The effect of microinjection of dimethyl sulfoxide into the rostral ventromedial medulla on swim stress-induced analgesia

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Abstract

Background: Dimethyl sulfoxide (DMSO) is an important solvent for compounds that used in pain research. Rostral ventromedial medulla (RVM) plays an important role in modulating nociception and stress-induced analgesia (SIA).

Objective: The aim of this study was to investigate the effect of DMSO administration into the RVM on SIA by using formalin test.

Methods: This experimental study was conducted on 27 Wistar male rats (200±30 gr) were randomly assigned to control, stress and stress+DMSO groups. Animals were placed in a water reservoir (20±1°C) for 3 minutes to induce forced swimming stress. Stereotaxic surgery was performed to microinjection of DMSO (0.5μl, 100%) into RVM. The pain behavior score was evaluated by subcutaneous injection of formalin 2% in the dorsal plantar region of hind paw.

Findings: The pain score of phase 1, interphase and phase 2 of formalin test in swim stress group decreased significantly in comparison to control group (P<0.001, P<0.05, P<0.001) respectively. In addition, the pain score of three phase of formalin test after DMSO injection in swim stress group decreased significantly in comparison to control and stress group (P<0.001, P<0.05) respectively.

Conclusion: Also microinjections of DMSO into the RVM potentiate the swim stress analgesia. According to the analgesic effects of dimethyl sulfoxide, as well as its ability to potentiate stress-induced analgesia, DMSO should be used with caution as a solvent in pain studies.

Keywords: Rostral ventromedial medulla, Dimethyl sulfoxide, Swim stress, Formalin test, Stress-induced analgesia