BACKGROUND: Suppression of nociceptive signalling in the thalamus is considered to contribute significantly to the anaesthetic state. Assuming additivity of anaesthetic mixtures, our study assessed the effects of corresponding minimum alveolar concentrations (MACs) of isoflurane and isoflurane/nitrous oxide on thalamic nociceptive signalling.

METHODS: Nociceptive response activity (elicited by controlled radiant heat stimuli applied to cutaneous receptive fields) of single thalamic neurons was compared in rats anaesthetized at approximately 1.1 and approximately 1.4 MAC isoflurane with that at approximately 1.1 and approximately 1.4 MAC isoflurane/nitrous oxide. RESULTS: Under baseline anaesthesia (approximately 0.9 MAC isoflurane), noxious stimulation elicited excitatory responses in all neurons (n = 19). These responses were uniformly suppressed at approximately 1.1 and approximately 1.4 MAC isoflurane. In contrast, at approximately 1.1 and approximately 1.4 MAC isoflurane/nitrous oxide, excitatory responses no different to baseline were still present in 64 and 37% of the neurons, respectively.

CONCLUSIONS: These data demonstrate a pronounced nitrous oxide-induced response variability. It appears that, with respect to thalamic transfer of nociceptive information, the interaction of isoflurane and nitrous oxide has divergent effects on thalamic nociceptive signalling.
oxide may not be compatible with the concept of additivity and that the antinociceptive potency of nitrous oxide is considerably less than previously reported.