Analysis of Contactin-3 Expression in Cortical Interneuron Subtypes

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Cortical interneurons (INs) are a diverse group of INs crucial for regulating excitatory pyramidal neuron (EPN) activity– with dysfunction in certain IN types linked to neurological disorders such as epilepsy and schizophrenia (Dienel & Lewis, 2019). Among cortical INs, Chandelier cells (ChCs) are particularly notable for their powerful influence on cortical networks, due to their unique targeting of the influential Axon Initial Segment (AIS) on EPNs. However, the molecular mechanisms underlying ChC innervation to the AIS remain poorly understood. One protein potentially involved in ChC-specific innervation is Contactin-3, a cell adhesion protein significant in synaptic formation between INs (Shimoda & Watanabe, 2009). Its specificity in ChCs compared to other IN types, such as Vasoactive Intestinal Peptide (VIP) and Somatostatin (SST) cells, has not been confirmed. In this study, we investigated the gene expression of Contactin-3 in ChC, VIP, and SST cells in mouse brain tissue. We hypothesized that Contactin-3 expression would be significantly higher in ChCs than in VIP or SST cells. Statistical analysis revealed a significant difference between ChC, VIP, and SST cells ($p = 0.00064$, $F(2, 54) = 8.455$). No significant difference was found between VIP and SST cells ($p = 0.4161$). These findings support our hypothesis, suggesting that Contactin-3 is involved in ChC-specific innervation and may serve as a potential target for therapeutic interventions aimed at treating ChC-associated disorders.

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