

**Eunice Kennedy Shriver National Institute of Child Health
and Human Development (NICHD)
Obstetric and Pediatric Pharmacology Branch (OPPB)**

BPCA Neurology Disease Therapeutics Working Group

Selected Citations – Anesthetic Drug Toxicities in Children

1. Bosenberg, A. Pediatric regional anesthesia update. *Paediatr Anaesth* 14: 398-402, 2004.
2. Dalens, B. Some current controversies in paediatric regional anaesthesia. *Curr Opin Anaesthesiol* 19: 301-308, 2006.
3. Dalens, B.J., and Mazoit, J.X. Adverse effects of regional anaesthesia in children. *Drug Saf* 19: 251-268, 1998.
4. Ecoffey, C. Pediatric regional anesthesia - update. *Curr Opin Anaesthesiol* 20: 232-235, 2007.
5. Giza, C.C., Mink, R.B., and Madikians, A. Pediatric traumatic brain injury: not just little adults. *Curr Opin Crit Care* 13: 143-152, 2007.
6. Goad, R.N., and Webster, D. Sedation, analgesia, and anesthesia issues in the pediatric patient. *Clin Podiatr Med Surg* 14: 131-148, 1997.
7. Haberny, K.A., Paule, M.G., Scallet, A.C., Sistare, F.D., Lester, D.S., Hanig, J.P., and William Slikker, Jr.: Ontogeny of the N-methyl-D-aspartate (NMDA) receptor system and susceptibility to neurotoxicity, *Tox. Sci.* 68: 9-17, 2002.
8. Hertzog, J.H., and Havidich, J.E. Non-anesthesiologist-provided pediatric procedural sedation: an update. *Curr Opin Anaesthesiol* 20: 365-372, 2007.
9. Jevtovic-Todorovic, V., Hartman, R.E., Izumi, Y., Benshoff, N.D., Dikranian, K., Zorumski, C.F., Olney, J.W., and Wozniak, D.F. Early exposure to common anesthetic agents causes widespread neurodegeneration in the developing rat brain and persistent learning deficits. *J Neurosci* 23: 876-882, 2003.
10. Johr, M., and Berger, T.M. Paediatric anaesthesia and inhalation agents. *Best Pract Res Clin Anaesthesiol* 19: 501-522, 2005.
11. Kam, P.C., and Cardone, D. Propofol infusion syndrome. *Anaesthesia* 62: 690-701, 2007.
12. Lerman, J. Inhalation agents in pediatric anaesthesia - an update. *Curr Opin Anaesthesiol* 20: 221-226, 2007.
13. Lonnqvist, P.A., and Morton, N.S. Paediatric day-case anaesthesia and pain control. *Curr Opin Anaesthesiol* 19: 617-621, 2006.
14. Maxwell, L.G., Tobias, J.D., Cravero, J.P., and Malviya, S. Adverse effects of sedatives in children. *Expert Opin Drug Saf* 2: 167-194, 2003.
15. Mellon, R.D., Simone, A.F., and Rappaport, B.A. Use of anesthetic agents in neonates and young children. *Anesth Analg* 104: 509-520, 2007.
16. Naguib, M., Magboul, M.M., Samarkandi, A.H., and Attia, M. Adverse effects and drug interactions associated with local and regional anaesthesia. *Drug Saf* 18: 221-250, 1998.

17. Rowe, R. Neurotoxicity of anesthetic agents in children. *Anesth Analg* 105: 882; discussion 882-883, 2007.
18. Shi, Q., Guo, L., Patterson, T.A., Dial, S., Li, Q., Sadovova, N., Zhang, X., Paule, M.G., Slikker, W., Jr., and Wang, C.: Gene expression profiling in the developing rat brain exposed to ketamine. *Neuroscience* 166(3): 852-863, 2010.
19. Siebert, J.N., Postfay-Barbe, K.M., Habre, W., and Siegrist, C.A. Influence of anesthesia on immune responses and its effect on vaccination in children: review of evidence. *Paediatr Anaesth* 17: 410-420, 2007.
20. Slikker, W., Jr., Zou, X., Hotchkiss, C.E., Divine, R.L., Sadovova, N., Twaddle, N.C., Doerge, D.R., Scallet, A.C., Patterson, T.A., Hanig, J.P., Paule, M.G., and Wang, C.: Ketamine-induced neurodegeneration in the perinatal rhesus monkey. *Tox. Sci.*, 98(1): 145-158, 2007.
21. Soriano, S.G., and Anand, K.J. Anesthetics and brain toxicity. *Curr Opin Anaesthesiol* 18: 293-297, 2005.
22. von Ungern-Sternberg, B.S., and Habre, W. Pediatric anesthesia-potential risks and their assessment: part II. *Paediatr Anaesth* 17: 311-320, 2007.
23. von Ungern-Sternberg, B.S., and Habre, W. Pediatric anesthesia - potential risks and their assessment: part I. *Paediatr Anaesth* 17: 206-215, 2007.
24. Wang, C., Sadovova, N., Ali, S.F., Fu, X., Scallet, A.C., Patterson, T.A., Paule, M.G., and Slikker, W., Jr.: L-carnitine protects neurons from 1-methyl-4-phenylpyridinium (MPP+)-induced neuronal apoptosis in rat forebrain culture. *Neuroscience* 144: 46-55, 2007.
25. Wang, C., Sadovova, N., Hotchkiss, C., Fu, X., Schmued, L., Scallet, A., Patterson, T., Hanig, J., Paule, M., and Slikker, W., Jr.: Blockade of n-methyl-d-aspartate (NMDA) receptors by ketamine produces loss of postnatal day 3 (PND-3) monkey frontal cortical neurons in culture. *Tox. Sci.* 91(1): 192-201, 2006.
26. Wang, C., Sadovova, N., Patterson, T.A., Zou, X., Fu, X., Hanig, J.P., Paule, M.G., Ali, S.F., Zhang, X., and Slikker W., Jr.: Protective effects of 7-nitroindazole on ketamine-induced neurotoxicity in rat forebrain culture. *NeuroToxicology* 29: 613-620, 2008.
27. Wang, C., Zhang, X., Zou, X., Paule, M.G., and Slikker, W., Jr. Ketamine and glutamate receptors: potential toxicity of general anesthetics during rapid brain development. *C. N. S. Agents Med. Chem.* 8: 85-91, 2008.
28. X. Zhang, X., Paule, M.G., Newport, G.D., Sadovova, N., Berridge, M.S., Apana, S.M., Kabalka, G., Miao, M., Slikker, W., Jr. and Wang, C.: MicroPET imaging of ketamine-induced neuronal apoptosis with radiolabeled DFNSH. Submitted, Neuroscience 2010.
29. Young, C., Jevtovic-Todorovic, V., Qin, Y.Q., Tenkova, T., Wang, H., Labruyere, J., and Olney, J.W. Potential of ketamine and midazolam, individually or in combination, to induce apoptotic neurodegeneration in the infant mouse brain. *Br J Pharmacol* 146: 189-197, 2005.
30. Zhang, X., Paule, M.G., Newport, G.D., Zou, X., Sadovova, N., Berridge, M.S., Apana, S.M., Hanig, J.P., Slikker, W., Jr. and Wang, C.: A Minimally-invasive, translational biomarker of ketamine-induced neuronal death in rats: microPET imaging using [18F]-Annexin-V, *Tox Sci* 111: 355-361, 2009.
31. Zou, X., Patterson, T.A., Divine, R.L., Sadovova, N., Zhang, X., Hanig, J.P., Paule, M.G., Slikker, W., Jr. and Wang, C.: Prolonged exposure to ketamine increases neurodegeneration in the developing

- monkey brain, *Intl. J. Develop. Neurosci.* 27: 727-731, 2009.
32. Zou, X., Patterson, T.A., Sadovova, N., Twaddle, N.C., Doerge, D.R., Zhang, X., Fu, X., Hanig, J.P., Paule, M.G., Slikker, W., and Wang, C.: Potential Neurotoxicity of Ketamine in the Developing Rat Brain, *Tox. Sci.* 108: 149-158, 2009.
33. Zou, X., Sadovova, N., Patterson, T.A., Divine, R.L., Hotchkiss, C.E., Ali, S.F., Hanig, J.P., Paule, M.G., Slikker, W., Jr., Wang, C.: The effects of L-carnitine on the combination of inhalation anesthetic-induced developmental neuronal apoptosis in the rat frontal cortex. *Neuroscience* 151: 1053-1065, 2008.