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Osmotic Control and Vascular-Glial Unit Formation in the Circumventricular Organs

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Summary

The sensory circumventricular organs (CVOs), including the organum vasculosum of the lamina terminalis (OVLT), subfornical organ (SFO), and area postrema (AP) allows parenchyma cells to sense a variety of blood-derived information, since they lack the blood-brain barrier (BBB) or endothelial tight junctions. In the present study, we examined dynamic gliovascular interaction for controlling osmotic homeostasis in the sensory CVOs of adult mice. The expression of TRPV1 was observed in the sensory CVOs such as the OVLT, SFO, and AP of adult mice by using reverse transcription-polymerase chain reaction and Western analyses. Confocal microscopic observation revealed that TRPV1 expression was observed at cellular processes of astrocytes close proximity to fenestrated vasculature to constitute dense networks, whereas such structural interaction was not observed between dendritic processes and fenestrated vasculature. Moreover, neuronal somata were often surrounded by TRPV1-positive cellular processes of astrocytes and dendrites. Thus, the present study demonstrates the direct brain sensing mechanism for blood-derived information through astrocytic TRPV1 in the sensory CVOs.