

Cerebrospinal fluid-contacting neurons, the role of their various receptors and axon terminals in the nonsynaptic signal transmission

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The system of cerebrospinal fluid (CSF)-contacting neurons represent special nerve cells taking up, transforming and emitting nonsynaptic signals mediated by the CSF. Most of them send dendritic processes bearing sensory cilia into the brain ventricles and central canal and are similar to known sensory cells of chemo-, mechano- and/or photoreceptor-type (Fig. 1). The axons of the CSF-contacting neurons transmit information taken up by their dendrites to synaptic zones of various brain areas or form neurohormonal terminals releasing various bioactive substances to the external CSF space. Some of their axons enter the internal CSF, terminating there by free endings. Sensory-type cilia were also found to extend into the intercellular spaces from nerve cells situated in various brain areas including brain cortex.

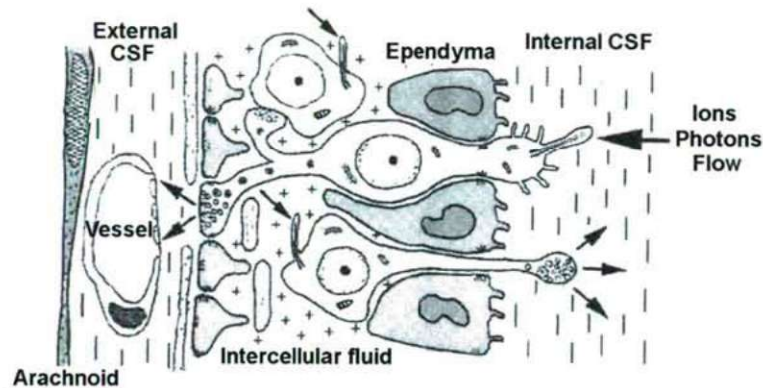


Figure 1. CSF-contacting neurons. Arrows: neurohormonal and nonsynaptic signaltransduction.

Some secondary neurons of the retina and pineal organ directly contact the retinal photoreceptor space (Landolt' clubs) and pineal recess, respectively. The composition of the fluid of the photoreceptor space and the CSF of the pineal recess may modify the activity of these neurons. CSF-contacting neurons representing the deep encephalic photoreceptors contain various opsins and detect the illumination of the brain tissue and play a role in the circadian periodicity of the organ.

CSF-contacting dendrites of the oblongate medulla, spinal cord and terminal filum bear kinocilia, and resemble mechanoreceptors. Terminating at the external CSF-space, the axons of these neurons form neurohormonal nerve endings.

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