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# Does Swaddling Decrease or Increase the Risk for Sudden Infant Death Syndrome?

**Bradley T. Thach, MD**
Departments of Pediatrics Washington University

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The report by Richardson et al in this issue of *The Journal*, adds to their extensive past studies on arousal from sleep in infants [1]. The present work on arousals in swaddled infants is an important addition to the literature. As the author's indicate, swaddling has become a much more common practice in the U.S. than it was in the recent past. Historically, swaddling was, for the most part, a universal practice prior to the eighteenth century. The present work by Richardson et al is unique in that arousal to a tactile stimulus is reported as opposed to spontaneous arousals.

Richardson et al address several important issues. First, is a low threshold for arousal necessarily a good thing? This may not be the case because cortical arousals may be disadvantageous in certain situations [2]. Cortical arousal in infants is often accompanied by hypoventilation especially with crying, which can precipitate sudden severe desaturations in an infant in an asphyxial rebreathing environment. In certain cases this may precipitate sudden unexpected death [3]. Moreover, frequent arousals, caused by a low arousal threshold may result in habituation and thereby increase the theshold for arousal, which would be disadvantageous in asphyxia-induced arousals. Fortunately in the present study, as noted previously, swaddling does not appear to impair sub-cortical arousals that are essential for adequate pulmonary function and appear to be the primary mechanism in terminating obstructive apneas in infants [2, 4].

Does the tactile stimulus employed by Richardson et al adequately reflect arousal caused by asphyxia? This is highly relevant because asphyxial and/or hypoxia is widely believed to be major preceding event leading to SIDS deaths. How accurately arousal to a tactile stimulus correlates with that caused by asphyxial stimuli remains unclear. Certainly cortical arousal is needed to escape from life threatening asphyxiating environments either by change in head position or when crying alerts caretakers to a dangerous situation. Equally relevant is that cortical arousal does not appear to be necessary for terminating central or mixed apnea in infants [5,6,7], hence, impairment of cortical arousal associated with swaddling might not be a disadvantage in terminating these types of apnea.



Correspondence and Reprint Requests: Bradley Thach, M.D. Washington University School of Medicine 660 South Euclid Campus Box 8208 Saint Louis, MO 63110 (314) 286-2851 fax: (314) 286-2893 email: thach@kids.wustl.edu.

Can swaddling actually increase the risk for SIDS as suggested by the Author's? This is certainly true for prone sleeping infants [8]. In this case, head lifting and turning to avoid an asphyxial environment are impeded when the arms are restrained at the baby's side rather than positioned beside the infant's head. In contrast the mechanisms of swaddlings effect on decreasing SIDS risk in supine infants seem clear. An immobilized infant can't crawl into dangerous asphyxiating environments. Also, swaddling prevents infants from pulling bedding over their heads. Both are risk factors for accidental suffocation and/or SIDS. The only evidence for an increased SIDS risk in swaddled infants comes from a non-peer reviewed abstract [9]. Significantly, this study did not distinguish between infants swaddled when prone vs. infant's swaddled supine. As indicated above, prone swaddled infants are at greatly increased risk for SIDS [8]. Particularly relevant here, is that two published studies found that swaddling actually reduces SIDS risk when infants sleep in the supine position [8, 10].

However, the potential dangers of swaddling infants should not be entirely dismissed. The authors have confirmed prior studies indicating that swaddling is associated with increased respiratory rate [11,12]. As the author's surmise, this is likely due to decreased functional residual capacity resulting from increased extra thoracic pressure. In theory decreased functional residual capacity might be deleterious in certain situations where pulmonary function is compromised as in the case of viral pneumonia. Also one might expect that cough might be compromised because forceful coughing must be preceded by inhalation that increases lung volume. Notably a popular publication giving advice to parents recommends that the tighter the swaddle the better the calming effects on infants [13]. Taking all this into account, caretakers need some simple method for determining thoracic pressure in swaddled infants to insure that the thoracic pressure imposed that does not compromise lung function and still preserves its calming effects.

In summary, the present article adds significant new information on arousal thresholds to tactile stimuli in swaddled infants. However, it should be noted that currently there is insufficient evidence that infants swaddled while supine are at any increased risk for SIDS. All in all it would appear that the advantages of swaddling supine sleeping infants outweigh the risks, if any.

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## References

1. Richardson HL, Walker AM, Horne RSC. Minimizing the risks of sudden infant death syndrome: To swaddle or not to swaddle? J Pediatr. 2009in press
2. Thach BT. Sleep, sleep position, and the sudden infant death syndrome: To sleep or not to sleep? That is the question. J Pediatr 2001;138:793–5. [PubMed: 11391317]
3. Thach BT, Harris KA, Krous HF. The potential role of pulmonary arteriolar medial smooth muscle thickening in the sudden unclassified death of a young infant. BJM. May;2009 In Press
4. Wulbrand H, McNamara F, Thach BT. The role of arousal related brainstem reflexes in causing recovery from upper airway occlusion in infants. Sleep 2008;31:833–840. [PubMed: 18548828]UI: 15509109
5. Thoppil CK, Belan MA, Cowen CP, Mathew OP. Behavioral arousal in newborn infants and its association with termination of apnea. J Appl. Physiol 1991;70(6):2479–2484. [PubMed: 1885441]
6. Davies AM, Koenig JS, Thach BT. Characteristics of upper airway chemoreflex prolonged apnea in human infants. Am Rev Resp Dis 1989;139:668–673. [PubMed: 2923368]
7. Garrick W, Don, Karen A. Waters. Influence of sleep state on frequency of swallowing, apnea, and arousal in human infants. J Appl. Physiol 2003;94:2456–2464. [PubMed: 12576405]

8. Ponsonby AL, Dwyer T, Gibbons LE, Cochrane JA, Wang YG. Factors potentiating the risk of Sudden Infant Death Syndrome associated with the prone position. New England Journal of Medicine 1993;329:377–82. [PubMed: 8326970]

9. Fleming, P. Research and current advice - an overview; SIDS 10th International Conference; Portsmouth, United Kingdom. 2008.

10. Wilson CA, Taylor BJ, Laing RM, Williams SM, Mitchell EA. Clothing and bedding and its relevance to sudden infant death syndrome: further results from the New Zealand Cot Death Study. Journal of Paediatrics and Child Health 1994;30:506–12. [PubMed: 7865263]

11. Gerard CM, Harris KA, Thach BTT. Physiologic Studies in Swaddling: An ancient childcare practice, which may promote the supine for infant sleep. J Pediatr 2002;141:398–404. [PubMed: 12219062]

12. Narangerel G, Pollock J, Manaseki-Holland S, Henderson J. The effects of swaddling on oxygen saturation and respiratory rate of healthy infants in Mongolia. Acta Paediatrica 2007;96:261–5. [PubMed: 17429917]

13. Karp, H. The happiest baby on the block. Bantam; New York: 2002.