Abstract

Patients with obstructive sleep apnea (OSA) have increased basal sympathetic nervous system activity, blood pressures, and cardiorespiratory responses to acute hypoxia. These effects are thought to be due to chemoreceptor activation. Afferent neurons projecting from the carotid body chemoreceptors synapse in the nTS of the brainstem where glutamate is released as the primary excitatory neurotransmitter. Chemoreceptor information is sent via the afferent pathways to the nTS, including on RVLM-projecting neurons. NR1 receptors are located in the nTS and decrease with CIH.

Introduction

Obstructive sleep apnea (OSA), affecting approximately 8% of women and 24% of men, is a sleep disorder in which cyclical cessation in breathing is observed. This pattern is induced by repetitive upper airway blockages or temporary collapses in the trachea while sleeping. Humans with OSA have symptoms such as increased basal sympathetic nervous system activity, increased blood pressure, and decreased oxygen levels. To study the functional and anatomical identification of the RVLM, colabeling decreases with CIH.

Methods

Retrograde Tracer

The retrograde tracer FluoroGold (FG, 2%, 30 ml) was microinjected into the RVLM region of the brain. The brains were removed and the brainstem was cut into 30-µm coronal sections on a vibratome. Immunohistochemistry was performed in a series. Tissue sections were mounted on slides and visualized using Progol Gold medium.

Summary of Data

• NR1 subunits of NMDA glutamate receptor are localized throughout the nTS region of the brain in normoxic and following CIH.

Conclusions

The trend for NR1 glutamate receptors (NRDAR1s) to decrease with CIH refutes our hypothesis. When active, NMDAR1s allow entry of calcium into the cell. From prior studies, we know that glutamate is increased in the chemosensitive-nTS synapse during hypoxia. The decrease in NMDA receptors may function to prevent excitation cell death from elevated levels of calcium in the cell in response to CIH and increased levels of glutamate.

Future Directions

• Increase n in order to achieve significant difference in the study.

• Run Western Blots to quantify total NR1 glutamate receptor protein in the nTS region of the brain.

• Immunohistochemistry was completed on NR2A and NR2B glutamate subunit receptors. Image analysis is in progress.

• Study other NMDA glutamate receptor subunits.

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