

## **Infant overheating, hyperthermia and increased sweating**

Thermal stress has been identified as a risk factor for SIDS in a number of studies. Infants who died of SIDS often had a preceding upper respiratory tract infection and may have had a fever.<sup>1</sup> Furthermore, otherwise healthy babies may become overheated when they are covered or swaddled excessively or when they sleep prone, although excess covering and prone sleeping also increase rebreathing and may also increase the risk of SIDS in that way.<sup>2</sup> Heavy wrapping and excessive room heating independently increased the risk of SIDS, especially in infants greater than 70 days.<sup>3</sup> Hyperthermia seemed to require an interaction among multiple risk factors, for example an increase of SIDS was found among infants who slept in the prone position in addition to swaddling, recent illness or room heating.<sup>4</sup> Infants lose much of their heat through the head and face, particularly when the rest of the body is covered.<sup>5</sup> Therefore, prone sleeping may increase the risk of rebreathing, but also dramatically reduce the capacity for heat loss.<sup>6</sup> The elevated risk of SIDS when prone sleeping and swaddling, recent illness or elevated room temperature were also present suggest an interaction between prone sleeping and the risk of overheating in the pathogenesis of SIDS. Prone sleeping reduces the effective surface for heat loss in infants and causes rebreathing which impairs respiratory heat loss. In a study on vagotomized decerebrated piglets the effect of increased body temperature on the inhibition of breathing produced by water injected into the larynx, which elicits the laryngeal chemoreflex (LCR). The respiratory inhibition associated with the LCR was substantially prolonged when body temperature was elevated. Thus elevated body temperature may contribute to the pathogenesis of SIDS by increasing the inhibitory effects of the LCR therefore causing increased breathing inhibition.<sup>7</sup> Another hypothesis that may link hyperthermia with SIDS is that a combination of acute hypoxia and elevated body temperature might prevent autoresuscitation (AR) from hypoxic apnea. Healthy infants have been frequently observed to autoresuscitate from prolonged apnea without apparent ill effects, indicating that this can be an important mechanism for surviving severe episodes of hypoxia.<sup>8</sup> Failure to autoresuscitate from hypoxic apnea by gasping is well documented in SIDS cases and it has been proposed that such failure could be a critical SIDS causal mechanism.<sup>9</sup> Examination of terminal recordings of infants dying of SIDS reveals that hypoxic apnea is followed by gasping and yet AR fails during the first attempt.<sup>10</sup> In a study on mice the combination of hyperthermia and hypoxia produced failure to autoresuscitate during the first hypoxic exposure with increasing frequency as the temperature increased. Neither hyperthermia alone or hypoxia alone was found to be lethal.<sup>11</sup> The conclusion of the authors is that it does seem probable that some deaths diagnosed as SIDS, stem in part at least, from elevated body temperature resulting from increased environmental temperatures, febrile illness, overbundling and prone sleeping position or a combination of these factors.

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- <sup>4</sup> Ponsonby AL, Dwyer T, Gibbons LE et al. Factors potentiating the risk of sudden infant death associated with the prone position. *N Eng J Med* 1993; 329:377-382.
- <sup>5</sup> Nelson EAS, Taylor BJ and Weatherall IL. Sleeping position and infant bedding may predispose to hyperthermia and the sudden infant death syndrome. *Lancet* 1989; 1:199-201.
- <sup>6</sup> Van der Velde L, Curran A, Filliano JJ et al. Prolongation of the laryngeal chemoreflex, prolongation alter inhibition of the rostroventral medulla: a role in SIDS? *J Appl Physiol* 2003; 94:1183-1895.
- <sup>7</sup> Curran AK, Xia L, Leiter JC et al. Elevated body temperature enhances the laryngeal chemoreflex in decerebrate piglets. *J Appl Physiol* 2005; 98:780-786.
- <sup>8</sup> Thach BT, Jacob MS and Gershan WM. Control of breathing during asphyxia and autoresuscitation. In: *Developmental Neurobiology of Breathing*, edited by Haddad G and Farber J. New York: Dekker, 1991, p. 681-699.
- <sup>9</sup> Poets LF, Meny RG, Chobanian MR et al. Gasping and other cardiorespiratory patterns during sudden infant deaths. *Pediatr Res* 1999; 45:350-355.
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