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Is postoperative hypernociception associated with anxiety-like behaviour in rats?

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ABSTRACT

Existing animal models of postoperative pain have focused on the sensory aspects of postoperative nociception and have ignored the affective components of pain, such as anxiety, which in human studies have been shown to be important determinants of the overall pain experience and pain outcomes. Therefore, I investigated whether anxiety-like behaviour in rats was a feature of an established animal model of postoperative pain. Postoperative hypernociception was assessed on a daily basis prior to surgery and nine days after surgery in 10 male Sprague-Dawley rats, that had had an incision made through the abdominal wall. Nociceptive thresholds were tested using an anaesthesiometer, which was applied to the wound until the rat showed aversive responses. Anxiety-like behaviour was assessed in a separate group of 50 experimental and 50 control rats that had undergone the same surgical intervention or sham surgery (anaesthesia only). The open field paradigm was used to test anxiety-like behaviour and involved placing rats in a 1 m^2 arena and measuring their exploratory behaviour; behaviour that is reduced in anxious rats. Additional 40 experimental and 40 control rats were decapitated and trunk blood was collected for corticosterone measurement, and the prefrontal cortices and hippocampi were excised for measurement of monoamines, including serotonin, noradrenaline and dopamine, as well as the neurotransmitters GABA and glutamate on postoperative days one, two, four and nine. Surgery produced a significant decrease in nociceptive thresholds for up to six days, however there was no significant decrease in exploratory behaviours between control and surgery rats at any stage after surgery. There was also no significant difference between the monoamines, GABA, glutamate or corticosterone levels between the surgery and control groups, on any of the postoperative days I assessed. However, a significant increase in dopamine

concentrations in sham surgery rats compared to control and surgery groups was found. It therefore appears that, in an established model of postoperative pain, rats do not display anxiety-like behaviour, or express circulating or brain biomarkers of stress.