

# Abstract Information

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<b>Title :</b>	Fueling the White Matter: Distinct Metabolism in Oligodendrocytes, Astrocytes, and Axons
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<b>Abstract :</b>	<p>Axonal integrity is crucial for brain function. However, the mechanisms by which oligodendrocytes and astrocytes support axonal health in white matter, especially their metabolic interactions and energy sources, remain poorly understood. In this study, we used two-photon imaging of the optic nerve alongside compound action potential (CAP) recordings to monitor both cellular ATP homeostasis and axonal spiking activity. We developed novel adeno-associated virus (AAV) delivery strategies to express the FRET-based ATP sensor Ateam1.03 specifically in optic nerve oligodendrocytes or astrocytes. Our findings revealed distinct metabolic capacities in glial cells and axons. Both oligodendrocytes and astrocytes were able to maintain some ATP levels in the absence of glucose, while axonal conduction ceased entirely. Oligodendrocytes were more efficient in switching to lipid metabolism during aglycemia compared to astrocytes, which required more time to initiate this pathway. We also identified differences in the ability of axons and glial cells to metabolize other substrates for ATP production. Our findings suggest that both oligodendrocytes and astrocytes can metabolize fatty acids or other substrates during hypoglycemia, potentially allowing the precious glucose to be delivered to axons to support critical antioxidant functions. Such glial metabolic flexibility, and possibly their glucose-sparing capacity, could be impaired in white matter diseases or in inflammatory conditions, which requires further research.</p>
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