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Expression and distribution of SP and its NK1 receptor in the brain-gut axis in neonatal maternally separated rat model with visceral hypersensitivity

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ABSTRACT. Neurokinin-1 receptor (NK1R) is a high affinity Substance P (SP) receptor and plays a key role in visceral hypersensitivity in irritable bowel syndrome (IBS). Early life stress is a significant risk factor in IBS. The aim of the present study was to investigate the influence of neonatal maternal separation on the expression and distribution of SP and its receptor along the brain-gut axis in a neonatal maternally separated rat model with visceral hypersensitivity. Male neonatal Sprague-Dawley rats, 2-21-day old, were randomly distributed into maternal separation groups of 3 h daily maternal separation (MS) or

non-handling (NH). These rats underwent colorectal balloon distention (CRD) upon reaching adulthood. Immunofluorescence was used to examine the distal colon, lumbosacral spinal cord, and the brainstem to semi-quantitatively determine SP and NK1R expression before and after CRD. The following features were assessed: percentage SP-positive area in colonic muscle layer, the number of NK1R-positive myenteric plexus, SP-positive area and NK1-positivity score in the dorsal horn and the brainstem. Neither of these was altered in the MS and NH groups before or after CRD. These results suggest that the SP system might play little role in the development of visceral hyperalgesia in the neonatal maternal separation rat model.

Key words: Irritable bowel syndrome; Neonatal maternal separation; Substance P; Neurokinin-1 receptor; Brain-gut axis; Rat