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In vivo Activity of Canine Expiratory Bulbospinal Neurons is Differentially Affected by Two Non-N-methyl-D-aspartate Receptor Antagonists

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Aim. Examination of the contribution of non-N-methyl-D-aspartate (non-NMDA) receptors to the spontaneous activity of caudal bulbospinal expiratory (E) neurons.
Method. The in vivo action of the non-NMDA receptor antagonists from the quinoxalinedione group, widely used 6-cyano-7-nitroquinoxaline-2,3-dione (CNQX), and the more recently introduced 2,3-dihydroxy-6-nitro-7-sulfamoyl-benzo(f)quinoxaline (NBQX), was tested on caudal expiratory bulbospinal neurons in the ventral respiratory group. Studies were carried out in thiopental sodium anesthetized, paralyzed, mechanically ventilated dogs. Multibarrelled micropipettes were used to record single unit neuronal activity and to pressure-eject drug solutions.
Results. Pressure picoejection of the agonists for both NMDA and non-NMDA receptors, NMDA and a-amino-3-hydroxy-5-methylisoxazole-4-propionic acid (AMPA), respectively, induced excitations in these neurons. Both CNQX and NBQX blocked the AMPA-induced increases in neuronal discharge frequency (Fn), but CNQX also depressed the NMDA-induced increases in Fn, while NBQX was without effect. The spontaneous discharge activities of the E neurons, whether phasic during respiratory rhythm or tonic during hypocapnic apnea, were significantly reduced by CNQX, but not by NBQX.
Conclusion. Our findings not only provide additional evidence that NBQX is a much more selective antagonist for the non-NMDA receptors than is CNQX, but also suggest that activation of NMDA receptors and not non-NMDA receptors is a major contributor to the spontaneous activity of expiratory bulbospinal neurons in dogs in vivo.

Key words: neurons, afferent; NMDA receptor; quinoxalines; respiratory system