THREE-DIMENSIONAL COMPUTER MODEL OF THE BRAINSTEM RESPIRATORY NEURONAL CIRCUITS - APPLICATION FOR TEACHING PURPOSES AND RESEARCH IN RESPIROLOGY

S. Gavliaková, I. Poliaček, J. Jakuš, J. Plevková

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D2.3 IMAGE ATLASES AND MULTIMEDIA FOR EDUCATION

The aim of the presented project was to create an intuitive graphical tool for medical students and scientists who study neuronal clusters in the brainstem responsible for the generation and regulation of breathing and respiratory defensive reflexes. These neurons are located in several areas which are described as the dorsal and ventral respiratory group, pontine respiratory group and parafacial respiratory group. Defined neural circuits are involved in generating breathing pattern and their reconfiguration leads to initialization and neurogenesis of defensive reflexes. Data on neurons and their exact location were taken from stereotaxic atlas and number of relevant scientific papers published in the field of neurophysiology and experimental respirology, and these data were processed into tabular form. Recorded neurons were plotted on the coordinates of their location in the brainstem model created by isosurface in the computer environment MATLAB. Visual display of neurons in three-dimensional space allows better orientation in this anatomical area for students of medicine and provides a vision of their mutual relations, the possibility of convergence of nerve impulses and helps in understanding the complexity of the respiratory network. The model is beneficial for scientists who deal with issues of microinjecting into the brainstem or with the recording of electrophysiological parameters from defined neuronal populations. The model is flexible and upgradeable since the creation of tabular databases of neurons localization in Excel allows adding new data. Keywords: respiratory neurons, brainstem, model, location, respiration, respiratory centre.