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## Estimating glutamate transporter surface density in mouse hippocampal astrocytes

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# Estimating glutamate transporter surface density in mouse hippocampal astrocytes

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One of the main functions of astrocytes is to remove glutamate from the extracellular space, a task that is accomplished through the activity of glutamate transporters expressed in abundance in the plasma membrane. This property allows astrocytes to limit glutamate diffusion out of the synaptic cleft, to limit extrasynaptic receptor activation and preserve the spatial specificity of synaptic transmission. The distribution of glutamate transporters on is known to be heterogeneous, as these molecules are enriched in astrocyte tip processes as opposed to the rest of the membrane.

We investigate in depth the effect of this non-uniform distribution, while also evaluating how local crowding effects can limit the transporter expression in small astrocytic processes. We generate a geometric model of astrocytes that capture statistically the main structural features of real astrocytes, to help estimate the proportion of the astrocyte cell membrane in different cellular compartments. We found stark differences in the density of expression of transporter molecules in different compartments, indicating that the extent to which astrocytes limit extrasynaptic glutamate diffusion depends not only on the level of astrocytic coverage, but also on the identity of the compartment in contact with the synapse. We discuss the potential long-range implications of these findings on the fields of synaptic plasticity and astrocyte physiology.