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2. Title
   Neural Circuits of Nicotine Reinforcement Involving the Supramammillary Nucleus and Dopaminergic Reward System

3. Period
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4. Summary
   Neural circuits mediating nicotine reinforcement extend beyond ventral tegmental area dopamine neurons, implicating additional, noncanonical substrates. The hypothalamic supramammillary region (SuM) has been identified as one such site, yet the cellular targets and circuit mechanisms through which nicotine engages the SuM remain unclear. In this study, we employed RNAscope in situ hybridization techniques in mice (both male and female) to examine the expression pattern of nicotinic acetylcholine receptor (nAChR) subunits in SuM neurons. Notably, we observed a prominent expression of the β2 subunit in VGluT2-expressing neurons projecting to the medial septum. We established robust intravenous nicotine self-administration in mice and identified dose ranges that reliably support reinforcement under fixed-ratio and progressive-ratio schedules. Using fiber photometry, we show that reinforcing doses of nicotine elicit rapid, infusion-locked increases in calcium activity in SuM VGluT2 neurons *in vivo*. Together, these findings identify nAChR-expressing SuM neurons as a candidate circuit substrate contributing to nicotine reinforcement and expand current models beyond traditional mesolimbic dopamine pathways.