Morphology Alterations of Synapses in the Ventromedial Nucleus (VM) of Thalamus and Caudal Nucleus Tractus Solitarius (NTS) after 10 Hz Electroacupuncture in Rats

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ABSTRACT Previous results demonstrated that 10 Hz electroacupuncture (EA) of Anmian acupoints in rats during the dark period enhances slow wave sleep (SWS), which involves the induction of cholinergic activity in the caudal nucleus tractus solitarius (NTS) and subsequent activation of opioidergic neurons and μ-receptors. One ascending projection is from NTS to the ventromedial nucleus (VM) of the thalamus (the NTS-VM pathway). Wakefulness is accompanied by synaptic potentiation in the cortical circuits, whereas slow wave activity (SWA) during SWS promotes a generalized depression or downscaling of synaptic strength. The VM receives opioidergic inputs from NTS and the activation of opioid receptors hyperpolarizes neurons of VM. Accordingly, 10 Hz EA may increase synaptic activity of NTS and subsequently hyperpolarize and downscale the synaptic strength in the VM of thalamus by inhibitory afferents, which lead to enhance SWS. Enhancement of excitatory synapses in NTS and inhibitory synapses in VM may respectively contribute to the up-regulation of synaptic strength in NTS and downscaling of synaptic strength in the VM after 10 Hz EA. Our results demonstrated that the synaptic density was increased in both NTS and VM after rats received 10 Hz EA stimuli, while the enhanced synaptic length was only observed in the NTS, suggesting that 10 Hz EA altered excitatory synaptic strength of NTS and inhibitory synaptic strength of VM by changing the synaptic morphology. [Cheng CH, Yi PL, Chang HH, * Chang FC. Morphology Alterations of Synapses in the Ventromedial Nucleus (VM) of Thalamus and Caudal Nucleus Tractus Solitarius (NTS) after 10 Hz Electroacupuncture in Rats. Taiwan Vet J 38 (2): 75-83, 2012. * Corresponding author TEL: 886-2-3366-3883, FAX: 886-2-2366-1475, E-mail: fchang@ntu.edu.tw]

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