2-O-032 Oral Sessions

Dynamics of neuron-induced astrocyte tiling and self-avoidance

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An astrocyte makes thousands of finely branched processes to approach neurons. Each astrocyte expands processes to form an exclusive territory with limited penetration of processes from neighboring astrocytes. This is a phenomenon called tiling. Whether their extensive branching sterically interferes entry of other astrocyte processes, or astrocyte processes actively avoid each other to form exclusive territories, was not known. Here we show that neurons not only induce extensive branching but also induce its tiling in two-dimensional culture. Time-lapse imaging of GFP-labeled astrocytes indicates that their processes grow in the direction where astrocyte processes do not exist, both of their own and of neighbors. After neuronal loss induced by glutamate excitotoxicity, terminal processes of astrocytes were lost, more branches went over other branches to violate tiling, while area of their territories did not significantly change. Our results indicate that neurons induce astrocyte branches that avoid each other for uniform coverage of brain parenchyma.