. Grandparents are often seen as supporters of the family- but what is their experience of bereavement?

This research used constructivist inquiry to explore, in a series of interviews and letters, how 16 grandparents and 6 parents from 11 families, living in New Zealand and the United Kingdom, constructed their experiences of grandparent bereavement, both as individuals and within the context of the family. All the grandchildren had died suddenly and unexpectedly with; 3 SIDS, 4 stillbirths, 3 perinatal deaths, and 1 infant death. Key aspects of this construction include the following:

- Facing challenge with the world turning upside down and you have got all these other ones when you are a grandparent. This encompasses the 'pain' of own loss, child's loss (as parent of the grandchild), grandchild's loss of a future, and other grandchildren's loss of a sibling.
- Responding to the challenge which includes physically going to be with the family and an active role as parents of adult parents which means walking a fine line of 'helping out but not taking over' from the parents.
- Managing changes from the challenge is about living with the grandchild's death and what this means. Parents perceive that grandparents have an important role,
- Placing the grandchild in the family, as 'family-keepers' who remember, and acknowledge the grandchild. Putting loss in life in place can involve revisiting other losses such as grandparents' own experiences of miscarriage.

Whilst this joint construction is grounded on the experiences of these 23 participants and cannot be generalised, it does offer us,

both as clinicians and researchers, an insight to be aware of bringing grandparents into the foreground when an infant suddenly dies.

142 SIDS PARENT RESPONDING TO FAMILIES: THE WELLINGTON EXPERIENCE

Madeleine Taylor

SIDS Wellington Inc, Lower Hutt, New Zealand

This presentation outlines why and how the current family support process came into existence. What structure was put in place to ensure a professional and consistent response to families.

Defining the service:

- Family Support Coordinator Position

Vision:

The committee had a vision to ensure that the families they were trying to reach received a consistently, supportive, and effective service.

An opportunity arose in September 1997 to re-look at the counselling service and to refocus the committees work. A draft charter about SIDS Wellington had been developed focusing on four goals:

1. To ensure that all families who experience the death of a child to SIDS, have access to the best possible support that is right for them
2. To provide an apnoea monitor service for subsequent siblings of SIDS babies
3. To promote SIDS information
4. To increase community awareness about ways of protecting babies from SIDS from this document a job description was drawn up: Major role: To facilitate and co-ordinate a quality counselling and support service for families affected by SIDS.

Key Tasks: (1) Ensuring SIDS Families are offered appropriate support and counselling services, (2) ensuring that Maori SIDS families have access to professional support from people of their own culture, (3) assisting SIDS families of all cultures access professional support from people of their own culture where it is available, (4) to co-ordinate parent supporters and other appropriate people to support SIDS families, (5) to provide a direct counselling service, (6) to accept counselling phone calls through the 24 hr answering service, (7) to provide support and supervision to SIDS parent supporters, (8) to initiate and develop our counselling service in conjunction with the parent support group and the committee, and (9) to speak about our counselling

service to other community groups and/or organisations. Working with the wider SIDS Community

Building the Team:

- First Responder
 - role,
 - tasks,
 - training, this includes:

discussing: outlining the theories of grieve resolution, talking about boundary issues
Visiting: Funeral Home, mortuary, methods of training: role play, feedback, tandem home visits, debriefing, hands on supervised practise,

- Life enhancement workshop

Developing the Networks:

- Getting out into the community
- Hui
- Maintaining links
- Working within the SIDS Wellington Group

Ongoing Supervision:

- monthly supervision - upskilling, issues, training, ethics,
- on going learning and updating resources

Public Relations:

- Public speaking
- Health shows

143

CREATIVE MEMORIES

*Sue Wilkinson, Vivienne Bateman
SIDSvictoria, Melbourne, Australia*

Since 1993, SIDSvictoria has provided a number of opportunities for bereaved parents to come together to talk about, create and share with others, items they have created in memory of children who have died. The entire process has been driven and guided by parents with support provided by staff members of the Family Services and Community Education Unit of SIDSvictoria. Early gatherings of the Creativity in Bereavement group included sessions on art, music and writing; and the "Homage" exhibition at the Australian National SIDS Conference in 1993. A special album, and the Patchwork Poster Quilt, both of which display photographs of works created by parents and others, were made. The Starry Curtain, a focal point for parents at the 1997 Australian SIDS Conference, provided another opportunity for parents to participate in the Creativity in Bereavement program. In June 1999, the 'Remembering Exhibition' was a part of the Red Nose Day Memorial Service. A number of families shared with others items they had created in loving memory of children who have died. These items included needlework, poetry, prose, leadlight, paintings and so on. Books

written by parents in memory of their child have been shared with others. A card making group has begun the process of designing and producing cards which more appropriately and sensitively reflect the experience of the loss of a young child. It is envisaged that the cards will initially be used to remember significant anniversaries, sensitively celebrate the birth of a subsequent child, and in other ways. Most recently, the Continuing Links Activity Group (C.L.A.G.) has met together to make up Continuing Links of Love packs which are now being given to families to decorate in memory of their child. The squares will be linked together in a continuous, and sadly, continuing length, and displayed at SIDSvictoria.

Generally grieving parents at some stage seek involvement in an activity that helps in some way integrate, or reduce the feelings of emptiness, sadness, loneliness and helplessness. Often parents make the comment that doing something creative allows them to maintain a connection with their child. It provides them with a tangible opportunity to recognise the importance of their child's life, often when others are encouraging them to 'move on'. Creativity should be emotionally safe for the (bereaved) parent. It is the parent's choice as to the type of project, when to begin, and their level of involvement.

This program illustrates the value of a close collaboration between parents and health professionals. Personal and community-based creativity projects at SIDSvictoria will be shared with the conference through a slide presentation.

144 INFANT CARE PRACTICES: WHAT SHOULD WE ADVISE

Tony Nelson.

*Dept of Paediatrics, The Chinese
University of Hong Kong, Hong Kong SAR,
China.*

How do we develop education messages based on SIDS risk factors and how do cultural factors complicate this process? One of the first Reduce the Risks (RTR) campaigns was proposed by the Canterbury Cot Death Society in Christchurch, New Zealand titled "Cot Death – you cannot predict it, you cannot prevent it, you can reduce the risks". Since this time our understanding of the significance and inter-relationship of these risk factors has greatly increased. Although simple association does not imply causation we are now confident that certain risk factors

(prone sleep position) are causally associated. However for other factors the evidence is less strong and implied causation is speculative. A diversity of RTR campaigns have developed and although most concentrate on 3 or 4 main messages, there are often a number of minor messages included. Important questions to consider include whether all messages are equally important and, if not, whether the recipient of the message can tell the difference, whether all messages are equally evidenced-based, and whether all messages are equally valid across cultures? If there is very strong evidence for a particular message then it is likely that the message is relatively more important. In terms of SIDS risk factors there is very strong evidence that non-prone sleep position and smoking increase the risk of SIDS. For many of the other messages the evidence is weaker, variable or non-existent. Sometimes the main messages are obscured by lesser but more newsworthy messages. Advice on how to prevent babies from rolling prone is difficult and at times controversial. Advice on "feet-to-foot" for preventing babies heads from being covered may seem reasonable and common-sense but appears not to be evidenced-based. It could be argued that infant restraint, as used in traditional societies, might also prevent rolling-over and head-covering. Messages on room temperature regulation and clothing are not straight forward, when heavy wrapping and high room temperatures appear to be risk factors for SIDS only when infants sleep prone. Likewise advice that infants should be given "tummy-time" to develop their muscles properly is not convincingly based on evidence. Western-trained physiotherapists and paediatricians appear to be the main source of this advice, although whether tummy-time is a developmental necessity is debatable. Cross-cultural comparisons suggest not. Although it might be speculated that tummy-time may help to teach a baby to roll over from the dangerous prone position to the safe supine position, the reverse is also possible. Messages related to pacifiers are often not included in RTR campaigns. Should parents be told "Yes, pacifiers may protect against SIDS" but "Yes, pacifiers may interfere with successfully breast feeding"? Developing RTR messages is not easy. One option is a hierarchy of risk factors, ranked according to the weight of the evidence. Key messages should be presented as such. Factors with less or limited evidence could be included with suitable qualification. However this

creates a dilemma, as the general public may lose confidence in a campaign that contains messages with too much qualification or if the messages keep changing. The effect of a message when given within a different cultural context also needs to be considered. Our aim is to reduce deaths from SIDS by advising parents about risk factors but at the same time we do not wish to create other problems by giving misleading advice or advice only applicable to a specific cultural group.

**145
PHYSIOLOGY MAJOR QUESTIONS TO
BE ADDRESSED**

André Kahn
*Free University of Brussels, Brussels,
Belgium*

**146
PATHOLOGY; MAJOR QUESTIONS TO
BE ADDRESSED**

Henry Krous
*Children's Hospital-San Diego &
University of California, San Diego School
of Medicine, USA*

**147
DISADVANTAGED COMMUNITIES –
THE FUTURE**

RG English
*Thomas Jefferson University,
Philadelphia, PA*

In President Clinton's radio address on February 21st, 1998, he committed the United States to a goal of eliminating by the year 2010, longstanding disparities in health status experienced by racial and ethnic minorities. Despite the progress in the overall health of the Nation, significant disparities continue to exist in illness and death among African Americans, Hispanics, American Indians, Alaska Natives, and Pacific Islanders, compared to the U.S. population as a whole. President Clinton's Racial and Health Disparities Initiative to eliminate serious health differences between minority and white Americans targets the following six areas: Infant Mortality, Cancer Screening and Management, Cardiovascular Disease, Diabetes, Immunizations, and HIV/AIDS (DHHS, 1998).

Although infant mortality in the U. S. has declined steadily over the past several decades and is at a record low of 7.2 deaths per 1,000 live births, the black/white gap in infant mortality rates has worsened. Consistently from 1960 to 1984, black babies

were twice as likely to die in infancy than white babies were. In 1984, infant mortality for blacks was 18.4 deaths/1,000 births and was 9.4 deaths/1,000 births for whites. Between 1992 (the year the American Academy of Pediatrics' statement on infant sleep position was released) and 1995, the SIDS rates declined 31% among whites and only 23% among blacks. The white rate fell from 11 to 6.5 and the black rate fell from 23.3 to 16.8 per 1,000 live births. As a result, the black/white gap in the SIDS rates also called the black/white mortality rate ratio, actually increased. In 1985, there was a 2.1 gap between black and white deaths. By 1995, that gap had risen to 2.4, which has remained consistent through 1998 (CDC/NCHS). Planned strategies and interventions for reducing these alarming trends will be explored.

**148
THE FUTURE DIRECTION FOR SIDS
RESEARCH AND PREVENTION – TO
LEAD OR BE LED?**

Kaarene Fitzgerald
SIDSaustralia

Current debate about the use of 'undetermined', 'positional asphyxia' and 'unascertainable' as causes of death due to current methods of investigation may leave us with little or no deaths ascribed to SIDS in the not too distant future.

The SIDS movement is at a major watershed. Within the past 18 months articles featured in newspapers and journals, often based on limited or 'mother-in-law' research, read like something from the early 1960' or 1970's. Child abuse, neglect, Munchausen Syndrome by Proxy and homicide have raised their ugly heads casting doubts over all SIDS deaths. Whilst these areas of concern must be studied it should be within a properly planned framework and not to the exclusion of developing further research into the causes of genuine sudden unexpected infant deaths.

We are running the risk of following a line similar to the frenzy of apnoea monitors. Agreement must be reached about minimum standards required to reach a cause of death but should include a case history, event scene investigation and autopsy.

Worldwide Reducing The Risks of SIDS programs have contributed to a significant drop in deaths enabling better investigations about the circumstances surrounding each child's death. Unsafe sleeping environments, accidental deaths and prior illness have now been highlighted leading to the question of

how do we further reduce infant mortality? New initiatives, as a result of the Australian Scientific Forum held on December 4th and 5th 1999 will be outlined in this paper.

149
SUDDEN UNEXPECTED DEATH WHEN YOUR CHILD IS OVER ONE YEAR OF AGE

Graeme Baker

SIDS Canterbury, New Zealand.

When Phillip died he was more than thirteen months old. The Pathologists report determined that it was SIDS. We received support from our local SIDS Canterbury team. Most of the SIDS information refers to babies and it just didn't seem relevant in this case. After all Phillip was at two years family Christmas parties, had celebrated his first birthday, could walk and even say a few words. It just didn't stack up, after all he had reached one year of age and was 'safe'! I suppose that you could even say we were lucky that we had this amount of time with him, given that most SIDS occur at an earlier age. The unfortunate reality is that one year out from birth is not a magical date. Given infancy may refer to the first year of life and SIDS by definition to deaths during the first year, the sudden unexpected death of a child does, as we know, happen beyond this period.

Other families have no doubt been in this situation and experienced similar thoughts and feelings of not quite fitting the pattern and even thinking that SIDS was suspicion raising, and a diagnosis of convenience. I will include in this presentation a broad overview from my experience along with my contacts with other families who have lost children at this end of the SIDS spectrum.

150
BEREAVEMENT SUPPORT VIA THE INTERNET

Karon Cox

SIDS Australia, New South Wales, Australia

Supporting bereaved family members via the Internet. To provide a safe caring environment in a chat room where people can express their feelings and share their grief when they have no one else to turn to, or are unaware of services offered in the community.

151
VIDEO AS GRIEF SUPPORT

T. Giving Kalstad

Norwegian SIDS Society, Oslo, Norway

After the devastating loss of a child, it is important for the bereavement process to know that one is not alone – that there are others who share the same thoughts and feelings of chaos and hopelessness.

Not everyone who has lost a child will be able to participate in support groups, and experience has shown that men in particular are hesitant. Although the use of a video can never replace a personal contact; it can be of assistance as it is less threatening and can be made available throughout the country. It can thus be considered both a supplement and an alternative to participation in a support group. The video "A Conversation about Grief – after the loss of a child" contains recordings of two sets of parents in separate conversations with Dr. Atle Dyregrov. One set of parents lost a child to SIDS, while the other lost their child to suicide. The main themes in the conversations are:

- a) the circumstances surrounding the death of the child
- b) acute grief and delayed grief reactions
- c) differences between men's and women's reactions to grief as well as how they express their grief
- d) interaction in bereaved families.

The last part of the video contains information about support groups for people who have lost children and about public agencies. We hope the video can encourage individuals to use the possibilities for support and assistance which are available. Although the video is designed for parents who have lost children, the open and forthright conversations will allow professionals to increase their understanding of grief and bereavement.

The 115-minute video is distributed free-of-charge to our contacts and sold to hospitals, health departments and church offices. It is a cooperative effort between the Norwegian SIDS Society and the Center for Crisis Psychology.

152
SEMINAR FOR UNPROCESSED GRIEF

D. Nordanger, T. Giving Kalstad

Norwegian SIDS Society, Oslo, Norway

The Norwegian SIDS Society is aware of the life-long grief members must deal with. They tackle the grief they feel in different ways, according to the type of help and follow-up they received. We are also aware that the help and follow-up families receive is coincidental and dependent on location and resources at the individual hospital. As a result, we have

initiated a project designed to give them necessary support and care, aimed at reducing the occurrence and complications of complicated grief among parents/families who have lost a child to SIDS or others who have experienced the sudden, unexpected death of an infant. This offer has also been given to members of another association.

The project consists of 3 parts in addition to an evaluation. Part I was a day seminar about bereavement which was led by a psychologist and had 112 participants. Based on a questionnaire, the group was mapped according to physical, mental and psychosocial relations in addition to their experiences as support parents. By using these questionnaires, we were able to determine who suffers the most. This group of 40 will be given the chance to receive help in Part II: 3 group meetings over 3 weekends, one month apart. Each of these meetings will be led by 2 psychologists. After these seminars are completed, participants will fill out a new questionnaire which will be used to evaluate the seminars plus determine if participants need more help. The final part of the seminar will be to offer 20 people individual therapy for up to 8 hours.

By February 2000, parts 1 and 2 will be completed and we will be able to share some of our experiences with you.

The seminar is a cooperative effort between the Norwegian SIDS Society and Center for Crisis Psychology.

153 BEREAVED KIDS

*Pauline Ingram
Dunedin Hospital, Dunedin*

Children are often the overlooked family members when a family is faced with bereavement. Adults are distraught often experiencing difficulties themselves with what is happened to their loved one.

Two Paediatric nurses in Dunedin have been running a bereaved kids (B.K's) programme for several years. It is a programme for children who have experienced the death of a loved one – sibling, parent or relative. The aim is to allow children to deal openly with grief and then get on with the business of living. This programme has helped children come to terms with the death and meet peers with similar issues.

As the silent sufferers children are often not able to express their needs and nurses need to advocate for their rights to help at this stressful time.

154 REDUCTION OF SUDDEN INFANT DEATH SYNDROME - IMPACT ON BEREAVEMENT SUPPORT SERVICES FOR FAMILIES

*Yani Switajewski
SIDSaustralia, Royston Park, Adelaide,
South Australia*

Families who have recently had infants die from both Sudden Infant Death Syndrome and sudden death due to other causes, require different support services, than were previously provided.

This paper will offer reasons why and how past bereavement support services have been adapted to change.

155 SIDS PARENTS CONTRIBUTING TO A SIDS ORGANISATION

*Lesley and Peter Jones
SIDSvictoria, Melbourne, Australia*

In 1988 our son Brendan died of SIDS. Ironically this was the beginning of years that would be filled with sadness, challenges, growth and personal rewards.

By chance Lesley began weekly visits to the Foundation at Malvern where she was offered the opportunity to shed a tear or two over a cup of coffee with other 'SIDS Mums'. This weekly coffee morning was hosted by a 'SIDS mum' who was an example of 'life after SIDS' for her. She was smiling, something that Lesley didn't believe she would ever be able to do again.

As time moved on we became volunteers at the Foundation assisting in many different ways. We were trained as Parent Supporters so that we could offer support to families based on a shared experience both individually and in groups; we became members of the Speakers Bureau so that we could assist with speaking engagements on behalf of the Foundation; Lesley became a Support Group Co-ordinator where she now hosts the monthly 'coffee mornings'; we are rostered members of the 24-hour Crisis Help Line; we have been closely involved in the development of a booklet 'Choices in Arranging a Child's Funeral'; Peter is involved in some of the Foundation's creative projects, and Lesley has become a Board Member and Secretary of the Executive Committee of SIDSvictoria.

As we have moved from being 'receivers' to 'givers' of support in a variety of ways, we have had a unique opportunity to be with other people in times of great need. We have found it to be a personally invaluable

experience, and in return we hope that we can offer families 'hope' for their future.

156
DEVELOPING AN EFFECTIVE PUBLIC EDUCATION AND AWARENESS CAMPAIGN ON SIDS

JF Hazel, S Cotroneo

Partnerships and Marketing Division, Health Canada, Ottawa, Ontario, Canada

In Canada, it is estimated that 3 babies die per week of SIDS. In the fall of 1998, a joint statement was released from the Canadian Paediatric Society, the Canadian Institute of Child Health, the Canadian Foundation for the Study of Infant Deaths, and Health Canada which outlined the most current research on how to reduce the risk of SIDS. It was information care givers and parents both wanted and needed to know.

Given that there was a lack of current research on awareness levels, attitudes and behaviors of the primary target audience (mothers to be/parents/care givers) around SIDS, a benchmark survey was conducted to probe these issues and provide insight into the target group. The results indicated that SIDS is the most weighty fear of new parents and there exists a high level of confusion and conflicting advice on the appropriate sleep position for an infant. Based on the results of this survey as well as multiple focus groups across the country, a comprehensive public education and awareness campaign was developed.

Our strategy involved the use of multi media to reach both the primary and secondary targets, in conjunction with our 3 partners. The public awareness campaign capitalized on the international slogan Back to Sleep to both build on the equity of this tagline and create consistency in all SIDS messages. The components of the campaign included a brochure, poster, print advertisement, television public service announcement and a Web site. The materials were distributed through parenting magazines, doctor's offices, hospitals, and contained a 1-800 number to call for further information.

Currently a series of dialogue circles in various Aboriginal communities are underway, so that the campaign can be adapted to this target group.

The feedback from the campaign has been extremely positive to date. In March a post campaign tracking survey is planned, replicating the pre-campaign benchmark survey to test awareness and attitude shifts, and suggest any necessary modifications to the campaign.

157
EXPANSION OF SERVICES BY SIDS NEW SOUTH WALES - THE PROCESS

Michael Corboy

SIDSnew south wales, NSW, Australia

As the rate of Sudden Infant Death fell in New South Wales it became obvious to the New South Wales Board of the Sudden Infant Death Association of New South Wales, as indeed with other SIDS organizations throughout Australia, that there were many other target groups that were receiving no service or minimal service from government, quasi government or charitable organizations. Those groups were identified as children who died as a result of fire, drowning and electrocution. Also receiving minimal support were families of children that died of quick onset disease, accidental death and death resulting from motor vehicle accidents.

In association with continued assistance of SIDS families as a priority, SIDA New South Wales (now SIDSnew south wales) embarked on research to determine a number of important factors as to whether they could provide assistance to these target groups. Factors such as volunteer support, staffing levels, funding required, government support and the size of New South Wales were all seen as contributing to the outcome of the decision. The process also involved speaking with other member organizations at a national level and having support of those other member organizations. Having the support of the National SIDS Council of Australia and other M.O.'s, specifically Victoria, already showing vision in expanding their services, New South Wales embarked on a lengthy and detailed survey followed by regional focus groups which concluded in support for those expanded services.

This paper outlines the process, the findings, the marketing and problems associated with the expanded services as well as the current position in that process.

158
FEWER BEREAVED PARENTS – LESS TAKE UP OF BEFRIENDER SUPPORT – WHAT NEXT FOR THE SIDS ORGANISATIONS?

Ann Deri-Bowen

Foundation for the Study of Infant Deaths, (FSID) 14 Halkin Street, London, UK

This paper looks at the issues facing SIDS organisations today with the volunteer

support they offer bereaved parents. With the large, welcomed decrease in the number of bereaved families each year and the reduced take up of the support offered by befrienders there is a need to address the following issues.

- What support do we offer, when should it be offered and does it match the needs of the family?
- Should we look at different ways of providing parent to parent support other than by Befrienders and in Groups?
- With the decline of parent support groups how can we support volunteers?
- How can we continue to train befrienders when they are scattered over a large area?
- How can we value Befrienders and use their skills in other ways?

159 THE AUSTRALIAN SIDS ONLINE CATALOGUE

Joanna Durst

SIDSaustralia, Victoria, Australia

The Australian SIDS Online Catalogue (ASOC), an initiative and tool of SIDSaustralia, has two components. Firstly, it is a collection of over 2,300 articles, reports, bibliographies, letters to the editor and other publications that are about SIDS, grief and trauma. Secondly, it is a computer listing of these documents, which is placed on the Internet and is therefore available to be searched by any interested party. The collection is comprehensive and ever-growing.

This paper will explain what ASOC is, what help it can provide to health professionals, parents and researchers, the purposes it has been used for recently and how the catalogue can be accessed and searched.

160 EXTENDED SEMINARS FOR BETTER PARENTAL SUPPORT

H.Eriksen

Norwegian SIDS, Oslo, Norway

Parental support to grieving families is the basis for our work, along with information and the funding of research. We have more than 50 people all over the country available to assist bereaved families. All of these support parents have experienced the loss of a child to SIDS and are highly motivated to be of help to those in need. Some have a medical/nursing/social work/pedagogical professional background, others don't. In order to secure the quality of parental support, we have developed a three step (three weekend) process-oriented seminar in how to support grieving parents. The

seminar is arranged so as to allow for learning in a safe environment and gives participants practical information as to how to lead a discussion (basics about grief, active listening skills, etc.) as well as on the leadership of support groups. The seminar is led by a psychologist with long experience in helping volunteers work with people in grief and by one of our members who has an advanced teaching degree. Our national board has decided that all our parental support volunteers will be required to participate in this seminar.

Our aim is to give you a brief understanding of how these seminars are run and the results of our first three-step seminar and a half-way report on our second.

161 REGIONAL BEREAVEMENT SUPPORT COOPERATION

H.Eriksen

Norwegian SIDS, Oslo, Norway

Families who lose a child, regardless of cause, have a significant need for support; often long after the child's death. Bereavement support to these families is the main objective of the Norwegian SIDS Society and the Norwegian Association of Lost a Child.

Many factors indicate the wisdom of coordinating the activities of these two societies. With their network of volunteer support parents, they will be able to reach out to more families, and their volunteers will be able to represent the needs the bereaved have in regard to hospitals and public agencies. One condition for the successful creation of such an arrangement is that the cooperation between the members at a regional level must be strengthened.

Support parents from both societies have attended four regional seminars with this purpose in mind. The following topics have been focused on:

- a) establishment of contact between the two societies
- b) exchange of experiences and ideas
- c) increase knowledge of mutual activity in both societies,
- d) lay foundation for regional activity of support,
- e) secure the quality of the volunteer work
- f) encourage contact based on confidence between the network of volunteers and public agencies.

We have thus been able to determine what resources are available in the different regions. This cooperation allows us to establish contact with potential support

parents/leaders of support groups and maintain contact with functioning support parents.

We plan to arrange a follow-up education programme at a regional level with 2 basic seminars for new volunteer support parents and 2 follow-up seminars for experienced leaders of support groups. Topics of focus will be 1) partner relations after the loss of a child, 2) siblings and interaction in bereaved families and 3) self-help to the leader of a support group. By February 2000 all four seminars will have been completed

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PARTICIPATION IN RESEARCH: INFORMED CONSENT, MOTIVATION AND INFLUENCE

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Objectives: To investigate the process and quality of informed consent in parents who were invited to enroll their baby in a non-therapeutic research project. The motivation of parents who participated and declined and the effect of external influence were also explored.

Design: A mixed quantitative/qualitative questionnaire was sent to a cohort invited to participate in a physiological research project in the area of Sudden Infant Death Syndrome (SIDS). Separate questionnaires were used for parents who participated and those who declined to participate.

Setting: Dunedin Public Hospital, New Zealand

Subjects: 94 consenting parent and 103 declining parent questionnaires were sent; response rate respectively was 69% and 42%.

Results: Participant parents: All consenting parents felt they understood the purpose and procedure of the study. They also felt able to ask questions about the study. The majority (90%) felt the information about the study was very good; 6.5% felt more detail was required. Eighty-five percent found the verbal explanation was the most useful source of information. All participated for altruistic reasons such as to prevent SIDS. Their infant's vulnerability to SIDS was the second most important reason for participating. Although 27% had concerns about safety of the tests, after the tests all responders felt happy with the safety of the tests. All participants felt able to withdraw their child from the study at any time. Non participant parents: Inconvenience was the main reason (53%) for declining to participate. Twenty-eight percent were concerned about the safety of the tests. Parents provided many comments to back up

their choices on the questionnaire. These comments will be presented with the quantitative data.

Conclusion: The process for obtaining informed consent in these studies was satisfactory. Parents' motives for participating were mostly altruistic. To improve participation and ensure the participants confidence in the study, further attention could be made toward parent understanding of safety issues.

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SUPPORT AND INFORMATION OFFERED TO ACCIDENT AND EMERGENCY DEPARTMENTS IN THE NORTHERN REGION OF ENGLAND

G. Latter

The Foundation for the Study of Infant Deaths, London, UK

In 1997 there were 416 sudden and unexpected infant deaths in England, Wales and Northern Ireland. In the Northern Region of England, covering Cumbria, Northumberland, Tyne and Wear, Durham and Teesside, a population of 3,086,500 there were 25 such deaths. The majority of these were taken to the Accident and Emergency (A&E) Department of the local hospital for certification of death.

Since 1993, as part of the Foundation for the Study of Infant Deaths (FSID) regional programme for education and support, A&E departments have been visited by regional staff.

The aims of these visits have been to:

- offer a personal local contact
- identify facilities for bereaved parents
- provide current information
- discuss support initiatives for families
- look at guidelines and support for staff.

In the Northern Region there are twenty general hospitals, one with a specialist paediatric A&E Department, and five cottage hospitals with Minor Injury Units. The presentation will look at the outcome of the visits to A&E departments in this region during the period 1993-1998. It will:

- discuss which A&E Departments have been visited and how many visits made to each,
- identify the facilities for bereaved families and changes during the period,
- highlight questions frequently raised by A&E staff,
- give details of presentations given to staff which include the FSID video 'Words Can't Describe How You Feel', and the promotion of befriender and telephone Helpline support.

As a result of this preliminary work, the

Department of Health have funded the regional staff to visit 120 A&E departments each year for the next three years.

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THE POWER OF THE HOME VISIT FOR EXTENDING THE INFLUENCE OF SMOKING INTERVENTIONS

Carol Reardon

Smokechange Trust, Christchurch, NZ

Aim: To demonstrate the ripple effect of change on family and friends from working in homes with pregnant women who smoke.

Background: Smokechange is an intensive home-visiting intervention for reducing smoking in pregnancy that is matched to a comprehensive assessment of individual readiness for change. Women are referred to Smokechange by their doctor or midwife. Although it is the pregnant woman who enrolls, family and friends are welcomed into discussions and change plans, too. Babies of teenaged, Maori, smoking women are at increased risk for SIDS. Three such women were attracted to the support of Smokechange because it was in their homes and schools.

Results: A 16 year old Maori girl called Shelly was one of a group of 20 Maori students in a pilot Smokechange programme at a local High School in June 1998. Shelly subsequently became pregnant and accepted support from the pregnancy programme. She reduced her smoking during pregnancy and became completely smokefree soon after her baby was born. There were at least four family members living with her who also smoked and many visitors, too. Contact with Shelly's family has been extended due to the pregnancies of her teenaged sister and cousin who both wanted the support of Smokechange. During the 16 months of contact 10 people have been directly influenced: the step-father became smokefree and has sustained this for over 12 months, Shelly is still smokefree after 6 months, her mother is recently smokefree, her sister and cousin are smoking less than 5 per day and seriously attempting to stop completely, the sisters' partners have reduced their smoking and all seven adults are committed to a smokefree home. Most importantly, 3 babies have had increased protection at vulnerable times - pregnancy and infancy.

Conclusion: This presentation describes one instance of the ripple of influences resulting from "taking the programme to the people". Other effects on schools and the community will also be presented.

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DEVELOPING AN EFFECTIVE PARTNERSHIP TO REDUCE THE RISK OF SIDS IN CANADA

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SIDS is the leading cause of death in Canada for infants between 28 days and one year of age. Although there has been a decrease in the number of infant deaths reported as SIDS, from 1/1500 live births in 1993 to 1/2200 live births in 1996, it remains, nevertheless, a significant public health concern in Canada. SIDS is of particular concern in the Aboriginal population where the rates of SIDS deaths are considerably higher than in the general population.

Based on research in the 1980s and early 1990s that reported a relationship between the prone sleeping position of a healthy term infants and the rate of SIDS, there was concern in Canada that this issue needed to be addressed. In 1993, Health Canada approached other groups concerned with the health of Canada's children to hold a consensus workshop to respond to the issue of SIDS. A Committee was formed which included the Canadian Paediatric Society, the Canadian Foundation for the Study of Infant Deaths, the Canadian Institute of Child Health and Health Canada. Such a collaborative approach was found to be most effective in promoting consistent messages to multidisciplinary health professionals and the general public.

As a result of the 1993 consensus workshop, which reviewed and studied the most recent research, and recommended a plan of action, Health Canada and its three partners developed a joint strategy to raise awareness of the risk factors related to SIDS. Elements of the joint strategy included a national consensus statement, targeted to health professionals that defined SIDS and recommended ways to reduce its occurrence. The information in the joint statement was then adapted into a brochure for parents, a poster and a television public service announcement. Together with its partners, Health Canada ensured that the resources were broadly disseminated to health professionals and the general public.

In the spring of 1999, Health Canada and three partners successfully launched the "Back to Sleep" campaign to reflect the latest research findings concerning SIDS.

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OUR BABY DIED FROM SUDDEN INFANT DEATH SYNDROME

Carolyn Stead

Parent and Staff Nurse Coronary Care Unit, Dewsbury and District Hospital, West Yorkshire, England.

This presentation tells of the fateful day when I found Dominic faced down in the car. "I turned him over aggressively, panicking, I gasped! I never even checked to see if he was breathing, I knew he wasn't. There are no words to describe finding your baby dead. "I began a frenzied attempt at resuscitation hoping that my skills would kick into action. They didn't. I was a mum fighting desperately to save a baby's life, not an experienced Accident and Emergency (A&E) Nurse, which I was at that time until recently. All the basic life support training I had ever had was hopeless. I did everything wrong. It's so different doing it for real on someone you love so much".

The speech describes what we found to be helpful and not so helpful nursing intervention when our baby son Dominic died in February 1996 aged 3 months as a result of Sudden Infant Death Syndrome. The main aim is to help other professionals, if faced with a similar incident, deal with it compassionately and skillfully. This is an experience which will remain in the parents' lives forever, it's important that health professionals 'get it right' in order to facilitate the grieving process rather than hinder it.

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EVALUATION OF INFORMATION CAMPAIGN AGAINST SIDS IN THE NORTHEASTERN OF POLAND

Jolanta Wasilewska

Medical Academy of Bialystok, Poland

Aim: Evaluation of the methods used to reduce risk factors of SIDS in the years 1992-1999. The first results were presented in the SIDS Congress in Graz, 1995.

Material And Methods: The SIDS prevention programme was addressed to 3 groups: I- parents (information in mass media); II- doctors (specialization programme); III- medical students (obligatory lectures, annual reports from ESPID Congresses). After 4 years, comparative questionnaire studies were conducted comprising 331 subjects: I- 123 parents + 56 women in 1 pregnancy; II- 72 family doctors; III- 80 medical students.

Results: During prevention programme we found: 1/ An increase in the number of people who received information on SIDS:

in parents group from 61.8% to 85.4%. 2/ In parents group the main source of information on SIDS was still based on mass media. 3/ 9.7% knew or heard about a SIDS affected family; 4/ Parents became less aware that prone sleep position is a risk factor of SIDS (in 1999 66.0% of parents regarded this position as safe for baby; 5/ The number of back-sleeping infants decreased from 60.4% in 1995 to 21.1% in 1999; 6/ Women in first pregnancy declared that they would put their children on back (37.5%) or side (57.1%), only 1.8% in prone position; 7/ Despite significantly increased awareness that smoking is harmful (from 52.6 to 99.9%) 23% of children are still exposed to passive smoking.

Conclusions

1. The SIDS information campaign addressed mainly to doctors and medical students contributed to the increased theoretical knowledge on SIDS in this group.

2. Practical knowledge of parents has decreased as a consequence of reduced information in mass media.

3. Pregnant women are the best respondents of SIDS information and actively search for it.

4. The study indicates that theoretical training of doctors is not sufficient. The information should be mainly addressed to parents. There is necessity to intensify the campaign in mass media again.

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RISK SCORING FOR SIDS - EPIDEMIOLOGICAL & ENVIRONMENTAL FACTORS

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Scoring systems to identify families at higher risk of sudden infant death syndrome (SIDS) have previously been attempted but lacked the sensitivity or specificity to be used as a practical tool for preventative care. However, given the decrease in SIDS rate and increase in both the proportion of socially deprived families and significance of factors within the sleeping environment, the "high risk" group itself may be worthy of epidemiological study.

Methods A three year case-control study conducted in 5 of 14 Health Regions in England (population ~ 17 million, 500,000 livebirths). Parental interviews were conducted for each infant who died and for four controls matched for age and time of

sleep. Ascertainment was over 90% [1][2]. The scoring system was developed on the SIDS dataset from the first two years and tested on the third year data (130 SIDS and 520 controls).

Results The presence of three of four epidemiological factors recognisable prenatally (maternal smoking, low socio-economic status, young maternal age and high parity) identified 42% of SIDS families compared to 8% of the control families (OR=8.3 [95%CI:6.2, 11.3]). The 8%(44) of control infants identified by this score as being at "high" risk demonstrated a higher prevalence of several adverse environmental factors compared to other control infants at "normal" or "low" risk, though the relatively small sample size limits the significance of these findings (e.g. non-supine sleeping position 40.9% vs 24.5%; OR=2.1 [95%CI:1.1, 4.2], head covering 9.1% vs 3.6%; OR=2.66 [95%CI:0.62, 8.72], recent poor health 27.3% vs 19.1%; OR=1.59 [95%CI:0.74, 3.35]).

Conclusion At least part of the increased risk of SIDS in the "high risk" group may thus be related to postnatal care practices. Studying this group may increase our understanding of adverse environmental conditions associated with SIDS

1 Fleming PJ, Blair PS, Pollard K, Platt MW, Leach C, Smith I, Berry PJ, Golding J. Pacifier use and SIDS-Results from the CESDI SUDI case-control study. *Arch Dis Child* 1999;81:112-116.

2 Leach CEA, Blair PS, Fleming PJ, Smith IJ, Ward Platt M, Berry PJ, Golding J. Epidemiology of SIDS and 'explained sudden infant deaths *Paediatrics* 1999;104:e43.

169 WEIGHT GAIN AND SIDS : POOR GROWTH AMONGST THOSE INFANTS BORN WITH A NORMAL BIRTHWEIGHT

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The results of studies that have investigated growth patterns in relation to the risk of sudden infant death syndrome (SIDS) are conflicting. The recent development of conditional reference charts [1] to assess weight gain in infants (The British 1990 growth reference), comparing current weight with that predicted from previous weight and allowing for regression towards the mean have allowed us to reassess this issue.

Methods A three year case-control study conducted in 5 of 14 Health Regions in

England (population ~ 17 million, 500,000 livebirths). Parental interviews were conducted for each infant who died and for four controls matched for age and time of sleep. Ascertainment was over 90% [2]. Prospective weight observations were obtained for 247/325 SIDS and 1110/1300 controls.

Results The mean birth weight centile for SIDS infants was significantly lower compared to the controls (42nd vs 53rd centile, $p < 0.0001$). The difference in mean centiles for the last recorded weight were even more marked (34th centile vs 58th centile, $p < 0.0001$).

The growth rate from birth to the final weight observation was significantly poorer amongst the SIDS infants (SIDS mean change in weight z-score (dzw)=-0.38[sd:1.40] vs Controls = +0.22 [sd:1.10], multivariate: $p < 0.0001$). Weight gain was poorer amongst SIDS infants with a normal birthweight (above the 16th centile : OR=1.75[95%CI: 1.48-2.07], $p < 0.0001$) than for those with lower birthweight (OR=1.09[95%CI:0.61-1.95], $p = 0.76$). There was no evidence of increased growth retardation before death and the difference in growth rate was observed as early as 6 weeks of age.

Conclusions Poor postnatal weight gain was independently associated with an increased risk of SIDS. The difference was more marked amongst SIDS infants born of normal rather than low birthweight. Monitoring weight gain may be of particular importance among those families which are identified from other criteria as being at increased risk for SIDS.

1 Cole TJ. Conditional reference charts to assess weight gain in British infants. *Arch Dis Child* 1995; 73: 8-16.

2 Fleming PJ, Blair PS, Pollard K, Platt MW, Leach C, Smith I, Berry PJ, Golding J. Pacifier use and SIDS - Results from the CESDI SUDI case-control study. *Arch Dis Child* 1999;81:112-116.

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THE CESDI SUDI CASE-CONTROL STUDY: THE THERMAL ENVIRONMENT OF INFANTS DURING SLEEP AND THE RISK OF SIDS

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Objectives. To investigate the role of heat stress in the aetiology of SIDS after the "Back to Sleep" campaign.

Design. Three-year population-based case-control study [1][2]. Parental interviews were conducted for each sudden infant death and for four controls matched for age, locality and time of sleep.

Setting. Five Health Regions (population 17 million) in England.

Subjects. 325 SIDS infants and 1300 controls.

Results. SIDS infants were more heavily wrapped than controls, both usually and for the final/reference sleep (median: 5.0 vs 4.2 tog, $p < 0.0001$). More SIDS than controls were wrapped in 10 tog or more (OR 2.54 [95% CI 1.76, 3.67]), and SIDS infants were more likely to have the heating on all night (OR 1.54 [1.07, 2.22]). More SIDS infants wore a hat (OR 3.12 [95% CI 1.39, 7.01]). Having a mother who worried about the baby getting too hot was protective (OR 0.53 [95% CI 0.36, 0.78]). The use of a duvet was a risk factor (OR 2.92 [95% CI 2.15, 3.95]) whether an adult or infant duvet was used. Being found with the covers over the head (16.2% SIDS, 2.9% controls) was associated with the use of a duvet, and commonly with the infant having moved down the cot (OR 3.51 [95% CI 2.00, 6.12]).

In a multivariate analysis, including all significant factors, being found with the head covered (OR 33.22 [95% CI 9.46, 116.69]), use of a duvet (OR 2.00 [95% CI 1.03, 3.85]), and having a mother who worried about her baby being too hot (OR 0.44 [95% CI 0.23, 0.87]) remained significant.

Conclusions. Heat stress remains a risk factor for SIDS, as does the use of a duvet. Putting babies in the "feet to foot" position, and educating mothers about avoiding heat stress may reduce the risk of SIDS.

1 Fleming PJ, Blair PS, Pollard K, Platt MW, Leach C, Smith I, Berry PJ, Golding J. Pacifier use and SIDS - Results from the CESDI SUDI case-control study. *Arch Dis Child* 1999; 81(2): 112-116.

2 Leach CEA, Blair PS, Fleming PJ, Smith IJ, Ward Platt M, Berry PJ, Golding J. Epidemiology of SIDS and explained sudden infant deaths *Pediatrics* 1999;104:e43.

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IS THERE A GENETIC COMPONENT TO THE INFLAMMATORY RESPONSES IMPLICATED IN SIDS?

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Studies of invasive bacterial diseases have shown that genetic control of inflammatory responses plays a role in severity or fatal outcome of the infection (1). There is increasing evidence that inflammatory responses have been induced in many SIDS infants, and our group has identified pyrogenic toxins of *Staphylococcus aureus*, including toxic shock syndrome toxin (TSST), in >50% of tissues from SIDS infants sent to us for analysis from Britain, France, Australia and Germany. In vitro analysis of inflammatory responses to TSST indicate a minority of individuals produced much higher levels of tumour necrosis factor (TNF) (2). We examined the hypothesis that compared with parents who have not had a 'cot death', parents of SIDS infants have: 1) higher pro-inflammatory responses in to TSST; 2) lower levels of the anti-inflammatory cytokine interleukin-10 (IL-10) involved in control of the pro-inflammatory cytokines identified in experimental models of toxic shock syndrome and in many SIDS infants, interleukin-6 (IL-6) and TNF.

Whole blood from 44 donors (29 SIDS parents and 15 control parents) was stimulated with TSST-1 (0.5 mg ml⁻¹) for 24 h. Preliminary results found a mean of 1.4 ng ml⁻¹ IL-6 (range 0.2 - 3.8 ng ml⁻¹) for SIDS parents and a mean of 1.8 ng ml⁻¹ (range 0.1 - 8.2 ng ml⁻¹) for the controls. These samples are being tested at present for TNF and IL-10.

We are recruiting additional SIDS parents and controls and in the next phase of this study will compare the inflammatory responses of Asian families in which there is a low incidence of SIDS with those of non-Asian parents.

1 Westendorp et al. *Lancet* 1997; 349 170-173.

2 Raza et al. *FEMS Immunology Medical Microbiology* 1999; 25: 145-154.

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FUTURE DIRECTIONS FOR SIDS RESEARCH

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The Foundation for the Study of Infant Deaths hosted a workshop examining future research strategies. 24 participants included basic scientists and epidemiologists, some expert in SIDS research and others new to the field. A trained facilitator organised a process in which small groups, composed of members with similar interests, exchanged members then slowly converged into a whole group discussion.

Agreed background concepts:

- All infants who die suddenly and unexpectedly should be included. A broader range of health outcomes, such as low birth weight, could be considered.
- SIDS is not a single aetiological entity.

Summary of outcomes:

The insults, what they are and when they act
Trained paediatric pathologists briefed by a full history must carry out all postmortem examinations in infants who die suddenly. Death scene examination should be included. Work in basic science must continue to examine:

- the basic processes (physiological, biochemical, nutritional etc.) that contribute to SIDS
- normal infant development and protective mechanisms.

The “at risk” groups

Continued monitoring of the population, and international comparisons, help determine those insults remaining responsible for sudden infant death, following recent changes in child care. This monitoring also helps target preventative measures.

A scoring system sufficiently simple for routine clinical practice should be developed.

Research relating to basic mechanisms must incorporate known at risk groups and protective factors; eg, stratification for socioeconomic status is essential.

Prevention

More information is needed on how to promote changes in knowledge, attitudes and behaviour in the vulnerable group. Different forms of intervention should be explored. This exploration could take the form of discussion and information sharing with other groups interested in health promotion.

Properly designed intervention studies are required. Interventions must be generalisable

to regular practice rather than only applicable in research settings.

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HONG KONG CASE-CONTROL STUDY OF UNEXPECTED INFANT DEATH: LEGAL, ETHICAL AND PRACTICAL ISSUES

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A 1987 Hong Kong study documented a SIDS incidence of 0.3/1000 but official statistics classified only 6 of these 21 deaths as SIDS. This case-control study will document over a 2 year period all unexpected deaths in children under two years of age. Hong Kong's Personal Data Privacy Ordinance prevented ideal controls being identified from the Births Registration Office. Instead 160 controls (4 for each of the anticipated 20 deaths per year) are being selected from individual maternity hospitals (in proportion to number of births). Dates of interview (nominated dates) were randomly selected for all 730 days of the study. Age and nominated time were randomly selected according to anticipated distribution (based on New Zealand and Hong Kong data) and date of birth calculated. Hospital Administrators of 10 government hospitals (70% of births) and 10 private hospitals (30% of births) that provide maternity services were contacted, some of whom had concerns about the Ordinance and additional workload. One government hospital refused to participate and another intended to charge for anticipated extra workload. Although ethical approval had been obtained from both the Clinical Research Ethical Committee and the Survey Ethics Committee of the Chinese University of Hong Kong, a number of hospitals required their own approval. Private hospitals had initial concerns about practical implications of contacting numerous individual doctors. Selected control families are approached shortly after birth by the research nurse and, once written consent is obtained, arrangement for interview on the nominated date is made.

All unexpected deaths are legally required to undergo a post-mortem examination at one of three public mortuaries. Workload concerns required that a designated pathologist from the study group undertake these examinations to enable the International Standardized Autopsy protocol to be completed. Mortuary staff arrange contact between the family and research nurse which is made 7-21 days after the death.

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DEATH-SCENE INVESTIGATION IN THE GERMAN CASE-CONTROL STUDY ON SIDS

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In the ongoing German case-control study on SIDS, a two-year substudy of death-scene investigation has been running since 1 April 1999. Infants who died suddenly and unexpectedly between the 8th and 365th day of life are eligible for this study, which includes an autopsy (with full virology and toxicology) and a parent interview. In the 5 substudy areas, an additional death-scene investigation is carried out for each case by a doctor of legal medicine within a few hours after death.

Following a standardised protocol, the following observations and measurements are taken: temperatures of the room, the heating device, the body, and outdoors; dimensions of the room and the cot; type, dimensions and weight of the bedclothes; type, dimensions and softness of the mattress; type of the infant's clothing; pacifiers or other objects found in the cot. For each index case, three living controls are enrolled, matched to cases by gender, age, region, and season. Each control infant's wake-up scene gets observed and documented identically. Additional information, including socioeconomic status and other confounders, is available from parent interviews. The main question of this substudy is whether indications of hypoxia, rebreathing or hyperthermia as the mechanisms of death can be revealed by comparing 'objective' scene data from cases and controls. Additional explorative analyses

will be performed in order to generate new hypotheses, which may be tested in future confirmatory studies. Total sample size is 100 cases and 300 controls within two years; interim results of the first study year will be communicated.

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A WAY OF SIDS INVESTIGATION IN FORENSIC PRACTICE

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The objective of the study was to identify the classical pathomorphological changes for sudden infant death syndrome. For five years (1994-1998) data were collected retrospectively from the autopsy and histology reports of the Institute of Forensic Medicine, Budapest. Infant death cases constitute a small part of forensic autopsies. All together there were 78 cases (28 SIDS and 50 non-SIDS) between 1 week and 1 year of age among the autopsy reports. The proportion of infants died suddenly and unexpectedly or of any violent cause of death was 0.6 % of the total number of autopsy cases. In non-SIDS group there were 4 violent death cases. In the SIDS group there were 13 male and 15 female, and in the non-SIDS group 31 male and 19 female cases. Data from the scene investigation, signs of injuries, signs of inflammation macroscopic and histological changes of internal organs were examined. Age groups and seasonal variation were not associated with different cause of death. Petechial haemorrhages on the surface of thymus showed higher number in SIDS group than in non-SIDS group: adjusted odds ratio (OR) = 5.26: (95% confidence interval (CI) = 1.67, 17.03). No significant differences were found for pathomorphological changes of the other internal organs. However, the number of investigated cases seems to be relatively low.

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THE BMBF SIDS STUDY IN GERMANY: PRELIMINARY RESULTS FROM A NATION WIDE STUDY

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Introduction: Since October 1998 a multicenter case-control study of Sudden

Infant Death Syndrome (SIDS) is underway in Germany. The study cooperates with the 14 forensic medicine centers in Germany, sponsored by the Ministry for Education and Science and is coordinated by the Institute for Forensic Medicine in Muenster.

Methods: The study uses a classical matched case control approach (3 controls matched for age and gender). In a preliminary analyses of 77 cases and 203 controls we explored the relationship between SIDS and prone sleeping, smoking, breastfeeding, co-sleeping, extra heating; and young age and a low educational level of the mother using univariate analyses. The data are presented with odd ratios and 95% confidence intervals.

Results: 59.7% of the SIDS cases are male infants, 46.8% died within the first 4 months of life. 52.7% of the SIDS children were found in a prone sleeping position, but only 7.5% of the controls woke up prone (Odds: 13.82, CI: 6.54 – 29.54). Smoking of the mother during pregnancy (OR: 9.56 CI: 4.86 – 18.92) and breastfeeding for less than 7 weeks (OR: 6.15 CI: 3.35 – 11.34) were found to be strong risk factors for SIDS. While co-sleeping in the bed of the mother was not a risk in our data (odds: 1.29, not sign.), but extra warming of the baby was corresponding with an odds ratio of 2.25 (CI: 1.13 – 4.48). In 17.6% of the cases the mother was 21 years or younger, but in the randomly selected control group we found only 1.58% of the mothers in this age group (Odds ratio: 13.28, CI: 3.38 – 60.89). Low maternal education, defined as less than 12 years of formal education, is a clear risk in our study (OR: 8.91, CI: 4.23 – 18.97).

Discussion: These preliminary data suggest that prone sleeping position and young age of the mother are the highest predictor of Sudden Infant Death Syndrome in our study, followed by smoking and low education. Co-sleeping in the bed with the mother is not likely to be a risk factor in our data set.

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SIDS INFANTS – HOW HEALTHY AND HOW NORMAL? A CLINICAL COMPARISON WITH EXPLAINED SUDDEN UNEXPECTED DEATHS IN INFANCY

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Clinical features characteristic of sudden infant death syndrome (SIDS) suggest infant vulnerability at birth, after discharge from hospital, during life and shortly before death. The relative significance of these features amongst SIDS infants and between SIDS and explained sudden infant deaths has been investigated.

Methods. A three year case-control study conducted in 5 of 14 Health Regions in England (population ~ 17 million, 500,000 livebirths). Parental interviews were conducted for each infant who died and for four controls matched for age and time of sleep. Ascertainment was over 90% [1]. This analysis includes 325 SIDS, 72 explained SUDI and 1588 matched controls.

Results In the multivariate analysis four clinical features were associated with SIDS identifiable at birth: < 37 weeks gestation (20% vs 5% controls, OR=4.93[2.16-11.24]), <10th birth centile (16% vs 8% controls, OR=2.44[1.13-5.26]), multiple births (5% vs 1% controls, OR=7.81[1.35-45.28]) and major congenital anomalies (5% vs 2% controls, OR=4.54[1.32-15.56]) whilst explained SUDI deaths were characterised by one: neonatal problems (38% vs 26% controls, OR=4.64[1.34-16.03]).

Of those postnatal clinical features after discharge, the most significant was a history of apparent life-threatening events for both index groups (SIDS: 12% vs 3% controls, OR=2.55[1.02-6.41], explained SUDI: 15% vs 4% controls, OR=16.81[2.52-112.30]).

A retrospective scoring system based on the "Cambridge Baby Check" [2] was used to identify infant illness in the last 24 hours. This marker of illness was associated with the highest risk for both index groups (SIDS: 22% vs 8% controls, OR=4.17[1.88-9.24], explained SUDI: 49% vs 8% controls, OR=31.20[6.93-140.5])

Conclusions The clinical characteristics of SIDS and explained SUDI are similar. 'Baby Check' particularly in high risk infants, may identify seriously ill babies at risk of sudden death.

1 Fleming PJ, Blair PS, Pollard K, Platt KW, Leach C, Smith I, Berry PJ, Golding J. Pacifier use and SIDS - Results from the CESDI SUDI case-control study. *Arch Dis Child* 1999; 81:112-116.

2 Morley CJ, Thornton AJ, Cole TJ, Hewson PH, Fowler MA. Baby Check: a scoring system to grade the severity of acute systemic illness in babies under 6 months. *Arch Dis Child* 1991; 66: 100-6.

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**PREVALENCE OF SMOKING AMONG
CREE REPRODUCTIVE AGE WOMEN**

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Objective: To determine the rate(s) of smoking among reproductive age Cree females after smoking cessation campaigns. Setting: A Cree reservation in Alberta, located north of Edmonton.

Methodology: Cree women from 16 to 39 years of age, with infants under 12 months of age, were interviewed in their homes to determine: a) whether they currently smoked b) if they smoked, how many cigarettes a day did they smoke c) where there other smokes in the home, and how many cigarettes did they smoke per day d) whether smoking was inside the home (and where), if outside the home where; e) did the women smoke during pregnancy f) did they stop smoking during pregnancy, if yes, when? g) if no, how many cigarettes did they smoke during pregnancy and h) did they smoke during the time frame of breast-feeding? Women were asked if they were aware of the smoking cessation campaigns? And if so, why they continued to smoke?

Results: A total of 70 homes were visited in the Cree community with 47 smoking mothers and 22 non-smoking homes. No age difference was found between non-smoking and smoking mothers (N=48, DF=1 $X^2=0.196$ n.s.). However, higher number of older mothers smoked than younger mothers and smoke in the house. Infants were exposed to cigarette smoke when mothers continued to smoke in conjunction with "others" who smoked in the house. In 37 homes, both mother and others were smokers. The median number of cigarettes smoked in the households where the mothers only smoked was 5. However, if other members smoked the median number of cigarettes in the household was 20.

Conclusions: Cree women continue to smoke at a rate that may compound the risk of SIDS in their community.

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TOXIC GAS HYPOTHESIS REJECTED

Lady Sylvia Limerick

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There is no evidence that compounds containing antimony and phosphorus, used as fire retardants or plasticisers in PVC and other cot mattress materials, are a cause of sudden infant death syndrome (SIDS) or pose a danger to infants. An Independent Expert Group, appointed by England's CMO, reached this unanimous conclusion in 1998 after thorough investigation of the hypothesis first publicised in 1989 by Barry Richardson, a consultant on biodeterioration of materials in England. He suggested the primary cause of SIDS was poisoning by gaseous phosphine, arsine and stibine generated by the fungus, *Scopulariopsis brevicaulis*, from chemical compounds added to PVC mattresses. The Expert Group based their conclusion on the following:-

1. Cot mattress contamination with the fungus *S. brevicaulis* is rare and no more common in the SIDS infants' mattresses than in other used mattresses;
2. There is no evidence for the generation of any toxic gases by the fungus from cot mattress PVC samples when tested under conditions relevant to an infant's cot. The Group identified laboratory conditions, wholly unlike those that could occur in an infant's cot, in which antimony compounds can be biovolatilised but to the much less toxic trimethylantimony and not to stibine.
3. There is no evidence of poisoning by phosphine, arsine or stibine or their methylated derivatives in infants who have died as SIDS.
4. Low amounts of antimony are detected in samples from the majority of infants including newborns and foetal tissue, placenta and cord blood indicating pre-natal acquisition. The concentrations in SIDS infants are no different from those in infants dying from known causes and are within the normal range;
5. There is no evidence that the changing Sudden Infant Death rates correspond to the introduction and removal of antimony- and phosphorus- containing fire retardants in cot mattresses.

*Expert Group to Investigate Cot Death Theories:
Toxic Gas Hypothesis. Chairman Lady Limerick.
Final Report, 1998

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ABORIGINAL MOTHERS: CHILD CARE KNOWLEDGE AND FACTORS

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Aboriginal people in Alberta have a SIDS rate about nine times the rate of the rest of the community. The study aimed to determine childcare knowledge in the aboriginal community in Morley, Alberta, and also to determine how these mothers would like to find out about childcare knowledge.

This was a sample of twenty-five mothers, all with children under one year old, who completed an anonymous culturally sensitive questionnaire. The questionnaire dealt with type and number of SIDS risk factors, the type of childcare practices used, level of anxiety about SIDS, preferred and actual methods of childcare knowledge dissemination.

Mothers were aged from 17 to 37 years 20% had a high school diploma and 28% were employed outside the home. In 96% there was at least one modifiable SIDS risk factor in their childcare practice. Eighty-eight percent had heard of SIDS but only 28% could name a SIDS risk factor. Those factors known included prone sleeping (12%), not breastfeeding (4%), smoking (4%), co-sleeping (4%). Those mothers who did not know SIDS risk factors were more likely to use childcare practice, which increased the risk of SIDS. We noted that passive smoking occurred in 68%, not breastfeeding in 64%, infant co-sleeping in 44% prone sleeping in 12%.

As far as childcare information is concerned, the sources of information were family, literature and health care workers. Ninety-six percent of the mothers surveyed requested further parenting and SIDS information.

Childcare providers in this particular community have a high percentage of modifiable childcare practices known to increase SIDS risk, and very little knowledge. They do wish further information, would like this from healthcare workers and their family.

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SUDDEN INFANT DEATH SYNDROME IN INDIGENOUS AND NON INDIGENOUS INFANTS IN NORTH QUEENSLAND: 1990-1998

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Background: Sudden Infant Death Syndrome (SIDS) is the most common cause of postneonatal death in Queensland (0.98 per 1000 live births, 1994-1996). SIDS rates have fallen dramatically in non-indigenous populations. Indigenous SIDS rates in North Queensland are unknown, but in other states remain 3-5 times higher than non-indigenous rates.

Aims: To ascertain SIDS rates in indigenous and non-indigenous infants in North Queensland between 1990-1998. To assess the quality of data recorded for SIDS deaths. Methods: Records were obtained for possible SIDS cases from all coroners courts in North Queensland from 1990 to 1998. Data was recorded for demographic factors, ethnicity, age at death, sleeping and feeding factors, smoking and post mortem findings. Incidence, medians and univariate association (2) between indigenous and non-indigenous groups were performed where appropriate.

Results: There were 83 248 live births for this period; 71 389 non-indigenous and 11 859 indigenous. There were 67 SIDS deaths, 0.80 per 1000 live births. Overall recording of demographic and death scene data was poor. There were 21 (31%) non-indigenous, 22 (33%) indigenous deaths (24 unknown), relative risk 6.3(CI 4.7,8.4). Median age at death was 12.0 weeks for non-indigenous and 16.0 for indigenous babies; 14.3% occurring in the neonatal period for both groups. Prone position was reported in 69%, shared bed in 48% of cases with reported data. 44% cases occurred in the wet, 55% in the dry season. There were no differences in gender, season, sleeping position between the two groups. Indigenous babies (72%) were significantly more likely to have been bed sharing than non-indigenous (39%), $p < 0.05$.

Conclusion: Data recorded for SIDS deaths in North Queensland is poor. SIDS rates may be up to 6.3 times higher in the indigenous population. A uniform system of post mortem and death scene data reporting is urgently needed in North Queensland.

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VOLUMETRIC ANALYSIS OF PLACENTAL TISSUE FROM INFANTS SUCCUMBING TO SUDDEN INFANT DEATH SYNDROME (SIDS) AND INTRA UTERINE GROWTH RETARDED (IUGR) INFANTS.

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The placenta is the major organ for gas exchange and nutrient delivery to the developing fetus and as such any placental insufficiency (in either gas exchange or nutrient delivery) may result in developmental delays/arrest, manifesting as deficiencies in the number of functioning units in specific organs. The aim of this study was to determine whether placentae from term delivered infants who later succumb to SIDS and those infants born IUGR develop differently from those of normal infants.

Control placentae (n=16), placentae from infants later succumbing to SIDS (NBW n=10, LBW n=4) and term delivered IUGR placentas (n=7) were selected from an archived tissue bank. Each placenta was weighed and the volume estimated using a fluid displacement technique. Approximately 10 full depth blocks of tissue (taken from the fetal to maternal side) were obtained from each placenta using a uniform random sampling technique. Each tissue block was cut in half longitudinally, embedded in wax and 5µm sections cut and stained with H&E. Using a simple point but unbiaised counting technique, the number of points present within the villi and maternal inter villous space were counted.

Mean fixed placental weight for control cases was 485g (CV=6%), for SIDS NBW cases 507g (CV=5%), SIDS LBW cases 405g (CV=3%) and for IUGR cases 440g (CV=3%). There was statistically significant difference in mean placental weight between control and IUGR cases (p=0.023) and between control and SIDS LBW cases (p=0.038). Mean volume estimated by fluid displacement for control cases was 452cm³ (CV=7%), for SIDS NBW cases 489cm³ (CV=5%) cm³ SIDS LBW 422 cm³ (CV=2%) and for IUGR cases 415cm³ (CV=3%). For all study groups, approximately 80% of the total fixed placental volume was made up of villous tissue and the remaining 20% being maternal intervillous space volume. Although no differences were observed in

total volume of the villous tissue and total volume of maternal intervillous space, detailed quantitative analysis of the placenta with increased numbers within each study group and additional quantitative parameters may reveal subtle changes that can not be detected by gross volumetric analysis.

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STEREOLOGICAL ESTIMATION OF TOTAL VILLOUS SURFACE AREA IN PLACENTAS FROM SUDDEN INFANT DEATH SYNDROME (SIDS) CASES AND INTRA UTERINE GROWTH RETARDED (IUGR) CASES.

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Transfer of nutrients and gas exchange across the maternal/fetal interface is governed to a degree, by the amount of villous tissue surface area available. The aim of this study was to determine the total amount of villous surface area available in placentae collected consecutively from SIDS infants and infant born IUGR.

Control placentae (n=6), placentae from NBW infants later succumbing to SIDS (n=6), LBW SIDS infants (n=4) and IUGR placentae (n=4) were selected from an archived tissue bank. Each placenta was weighed and the volume estimated using a fluid displacement technique. Approximately 10 full depth blocks of tissue (taken from the fetal to maternal side) were obtained from each placenta using a uniform random sampling technique. Each block was then cut in half longitudinally, embedded in wax and 5µm sections cut and stained with H&E. Using design based stereological techniques, principally the surface estimator technique, total villous surface area was estimated for each placenta.

Mean placental volume for control cases was 452cm³ (CV=7%), mean surface density was 0.0191µm²/µm³ (CV= 8%) producing a total mean villous surface area of 8.61m² (CV=11%). Mean placental volume for SIDS NBW cases was 489cm³ (CV=5%), mean surface density was 0.0187 µm²/µm³ (CV= 7%) producing a total mean villous surface area of 8.65m² (CV=11%). Mean placental volume for SIDS LBW cases was 422cm³ (CV=2%) mean surface density was 0.0203µm²/µm³ (CV= 10%) producing a total mean villous surface area of 8.51m²

(CV=11%). Mean placental volume for IUGR cases was 415cm³ (CV=3%), mean surface density was 0.0156μm²/μm³ (CV= 18%) producing a total mean villous surface area of 6.30m² (CV=6%). No statistically significant difference was observed for any parameter estimated, between any study groups.

Based on the limited number of cases analysed so far, no differences exist with regards to the total amount of surface area available for nutrient and gas exchange across the maternal fetal interface. Although the IUGR cases show a reduced value for total surface area this failed to reach statistical significance. However, whether there exist proportional differences between surface areas for the villous components, has yet to be determined.

184 PLACENTAL VILLI AND INTERVILLOUS SPACE DEVELOPMENT IN SUDDEN INFANT DEATH SYNDROME (SIDS) AND INTRA UTERINE GROWTH RETARDED (IUGR) CASES.

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Geometry of the villi and maternal and fetal vascular beds plays a major role in both placental transport and haemodynamics. The aim of this study was to examine placentas from both SIDS and IUGR infants in order to better understand the physical and possible functional consequences of changes in the dimensions of villi and maternal intervillous space (IVS). The star volume can be used to investigate the changing geometric relationship between villous arborisation and IVS.

Control placentas (n=6), placentas from infants NBW later succumbing to SIDS (n=6), LBW infants dying of SIDS (n=4) and IUGR placentas (n=4) were selected from an archived tissue bank. Each placenta was weighed and the volume estimated using fluid displacement technique. Approximately 10 full depth blocks of tissue (taken from the fetal to maternal side) were obtained from each placenta using a uniform random sampling technique. Each block was then cut in half longitudinally and embedded in wax and 5μm sections cut, stained with H&E. Using design based stereological techniques, principally the star volume, both

IVS volume and villous volume were estimated.

The mean star volume for maternal IVS for control cases was 2.09x106μm³ (CV=16%) for SIDS NBW 5.77x106μm³ (CV=15%), SIDS LBW 2.48x106μm³ (CV=27%) and for IUGR cases 2.46x106μm³ (CV=19%). Mean star volume for villous tissue for control cases was 4.02 x106μm³ (CV=9%) for SIDS NBW cases 2.75 x106μm³ (CV=14%), SIDS NLW cases 1.64 x106μm³ (CV=6%) and for IUGR cases 3.67 x106μm³ (CV=16%).

Although SIDS LBW group showed reduced values for both maternal IVS and villous arborisation volumes, they failed to reach statistical significance. Star volume is a "noisy" estimate of villous domains volume and IVS pore volume, this was reflected in the large variation in values within each group. Before firm conclusions can be drawn the total number of cases within each group will be increased.

185 GENETIC, DEVELOPMENTAL AND ENVIRONMENTAL FACTORS CONTRIBUTING TO SUSCEPTIBILITY TO SIDS: THE NEED FOR MULTIETHNIC STUDIES

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Risk factors for SIDS parallel those for respiratory tract infections. Many ethnic groups in which there is a high incidence of SIDS also have high levels of serious respiratory tract infections among their infants; e.g., Native Americans and Aboriginal peoples of Australia. Infants in these groups are colonised earlier and more densely with potential respiratory pathogens, and their immune responses to some bacterial antigens differ significantly from those of European-derived populations in the same area.

There is no animal model that reflects genetic developmental and environmental factors associated with susceptibility to SIDS; consequently we have combined epidemiological and experimental studies to assess both risk factors for SIDS and factors that reduce the risk. Human secretions, milk, cells and cell lines have been used to determine how risk factors could affect: 1) colonisation by potentially pathogenic bacteria; 2) production of pyrogenic toxins; 3) induction and control of inflammatory responses to the bacterial toxins identified in over 50% of SIDS infants. New evidence

suggests that there are genetic factors involved in induction and/or control of inflammatory responses to some bacterial antigens implicated in SIDS.

There is an urgent need for multidisciplinary studies among different ethnic groups to compare the following for those with a high incidence of SIDS with those in which the incidence is low: 1) epidemiological investigations similar to those in Britain on the role of risk factors in relation to colonisation by potentially pathogenic bacteria; 2) studies of inflammatory responses to toxins implicated in SIDS and components of cigarette smoke using blood samples from SIDS and non-SIDS families from different ethnic groups; 3) comparison of levels of anti-toxin antibodies at birth a) to identify the effect of maternal smoking on infants' passive immunity and b) to identify infants that lack protection against the toxins implicated in SIDS.

186 WHY IS THE PRONE SLEEPING POSITION A SIGNIFICANT RISK FACTOR FOR SIDS?

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The major campaigns to discourage the prone sleeping position resulted in dramatic decreases in the incidence of SIDS worldwide. As yet, there is no clear explanation as to why the prone position should increase the risk of these deaths. We found over half of SIDS infants had pyrogenic toxins of *Staphylococcus aureus* in tissues or body fluids. These toxins are not post mortem artifacts because refrigeration of the body prior to autopsy would prevent their induction which requires a minimum temperature of 37°C. The temperature of the upper respiratory tract of young healthy children in an upright position is about 34-35°C. In the prone position, however, the temperature rises to 36°C and in 5/30 (16.7%) of young children examined, the temperature reached 37°C or higher [Molony et al., 1999].

Other studies indicate that density of bacterial colonisation in the nose is greater in the prone position, probably due to the effect of gravity draining mucosal secretions into the nasal passages rather than down the oesophagus as in the supine position. Older

infants (12-18 months) who had minor respiratory infections and who slept in the prone position had significantly higher numbers of bacteria and more species in their secretions than infants who slept supine. The composition of the bacterial flora of the infants who slept supine was similar to that observed in SIDS infants [Harrison et al., 1999].

We suggest that the prone position contributes to the risk of SIDS 1) by enhancing density of colonisation by *S. aureus* and other potentially toxigenic bacteria and 2) by raising the temperature of the upper respiratory tract to the range in which the pyrogenic toxins of these bacteria can be induced.

Harrison et al. FEMS Immunology Medical Microbiology 1999; 25: 29-35

Molony et al. FEMS Immunology Medical Microbiology 1999; 25: 109-113.

187 ACUTE GRIEF SUPPORT IN SUDDEN UNEXPECTED DEATHS IN INFANCY (SUDI)

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In my experience as a paediatric pathologist the communication of the cause of death (COD) to parents of a SUDI victim is the cornerstone of grief resolution; however, establishing the COD usually requires two to three weeks. Therefore, there is a need to support the family prior to a specific diagnosis. Sudden unexpected death in infancy (SUDI) is defined as the sudden and unexpected death of an infant who has no apparent life threatening illness. The death can be due to natural or unnatural cause. Natural death is the consequence of a medical disease/disorder, e.g. bacterial meningitis, whereas unnatural death is not, e.g. unintentional injury.

The pathologist establishes the cause and manner of death by a thorough postmortem examination that includes information from the scene of death, medical history, autopsy and selected studies, e.g. x-rays, toxicology. The preliminary diagnosis is usually available within 48 hours; however, the final diagnosis requires completion of the microscopic examination and results from elective tests, e.g. cultures. The final diagnosis is usually available in three to four weeks.

In our community infants that are SUDI

victims are usually pronounced dead in the Children's Hospital emergency room. Grief counselors from the Infant Death Centre are available to support the family. In addition, they explain the role of the coroner/medical examiner in establishing the cause of death. The coroner/medical examiner is encouraged to contact the family with preliminary results from the autopsy. This allows communication of the approximate time in which the final diagnosis can be expected.

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CRIB DEATH, COT DEATH & SIDS. A TRILOGY

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Sudden and unexpected death in infancy (SUDI) has been referred to as crib death in the United States and cot death in other parts of the world. The diagnostic term sudden infant syndrome (SIDS) was adopted at the second international conference on cause of sudden death in infants (1). SIDS was defined as 'the sudden death of any infant or young child, which is unexpected by history, and in which a thorough postmortem examination fails to demonstrate an adequate cause of death'. Variation in the diagnosis of SIDS cases is expected since the definition lists adequate cause and thorough autopsy examination. A realistic expectation is that this variation can be kept to a minimum and therefore not significantly affect epidemiology studies.

Concerns were raised by coroners/medical examiners that cases of unnatural death can masquerade as SIDS. They insisted upon listing the death scene investigation as a critical part of the criteria for SIDS. In response to these concerns an updated definition was established by the National Institute by Child Health and Human Development in 1989. The definition stated: 'The sudden death of an infant under one year of age which remained unexplained after a thorough case investigation, including the performance of a complete autopsy, examination of the death scene and a review of the clinical history'.

Diagnostic guidelines for pathologists involved in the diagnosis of sudden unexpected infant deaths have been published in a histopathology atlas. This monograph illustrates a thorough postmortem examination in an infant,

histopathology lesion (s) sufficient to cause death and death scene investigation (2).

189
RESULTS OF THOROUGH INVESTIGATIONS IN 81 CONSECUTIVE SUDDEN AND UNEXPECTED DEATHS IN INFANTS AND CHILDREN.

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Between November 1994 and August 1999, 81 consecutive sudden and unexpected deaths in infants and children were thoroughly investigated with the same multidisciplinary postmortem protocol including extensive microbiology studies. The cases were then classified according to Taylor and Emery (1) as: **a**=explainable death, **b**=partially explainable death, **c**=minor pathology, **d**=nothing, **e**=accident, and **f**=child abuse.

Results: 8 neonates (< 28 days; n=8) 8 **a**: 4 materno-fetal infections (2 group B *Streptococcus*, 1 *E.coli*, and 1 *Enterobacter cloacae*), 2 metabolic diseases, 1 cardiac malformation, and 1 accidental hyperthermia.

Children (> 1year-old; n=8) 8 **a**: 3 gastroenteritis, 3 bacterial infections, 1 hypertrophic cardiomyopathy and 1 previously known Thomsen myotonia.

Infants (28 to 365 days old; n=65): **50 a, 5 b, 1 c, 1 d, 4 e, and 2 f**; 2 infants had lesions due to their intensive care stay prior to death. The 50 **a** diagnoses were:

- 13 bacterial infections (including 3 urinary infections, 2 septicaemias and 1 meningitis),
- 15 viral infections (including 2 gastroenteritis, 1 myocarditis, 1 encephalitis, 1 cardioneuropathy),
- 13 both bacterial and viral infections (including 2 gastroenteritis and 1 septicaemia)
- 9 miscellaneous (3 previously known paediatric diseases, 2 isolated gastric content aspirations, 2 right ventricular cardiomyopathies, and 2 cardioneuropathies).

The most frequently identified pathogens were *E.coli* (n=12) and enterovirus (n=11). Some infants were found to have associated diseases with their infections including 1

cystic pancreatitis, 1 cardiac rhabdomyomas, and 1 muscular disease. Thus in this series of 65 post neonatal deaths, only 2 (3%) were diagnosed as unexplained deaths (SIDS) (1 **c** and 1 **d**). Among the fatal mechanisms were: gastric content aspiration, pulmonary oedema, cardiac arrhythmia, infectious shock, hyperthermia, dehydration, sleeping position and bedding (61% were found prone).

1 Taylor and J Emery. Trends in unexpected infant deaths in Sheffield. *Lancet* 1988:1121-1123.

190 PATHOGENESIS OF ALTE IN INFANTS WITH NASAL OBSTRUCTION

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Aim: Infants with nasal obstruction may present with signs both of inspiratory and expiratory airway obstruction. Vacuum-glossoptosis plays a very important role in the pathogenesis of inspiratory obstruction. Approximation of the soft palate and the tongue on expiration has been hypothesized as the cause of the expiratory block. Aim of this study was to further investigate the pathogenesis of respiratory problems in infants with nasal obstruction.

Patients and methods: Oesophageal pressure and airflow changes in three infants with bilateral choanal atresia and one infant with simple rhinitis were measured. The respiratory pattern was studied in the supine position with and without an oropharyngeal airway. An attempt was made to correlate the respiratory patterns with the clinical manifestations.

Results: When the oropharyngeal airway was withdrawn, all infants presented a sharp reduction in, or an absence of inspiratory flow despite markedly increased inspiratory efforts. Clinically, the tongue was sucked up and backwards to the hard palate sometimes producing a seal which prevented air entry. The expiratory pattern was characterized by an increase in the expiratory time, interruption of the expiratory flow despite the positive oesophageal pressure and a retarded expiratory flow. Clinically, expiration was associated with grunting which was loudest over the neck and mimicking a bronchospasm over the chest.

Conclusion: In infants with nasal obstruction, the expiratory airway obstruction is, at least in part, due to an

active braking of the expiratory flow brought about to defend lower airway patency. These findings support the concept that upper airway instability, obstructive apnoea, lower airway instability, absorption collapse, massive intrapulmonary shunt and ALTE are the result of a cascade reaction.

191 ALTE IN INFANTS WITH NASAL OBSTRUCTION

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Aim: In infancy, not only bilateral choanal atresia or stenosis (BCA/S), but also unilateral choanal atresia or stenosis (UCA/S), or even a simple rhinitis may be related to ALTE. To support this concept we studied the relationship between ALTE and degree of nasal blockage in a large series of infants with various types of nasal obstruction.

Patients and methods: We reviewed the records of 84 infants admitted to our surgical unit between 1970 and 1998 with suspected nasal obstruction. The final diagnosis was BCA/S in 41 patients, UCA/S in 25 and rhinitis in 18. ALTE was defined as a cyanotic episode of sufficient severity to prompt vigorous stimulation.

Results: The main findings in 38 infants with one or more ALTEs in comparison with 46 infants without ALTE are shown in the table:

Conclusion: In infants with nasal obstruction, ALTE is related to the severity of the associated respiratory control disorder more than to the degree of nasal obstruction. The respiratory control disorder is a manifestation of a more general abnormality in the autonomic nervous system. Not only removal of the anatomic obstacle but also, in selected infants, glossopexy may be required to avoid severe complications.

**192
PARENT REPORTED SLEEP
DISORDERED BREATHING AND
BEHAVIOURAL FEATURES IN
2-4 -MONTH-OLD INFANTS**

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The study aimed to evaluate possible association between sleep disordered breathing (SDB) and behavioural features in 2-4-month-old infants using Early Infancy Temperament Questionnaire (EITQ) as a tool. It covered the period from 1997 to 1998 and comprised 200 randomly selected clinically healthy infants aged 2-4 months who were singletons and born in St. Petersburg within the period in consideration. The mothers were asked to complete the questionnaires addressing infant, maternal, and demographic major characteristics, some infant care practices as well as infant's habitual breathing symptoms in sleep. As a part of interview, the mothers filled in the EITQ consisting of 76 items which describe different aspects of infant behaviour. Groups of questions were added according to scoring sheet to produce total scores to describe nine different aspects of infant temperament: activity, rhythmicity, approach, adaptability, intensity, mood, persistence, distractibility and threshold. In 129 cases (64.5%), mothers failed to report SDB in their infants. Mothers of 10 infants (5.0%) described their babies as habitual snorers; 48 babies (24.0%) were characterised as having other than snoring noisy breathing in sleep, and 13 (6.5%) habitually had both snoring and noisy breathing. Breathing pauses were noticed in only one infant with snoring and noisy breathing in sleep. Infants with SDB were rated as having more negative mood compared with asymptomatic ones, and most negative mood was the feature of those infants who had both snoring and noisy breathing in sleep. These associations remained after adjustment has been made for major potential confounders. Minor breathing disturbances in sleep, rather common in the young infants, may be associated with specific behavioural deviations, and infants presented with negative mood should be considered cautiously for possible obscure respiratory troubles.

**193
IS YOUR MONITOR REALLY
NECESSARY?**

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Home cardiorespirator monitors (HCRM) were suggested as a way to prevent SIDS in the 1970's. Despite a lack of evidence of benefit, they continue to be prescribed and use the latest technology. The major groups are: SIDS siblings; infants with Apparent Life Threatening Events (ALTE); preterm infants (all or specific subgroups).

We report trends in HCRM at the Alberta Children's Hospital (ACH), the referral centre for 1.2 million, approximately 22,000 deliveries per year. All HCRM in this area are supplied at ACH since 1982. No vendor shave supplied HCRM directly to patients. All infants requiring assessment for apnea are referred to ACH as are all infants on home oxygen.

Monitor use is shown:

There has been a steady fall in numbers and duration of HCRM prescribed. The trend was reversed, possibly related to recruitment of new staff. SIDS rates have fallen from 1.98/1000 live births in 1982 to 0.89 in 1995.

This fall in HCRM has occurred because of: continued physician education and critical review of literature; close contact and support of patient groups; demedicalizing of the NICU graduate and encouraging those parents to focus on the child's development and social needs; a centralized program involving a small number of personnel. Conflict has been avoided by working with parents and physicians and accepting occasional use of HCRM for parental or physician anxiety.

Rational limited use of HCRM is possible without major conflict with a consistent supportive approach.

Years	SIDS siblings	ALTE	Premature infants	Total
1982-85	82	70	67	219
1986-89	49	26	38	113
1990-93	27	15	5	47
1994-99	20	43	1	64

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RESEARCH ON PREVENTION OF SUDDEN INFANT DEATH AND METHODS FOR SELECTION OF HIGH RISK GROUPS

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Monitoring is considered to be essential for prevention of sudden infant death syndrome (SIDS). Currently there is no established methodology for the selection of a high risk group to be targeted for monitoring. In this study, we attempted to deploy an easy method for identifying target groups for monitoring. We investigated whether the effect of pre- and postnatal factors and bacterial colonisation in throat increase the risk for SIDS. Our aim was to select SIDS high risk groups by making use of the results of a door-to-door survey conducted in Hungary from 1996 to 1998. The number of risk factors of a single infant was calculated. A comparison was made between a normal infant group and SIDS group, in contrast to the low risk factor group (having 0-3 risk factors) and the high risk factor group (having 7-10 risk factors). In the normal infant group the low risk factor group included 66.21 % of the infants. The high risk factor group accounted for 5.4 % of these infants. The rate of risk factors from bacteriological investigation was 17% among healthy infants. In the SIDS group the low risk factor group accounted for 11.1 % of infants. The high risk factor group accounted for 22.2%. As a result a tendency was indicated that multiple risk factors are found for the development of SIDS group. The possibility might be suggested that identification of the number of risk factors in normal infants is effective in assisting in the determination of target groups for monitoring.

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KANGAROO CARE (KC), APNOEA OF PREMATURITY (AOP) AND BODY TEMPERATURE

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Background: KC improves parental bonding and, through vestibular stimulation, may have stabilising effects on respiratory control. The latter hypothesis, however, has never been proven.

Methods: To investigate the effect of KC on episodes of apnoea, bradycardia and desaturation, we performed three 2 h recordings of breathing movements, nasal airflow, heart rate, pulse oximeter saturation (SpO₂) and pulse waveforms before, during and after 2 h of KC in 22 spontaneously breathing preterm infants, median GA at birth 29 wk (23-31), age at study 26 d (7-72). Rectal temperature was obtained every 2 h. Recordings were analyzed for apnoea (>20 s), bradycardia (<100/min.) and desaturation (SpO₂ <80%) as well as for breathing patterns, baseline SpO₂, heart and respiratory rate.

Results: Median heart and respiratory rate increased from 150/min (range 130-160) and 64/min (50-84) before to 157/min. (140-165) and 76/min (45-112) during KC (p<0.01); baseline SpO₂ remained unchanged. There was no significant change in apnoea frequency, but both bradycardia (1.1/h (0-21) vs. 0.6 (0-3), p<0.05) and desaturation (0.9/h (0-14) vs. 0.0 (0-7), p<0.05) occurred significantly more often during than before or after KC. Rectal temperature increased from 36.9°C (36.2-37.4) immediately before to 37.3 (36.6-38.6) during KC and returned to 36.9 (36.6-37.4) thereafter (p<0.01). Regular breathing pattern, which corresponds well with quiet sleep, decreased from 14% (2-28) before to 7% (3-26) during KC (p<0.01).

Conclusion: KC resulted in a significant increase in the frequency of both bradycardia and desaturation in these infants. This increase could be related to heat stress and/or a reduction in the proportion of time spent in quiet sleep. Body temperature should be carefully monitored during KC.

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THE EFFECT OF MATERNAL SMOKING IN PREGNANCY ON INFANT RESPONSES TO PERIODIC THERMAL STIMULUS

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Maternal smoking during pregnancy is associated with a significantly increased risk of SIDS but underlying mechanisms remain

unknown. Because inappropriate thermoregulatory mechanisms and autonomic dysfunction have been implicated in the aetiology of SIDS, this study investigated the effect of maternal smoking on infant responses to periodic thermal stimulation at 2-3 days and at 3 months of age. This response is mediated by the autonomic nervous system, possibly due to sympathetic vasoactive reflexes.

Methods: Laser Doppler spectroscopy was used to measure skin blood flow. R-R interval data was acquired from a Medtel HS18 neonatal monitor. Two minutes of baseline data were collected when the baby was asleep. Alternation of warm and cool settings on a hairdryer directed at the lower left leg was used to administer the periodic thermal stimulus at a frequency of 0.05Hz for three minutes. Power spectral analysis was applied to heart rate variability and skin blood flow signals to determine relative levels of autonomic activity in low frequency (0.04-0.15Hz) and high frequency (0.15-0.3Hz) bands. The low:high frequency (LF:HF) power spectral ratio was also determined. Differences in response between infants of smokers and non-smokers in power spectral variables were sought using Mann-Whitney U-test and in heart rate and skin blood flow using Student's t-test.

Results: In the neonatal study, the median (range) relative change in heart rate variability spectral power in the low frequency band was 1.25 (0.2-8.3) for controls (n=25) and 0.5 (0.1-6.6) for infants of smokers (n=26, $p=0.03$). There was no difference in any other variables. At 3 months, control infants (n=15) significantly increased skin blood flow with a mean \pm SE increase of 8.5 \pm 3.9% while there was a decrease of 6.9 \pm 5.3% ($p=0.04$) in infants of smokers (n=17).

Conclusions: The attenuated skin blood flow response to a periodic thermal stimulus in 3 month old infants of smokers suggests alterations in autonomically controlled thermal responses.

197 GABA RECEPTOR IN HUMAN PERINATAL ASPHYXIA

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GABA (g-aminobutyric acid) is the major inhibitory neurotransmitter in the brain, being used by 20-25% of central synapses. It is metabolically and functionally closely associated with the major excitatory

transmitter, glutamate, which is used by 65-70% of synapses. We have previously shown that localized abnormalities in the density and activity of the NMDA class of glutamate receptors are associated with increased vulnerability to perinatal asphyxia in late-gestation human infants (1). For comparison, we have now extended the study to GABA-A receptor sites in similar cases. Tissue from Frontal, Motor, Temporal and Occipital Cortex was obtained at autopsy from infants with gestational ages ranging from 22 to 42 weeks. Mean post mortem delay was 44 h. Homogenate binding assays were carried out with the benzodiazepine ligands [3H]flunitrazepam ([3H]Fnz) and [3H]diazepam ([3H]Dz); GABA enhancement of [3H]Dz binding was also assessed as a measure of receptor functionality. As for glutamate-NMDA receptor site assays (1), it was found to be necessary to modify the assay protocol substantially from the standard procedure used with adult tissue. The results showed that the density (Bmax) of [3H]Fnz sites increased markedly during the third trimester, particularly in Occipital cortex. Moreover, the affinity (Kd) for [3H]Dz in infant tissue preparations differed significantly from the adult parameter; and it was not possible to quantify GABA enhancement of [3H]Dz binding in this material. The data suggest that different forms of GABA receptor sites are expressed during inter-uterine development, and that the full complement of receptor sites is still being acquired at this stage. However, no association with birth asphyxia was found. That is, there was no compensation in these indices of inhibitory amino acid neurotransmission for the alterations we have observed in excitatory neurotransmission.

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(1). Andersen D.L. et al. (1998) *J. Child Neurol.* 13, 149-157.

198 PACIFIER AND DIGIT SUCKING INFANTS II: DEVELOPMENTAL CHANGE AND BEHAVIOURAL EFFECTS

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Pacifier use is associated with a decreased risk of SIDS [1], and is widely believed to suppress digit sucking in infants, but little is known of the relative prevalence and behavioural effects of these two forms of

non-nutritive sucking (NNS), and their effects on breast feeding during early infancy.

Methods. Overnight polygraphic recordings of sleep state, respiration, oxygen saturation and infrared video were made of 10 mother infant pairs (5 routine bed-sharers, 5 room-sharers) on two consecutive nights, at monthly intervals from 2 to 5 months of age in a sleep laboratory. Each month, mother baby pairs were randomized to 1 night bed-sharing then 1 room-sharing, or vice versa. 'Episodes' of pacifier, own digit and mother's digit sucking (>1 minute) were identified and compared with 2 state-matched control periods, before and after each such episode [2].

Results: Full recordings, on 74 nights (749 hours), showed 329 episodes of NNS on 54 nights. Infants were awake throughout 66% episodes, but some (particularly digit sucking) occurred during sleep (Rapid Eye Movement > Quiet Sleep). Pacifier sucking decreased with age, whilst digit sucking increased. Routine pacifier users rarely sucked their digits. Sleeping in the 'non-routine' location was associated with a larger percentage of nights with sucking episodes and increased sleep latency. Bed sharing (routinely or on a given night) was associated with less sucking behavior and more breastfeeding. Non-nutritive sucking was not, however, associated with decreased total time breast feeding per night or number of feeds per night.

Conclusion: Patterns of NNS during the night change with age and are affected by maternal proximity. Digit sucking has state modulating effects, and may be suppressed by pacifier use. Thus any benefits of pacifier use must be set against the potential loss of a self-directed ability to modulate state during the night, and possible shortening of breastfeeding duration.

1. P.J.Fleming, P.S.Blair, K.Pollard, M.W.Platt, C.Leach, I.Smith, P.J.Berry, J.Golding. Pacifier use and SIDS - Results from the CESDI SUDI case-control study. Arch Dis. Child 1999; 81:112-116.

2. K.Pollard, P.J.Fleming, J.Young, A Sawczenko, P.Blair. Nighttime non-nutritive sucking in infants aged 1 to 5 months: relationship with infant state, breast feeding, and bed- versus room-sharing. (In press) Early Human Development 1999.

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A MATHEMATICAL MODEL OF OVERNIGHT TEMPERATURE CHANGES IN INFANTS: INVESTIGATION OF THE EFFECTS OF EPIDEMIOLOGICAL RISK FACTORS FOR SIDS.

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Overheating may be a contributory factor in SIDS. Certain risk factors for SIDS (e.g. maternal smoking, bottle feeding) are associated with delayed maturation of diurnal temperature patterns, but little is known of how such factors interact with environmental factors to affect thermal balance during sleep in infancy.

Methods Sequential overnight recordings were made at home of rectal, peripheral and environmental temperatures in 151 infants at 1, 3 and 5 months of age. Data were modeled as polynomial functions of time using 'Mixed' models to account for correlation due to repeated measurements. The effect of babies' age on the temperature 'profile' was studied by including age and age x time interactions in the model. Other factors were then investigated by adding terms at the appropriate level: i.e. baby level - factors (e.g. maternal smoking, birthweight of baby) which varied from one baby to another but were constant for individual babies, ii) visit level - factors (e.g. baby's age, tog value of bedding, sleeping position) which varied from one visit to another, but were constant for individual visits, and iii) observation level - factors (e.g. environmental temperature) which changed from hour to hour.

Results The characteristic falls in overnight rectal temperatures could be reliably described by a cubic polynomial, and showed lower nadir values as age increased, whilst changes in shin temperature were opposite in direction, suggesting active vasomotor mechanisms for the temperature changes.

In the mathematical modelling, baby's age and environmental temperature strongly correlated with rectal and surface temperature; rectal and axillary temperatures were also related to the tog value of bedding. Axillary temperature was strongly influenced by sleeping position and maternal smoking.

Conclusions Environmental temperature and tog value of bedding has significant effects upon infants' overnight

temperatures. Sleeping position and maternal smoking have effects upon peripheral temperatures and may thus influence heat balance.

200 RT-ISH: A NOVEL METHOD FOR DETECTING RECEPTOR SUBUNITS IN VIVO.

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The apnea hypothesis suggests SIDS is due to a subtle defect in brainstem neural circuits that control respiration and/or cardiac stability [1]. The brainstem contains the principle sites that regulate cardiorespiration. The neurochemical control of respiration involves a complex interplay between rapidly acting transmitters and longer-lasting neuromodulators respond to various physiological and pathological stimuli. To determine if neurotransmission is defective in brain regions vital to respiratory control, we have developed a method of *in situ* RT-PCR (RT-ISH) to measure the distribution of mRNA transcripts in human, post-mortem, paraffin-embedded sections. Patient and control samples were obtained from the extensive collection of brain samples held in our laboratory. Brain regions of interest, collected at autopsy 9-48 hours post-mortem, were fixed in phosphate-buffered formalin for at least 2 weeks (average 2 months) prior to processing. Small blocks of tissue were embedded in paraffin according to standard protocols and sectioned at 6 μ m. Brainstem sections were taken for RT-ISH using PCR conditions already established in our laboratory for the amplification of the α 1, α 2, α 3, α 4, α 5, α 6, α 7, α 8, α 9, α 10, α 11, α 12, α 13, α 14, α 15, α 16, α 17, α 18, α 19, α 20, α 21, α 22, α 23, α 24, α 25, α 26, α 27, α 28, α 29, α 30, α 31, α 32, α 33, α 34, α 35, α 36, α 37, α 38, α 39, α 40, α 41, α 42, α 43, α 44, α 45, α 46, α 47, α 48, α 49, α 50, α 51, α 52, α 53, α 54, α 55, α 56, α 57, α 58, α 59, α 60, α 61, α 62, α 63, α 64, α 65, α 66, α 67, α 68, α 69, α 70, α 71, α 72, α 73, α 74, α 75, α 76, α 77, α 78, α 79, α 80, α 81, α 82, α 83, α 84, α 85, α 86, α 87, α 88, α 89, α 90, α 91, α 92, α 93, α 94, α 95, α 96, α 97, α 98, α 99, α 100; subunits of the GABA-A receptor [2]. A one-step RT-PCR method was used to amplify the transcripts; digoxigenin-labelled nucleotides were directly incorporated into the amplified products during cycling on a DNA engine (PTC 2000, MJ Research). RT-PCR products were detected using either alkaline-phosphatase or FITC-conjugated antibody directed against digoxigenin and signals were visualized using light and epifluorescence on a Nikon microscope at 400X magnification. Amplification of the α and β subunits of the GABA-A receptor was successfully carried out on brainstem sections from SIDS and control infants using this method. In negative controls processed under the same conditions, where either the

RNA has been digested prior to RT-PCR or where the antibody was omitted, no signal was apparent. We were able to localise mRNA transcripts to individual neurons in discrete brain regions. Amplified signal was restricted to neurons, with none detected in glial cells.

1 Coumbe et al., (1990). *Pediatric Pathology*. 10, 483-490.
2 Lewohl et al., (1997). *Brain Research Protocols*. 1, 347-356.

201 AUTONOMIC RESPONSES IN INFANTS WHO HAD APPARENT LIFE THREATENING EVENTS (ALTE) OR IRRITABILITY (IRR)

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Aim: To compare the responses of infants who have had an apparent life threatening event (ALTE) or who have a history of irritability (IRR) with control infants to two tests of autonomic function and arousal.

Method: ALTE infants (age 0-10 weeks n=7, 10-24 weeks n=6) and IRR infants (age 0-10 weeks n=1, 10-24 weeks n=6) were recruited following admission to the Paediatric ward, Dunedin Hospital. Control infants (CO) were studied at 1 month (n = 49) and 3 months (n=46) of age. Each infant slept supine and the heart rate changes in response to a tilt test and the heart rate variability (HRV) were recorded twice in each sleep state i.e. quiet sleep (QS) and active sleep (AS). Arousal and sleep states were assessed by behavioural criteria. Tilt Test: 60° head up tilt maintained for 1-1/2 min or until arousal occurred. ECG measured infant heart rate changes. The mean heart rate was derived from 30 baseline RR intervals before the tilt. Arousal was coded on a 5 point system. Heart Rate Variability: RR waves were recorded continuously for 500 beats. The SDRR and SD \sqrt RR derived from the poincaré plot (a scatter plot of the variation from beat to beat) was used as a quantitative measure of autonomic function. Regression analysis compared variables for sleep state, age, and case diagnosis (ALTE, IRR or CO)

Results: The difference between ALTE and CO mean and the difference between IRR and CO mean for heart rate changes in response to the tilt and for the measures of HRV (SDRR, SD \sqrt RR) was not significant. There were also no significant differences between groups for the ratio of the maximum RR interval to

the minimum RR interval after the tilt. The ALTE and IRR infants had significantly lower heart rates than controls; respectively 19.3, $p=0.051$ and 27.7, $p=0.046$. Sweats at night were more common in cases (41%) than controls (11%).

Conclusion: ALTE and IRR infants appear to have normal autonomic responses to these two tests. Dysfunction of the autonomic nervous system may be manifested in a different way in these infants. For all tests the normal range includes some values that may describe a dampening of control.

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202 VENTILATORY RESPONSES OF ALTE INFANTS AND INFANTS WITH A HISTORY OF IRRITABILITY

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Aims: To compare ventilatory responses to a rebreathe test in infants having suffered an Apparent Life Threatening Event (ALTE) and infants with symptoms of irritability (IRR), with that of control infants.

Methods: ALTE infants ($n=13$) and IRR infants ($n=7$) were recruited following admission to the Paediatric ward. Control infants ($n=49$ [1month] and $n=46$ [3month]) were recruited from the maternity ward. Infants were studied at 2 ages: study 1 (0-10 weeks) and study 2 (11 to 24 weeks). Infants sleeping supine were exposed to a mild asphyxial test, which mimicked rebreathing face down into soft bedding. Gases were delivered through a perspex hood to change the content of inspired air with a slow build up of CO_2 (maximum 5%) and depletion of O_2 (minimum 13.5%) over 5-6 minutes. Respiratory pattern was recorded by inductive plethysmography. The slope of a linear curve plotting Ln ventilation against inspired CO_2 was used as a measure of the ventilatory asphyxial sensitivity (VAS). Arousal and sleep state was determined by behavioral criteria.

Key Findings: After controlling for age and sleep state, ventilatory responses of ALTE infants were similar to those of control infants (VAS for ALTE 0.233 vs. VAS for control 0.225). IRR infants had a significantly higher ventilatory response than control infants did (VAS = 0.322, $p = 0.02$). VAS was higher in older infants but was not

significantly associated with sleep state.

Conclusion: Infants with a history of IRR have a higher ventilatory response to rebreathing than controls. This could be a reflection of hyperactivity also presented as sleep disturbance/irritability. ALTE have normal ventilatory response to rebreathing consistent with the majority of findings on ventilatory studies of such infants.

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203 EFFECTS OF HYPERTHERMIA AND MURAMYL DIPEPTIDE ON IL-1b, IL-6 AND MORTALITY IN NEONATAL RAT MODEL

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Sudden infant death syndrome may be linked to an interaction between infection, hyperthermia, sleep state and cytokine production. This study investigated the effects of hyperthermia and a surrogate of infection (muramyl dipeptide or MDP) in a neonatal rat model. The study was in two parts. In the first part 80 neonatal rats in four groups had their body temperature raised to the desired level for one hour ($34^\circ C$, $38^\circ C$, $39^\circ C$ or $40^\circ C$) and then kept at a baseline level of $34^\circ C$ for one hour. Intraperitoneal injection of 0.1 ml 0.9% normal saline was given 30 min before start to control for MDP. In the second part of the study 80 animals, in four equivalent temperature groups ($34^\circ C$, $38^\circ C$, $39^\circ C$ or $40^\circ C$), were pretreated with MDP (25 nmol/animal) instead of Normal Saline. The results showed that hyperthermia significantly increased the production of IL-6 ($p=0.049$) but not in the production of IL-1b ($p=0.28$), and as anticipated significantly increased mortality. Administration of MDP (a surrogate for infection) significantly increased the IL-1b production ($p=0.008$) but not IL-6 ($p=0.42$). MDP in combination with hyperthermia had a significant effect on mortality ($p=0.016$ Cox's regression analysis) in the neonatal rat.

These findings may have implications for understanding the mechanism of sudden infant death syndrome.

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THE MOEBIUS STRIP AND THE
SUDDEN DEATH OF AN INFANT
DURING SLEEP

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A Moebius belt is formed by attaching one end of a long strip of material to the other end, and by twisting the latter 180 degrees. In the process of forming a Moebius strip, one can consider that the sleep/wake continuum in an infant can be seen as a Moebius strip model. Because in an infant the sleep-wakefulness states forms a continuous process, a Moebius model can be built by attaching the top surface (the wakefulness phase) to the end of the back surface (the sleep phase). In an infant, the sleep phase is the longest branch of the Moebius strip. The site where the back (the sleep phase) is joined to the top (the wakefulness phase), constitutes the infant's arousal process. It can be measured by the evaluation of the arousal threshold.

A variety of risk factors could alter the adjustment between the sleep-wake portions of the Moebius strip model. Such factors include prenatal and postnatal

environmental conditions shown to favour the occurrence of sudden unexpected deaths in infants.

In the Moebius strip model for the sleep-wakefulness continuum, death occurs when the continuous strip is broken. This disruption occurs when the passage from one side of the strip to the other is made impossible. Such condition could occur, when the arousal of the infant becomes impossible. Exposure to prenatal cigarette smoke, as well as postnatal exposure to heat or prone sleeping are conditions that by increasing the arousal thresholds of the infants, favour the disruption of the Moebius strip.

	Infants with ALTE %	Infants without ALTE %	p
BCA/S	52.6	45.7	n.s.
UCA/S	26.3	32.6	n.s.
Rhinitis	21.1	21.7	n.s.
Obstructive apnoea *	97.4	76.0	< 0.02
Wheezing / grunting	63.0	28.3	< 0.01
Cyanosis during crying	44.7	15.0	< 0.01
Oro-pharyngeal dysphagia	71.0	52.2	n.s.
Vomiting	42.2	23.9	n.s.
Hyperhidrosis	26.3	24.0	n.s.
Sialorrhoea	21.0	10.9	n.s.
Failure to thrive	36.8	32.6	n.s.
Cor pulmonale	18.4	4.3	n.s.
Deaths	18.4	4.3 †	n.s.
Asphyxic brain damage	10.5	-	n.s.

* Relieved by introduction of oro-pharyngeal cannula or by dummy sucking. † One infant was found dead in his cot.

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CAPNOGRAPHY AND PREMATURITY, AGE AND POSITION EFFECTS

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Sleep position and prematurity are considered as risk factors for SIDS.

Objectives: To delineate the effect of maturity and sleep position on capnography of premature infants.

Methods: Twenty preterm infants of 32 weeks post conceptional age (PCA) and above (BW 1464 g, 296 SD) were longitudinally followed until 37 weeks PCA. A control group (N=39) of term infants was assessed cross sectionally.

Procedure: Sidestream capnography (Datex, Normocap) with a sampling rate of 150ml/min was employed in the following positions: Supine, prone and side, inclined (30°) and supine-horizontal.

Results: Maturity effect: Preterm infants present a predominant type of wave pattern significantly different from controls (p=0.005-0.04). No maturation effect was noted until 36 weeks PCA. Inspiratory period was significantly correlated with respiratory rate (RR) among your prematures only at 32-34 weeks of PCA, whereas expiratory period was correlated with RR across all age groups. In prone, peak EtCO₂ as well as inspiratory period were significantly increased across ages only among preterm infants.

Conclusion: Capnography reflects a delayed maturation in the respiratory system among preterm infants. There is a specific effect of prone sleeping position. These findings have a possible implication related to SIDS and prematurity.

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SPERMINE ACTIVATION OF THE NMDA RECEPTOR IN SIDS

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Glutamate is present in the central nervous system well before birth and participates in most neural circuits, including those involved in the control of respiratory activity, cardiovascular and reflux responses¹. Recent studies suggest that pre-existing abnormalities of the N-methyl-D-aspartate (NMDA) class of glutamate receptors in discrete brain regions may predispose infants to apnea, asphyxia, acute-life threatening events and SIDS². Polyamine binding sites are located on NMDA glutamate receptors and play a neuromodulatory role, in that binding increases the amplitude of NMDA receptor responsiveness. Spermine is an example of such a polyamine.

This study examined spermine activation of NMDA receptor sites in human infant brain tissue from 10 SIDS and 10 control cases. MK-801 and spermine enhancement assays with the aid of a cell harvester allowed spermine activation curves to be obtained. Preliminary analysis suggested that spermine activation of the NMDA receptor is decreased in the SIDS cases compared with the controls. This varying response may be due to a different pre-existing conformation of protein subunits that make up the NMDA receptor.

1 Haxhiu M et al., (1997) *Journal of the Autonomic Nervous System* 67, 192-199

2 Andersen D et al., (1998) *Journal of Child Neurology* 13:4 149-157

Variable	Sleep state	AS	QS	Change with age
SaO ₂ (%)		96.1±1.0	96.6±1.4	n.s
tcpO ₂ (kPa)		10.6±0.4	10.7±0.4	n.s.
tcCO ₂ (kPa)		5.4±0.1	5.4±0.1	Decrease (p=0.002)
HR (beats/min)		122±7.5	121±3.7	Decrease (p=0.02)
RR (breaths/min)		29±5.4	29±10.5	Decrease (p=0.0002)

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TRANSIENT AROUSALS AT APNEA INITIATION AND SIGH-RELATED AROUSALS AT APNEA TERMINATION

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Failure of arousal from apnea is considered a potential risk factor in sudden infant death during sleep. We hypothesized 1) that arousal related changes in EEG and submental as well as diaphragmatic EMG activity may occur not only at termination but at onset and during the course of sleep apneas and 2) that termination of apnoeas is frequently characterised by a specific biphasic sigh-related arousal mechanism (Lijowska 1997, Thach 1976, 1997, Wulbrand 1995, 1998).

Twelve preterm infants (gestational age 29 to 34 weeks) were studied at 36, 40, 44 and 52 weeks age during sleep including EEG, submental/diaphragmatic EMG, ECG, tcpO₂/pCO₂, and breathing movements. EEG and EMG activities were continuously quantified by using spectral analysis techniques. Sighs were defined by a specific biphasic diaphragmatic EMG activity increase. 33 N-REM and 69 REM related apneas >10sec have been recorded. 8 N-REM and 16 REM related apneas followed a sigh, 26 N-REM and 44 REM related events were terminated by a sigh.

An EEG desynchronisation reflected by an activity (power) decrease was found during REM related inactive apnoeas (5-18 Hz, p<0.05) and during N-REM related mixed / obstructive apnoeas (3-13 Hz, p<0.05). A more distinct activity decrease was related to the incidence of a sigh, initiating apnoeas in both sleep phases (8-13 Hz, p<0.01). We conclude that in contrast to widespread opinions a transient arousal is already present at onset of many apneas. Moreover apnoea termination is frequently characterised by a specific arousal mechanism related to a sigh.

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OXYGENATION AND BREATHING PATTERN IN HEALTHY TERM INFANTS DURING SLEEP

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Background: Infants who are considered to be at risk for life threatening respiratory events and infants with pulmonary problems are often monitored during sleep for episodes of hypoxemia and/or abnormal respiratory events. There is however little agreement among different institutions which respiratory events constitute normal findings in this age group and which may require intervention. The prime aim of this study was to study oxygenation and breathing patterns (particularly periodic breathing (PB)) in healthy sleeping infants.

Patients and Methods: Forty four healthy term infants aged 2-36 weeks and originally recruited as age and sex-matched controls for babies with life threatening events (ALTE) were admitted to the study. Their mean GA was 39±0.9 wk, BW 3520±520g and mean weight at study 5699±1663g. Overnight polysomnography (mean duration 330±45 min) was performed in all infants. SaO₂, transcutaneous pO₂ and pCO₂, heart rate, and rib cage and abdominal breathing movements were recorded continuously using a computerized Respitrace – based device. Data were stratified for sleep states (active sleep-AS, quiet sleep-QS) and analysed with respect to age-related changes. In addition to an automated analysis, all recordings were manually reviewed for recording artifacts.

Results: main respiratory parameters are shown in the table

Five infants (11.3 %) had hypoxic episodes defined as SaO₂ <90% (mean SaO₂ 86.2±1.5 %). Four of those events occurred in conjunction with partial upper airway obstructions during AS. Periodic breathing (PB) defined as more than 3 consecutive

V_I (ml·kg ⁻¹ ·min ⁻¹)	V_T (ml·kg ⁻¹)	RR (min ⁻¹)	T_I/T_T (cmH ₂ O)	$P_{o,1}$ (ml·s ⁻¹)	V_T/T_I (%)	PET _{CO2} (%)	$P_{o,1}/(V_T/T_I)$ (cmH ₂ O·ml ⁻¹ ·s)
382± 86	10.2±2.1	40± 6	0.34±0.04	2.5±1.1	114±11	5.3±0.3	0.02±0.01
N							
446±112	7.6±1.5	60±16	0.39±0.08	5.2±2.0	109±35	4.5±0.5	0.05±0.03
P							
NS	<0.05	<0.01	NS	<0.05	NS	<0.001	<0.001

respiratory pauses > 3sec was observed in 38.6 % of infants.

Conclusion: Oxygenation and CO₂ levels in healthy sleeping infants are comparable to those of older children. Hypoxic episodes are very infrequent and if present, are associated with partial upper airway obstruction. PB, often assumed to be a pathological feature, is a normal breathing pattern in this age group.

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209 ALTERED BREATHING PATTERN AND TACHYCARDIA IN YOUNG LAMBS EXPOSED TO NICOTINE PRENATALLY

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Maternal smoking during pregnancy may result in multiple severe consequences for the young child, e.g. obstructive lung and increased risk for the sudden infant death syndrome. The responsible ingredients in tobacco smoke for these effects are not known. We have investigated effects of prenatal nicotine exposure in young lambs and have previously reported that prenatal nicotine exposure attenuates oxygen sensitivity, delays hypoxic arousal and impairs the cardiorespiratory response to acute hypoxemia in sleeping young lambs (Pediatr Res 41:302A, 1997). Studies with dopamine receptor blockers indicated that these effects were, in part, mediated by dopaminergic modulation of the peripheral chemoreceptors (Pediatr Res 43:332A, 1998). In addition, we have observed altered breathing patterns in these prenatally nicotine-exposed young lambs, which point to alterations in mechanical properties of the respiratory system.

Subjects & Methods: Seven pregnant ewes were infused continuously with nicotine, 40mg/d during the last trimester. Seven lambs exposed to nicotine before birth only (N) and 7 control lambs (C) were studied during quiet sleep at an age of 3 - 9 d with a

breath-by-breath method (Eur J Appl Physiol 74:44,1996) for determination of minute ventilation (V_I), tidal volume (V_T), respiratory rate (RR), inspiratory/total breath time (T_I/T_T), airway occlusion pressure ($P_{0.1}$), mean inspiratory flow (V_T/T_I), end tidal P_{CO_2} (PET_{CO₂}), effective impedance ($P_{0.1}/(V_T/T_I)$), heart rate (HR) and blood pressure (BP).

Results: Plasma nicotine concentration in the ewes was 7 ± 1 ng/ml (mean \pm SD) and the nicotine metabolite cotinine was 18 ± 5 ng/ml. HR was significantly increased in N: 241 ± 22 bpm compared with C: 185 ± 19 bpm ($p < 0.001$, t test). BP was not significantly different, N: 86 ± 13 mmHg, C: 92 ± 10 mmHg. Ventilatory parameters are presented in the table.

Summary: The higher heart rate in the nicotine-exposed lambs suggests an increased resting sympathetic tone. Compared with control lambs, nicotine exposed lambs were breathing faster with reduced tidal volume and increased inspiratory drive ($P_{0.1}$). Effective impedance was higher in the nicotine-exposed lambs which might reflect decreased compliance and/or increased airway resistance. The markedly altered breathing pattern suggests that prenatal exposure to a low concentration of nicotine results in abnormal lung development and postnatal function.

Conclusion: The combined effects of altered control of breathing and decreased lung function may predispose both to SIDS in infancy and obstructive lung disease later in childhood.

during normoxia :

Activity state	V_I	(ml·kg ⁻¹ ·min ⁻¹)	fR	(min ⁻¹)	$P_{0.1}$	(cm H ₂ O)	V_T/T_T
W	430±79	42±9	3.5±1.9	136±31			
QS	374±74*	37±6 ⁺	2.5±1.2**	115±25**			
W	436±106	58±14	4.8±2.0	114±42			
QS	446±112	60±16	5.2±2.0	109±35			

D; * $p < 0.05$; ** $p < 0.01$; ⁺ $p = 0.05$ (paired t-test)

SAFE T SLEEP MAY REDUCE INCIDENCE OF SIDS

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It is well established that prone sleep position increases the risk of SIDS and SIDS mortality has decreased dramatically since the recommendation that infants are not placed prone to sleep. However, SIDS mortality in New Zealand continues to be high (1996:1/9/1000 live births). A side sleeping position is also associated with a two fold increased risk of SIDS compared with the back sleeping position (1), probably due to infants turning onto their fronts (secondary prone). But even if the infant is placed on the back to sleep he may still turn to the prone position (2). Meanwhile the recommendation to sleep healthy infants only in a supine position has reportedly been linked to increasing rates of plagiocephaly.

The Safe T Sleep Sleepwrap has been developed as a tool to help prevent babies creeping into dangerous positions during sleep and eliminating the risk of an infant turning onto their front from either a supine or side sleeping position. Already more than 48,000 have been used in New Zealand without a single reported death, whereas national statistics suggest that we could have expected 91 SIDS deaths to have occurred. Even if the Safe T Sleep Sleepwrap is used mainly by families at lower risk of SIDS (such as non-Maori and socio-economically advantaged families) this result is still outstanding. Safe T Sleep Sleepwrap should be formally evaluated to confirm this observation.

The potential for a safe side sleeping option using the Safe T Sleep Sleepwrap could be seen as a means to encourage caregivers concerned about plagiocephaly to simultaneously address the increased SIDS risks of prone or secondary prone sleeping.

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