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Abstract Draft #3

”Quantification of Prevalence and Morphology of Spinule-Bearing and Non Spinule-Bearing Perisomatic Inhibitory Boutons in CA1 Hippocampus”

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Inhibitory synapses are critically important connections between neurons that release gamma-aminobutyric acid (GABA), which regulates neuronal activity, behavior, cognition, and prevents seizure-like activity. Presynaptic boutons (neurotransmitter releasing side of a synapse) often receive finger-like projections from surrounding neurons, called spinules, which may represent an unexplored from of neuronal communication and/or regulate synaptic strength and stability. Yet while spinules within select excitatory boutons have been quantified, there is no published data on spinules within inhibitory synapses. Hence, we performed a pilot study with the goal of quantifying the proportions of inhibitory presynaptic boutons within the memory center of the brain (CA1 hippocampus), to determine differences between spinule- bearing boutons (SBBs) and non spinule-bearing boutons (non-SBBs). Toward this end, we analyzed perisomatic inhibitory synapses within a large TEM image volume of CA1 from an adult mouse brain. We categorized inhibitory bouton synapses based on their spinules and post synaptic partners. In addition, we three-dimensionally reconstructed 570 boutons, 71 XX synapses, and 28XX spinules, and quantified their surface areas and volumes. We discovered that 58% of perisomatic inhibitory boutons in our volume were SBBs, and that SBBs were 2X larger than non-SBBs. In addition, we found that 60% of spinules within perisomatic inhibitory SBBs originated from somas, whereas ≤13% projecting from other sources. Together, these findings demonstrate that synaptic spinules are ubiquitous structures within CA1 inhibitory boutons, that inhibitory SBBs represent a subpopulation of larger and likely stronger boutons, and that somatic spinules may allow for unique excitatory to inhibitory communication in CA1.