

## **Basal forebrain gating by somatostatin neurons drives cortical activity**

Nelson Espinosa, Alejandra Alonso, Cristian Morales, Pablo Fuentealba

Centro Interdisciplinario de Neurociencia UC, Departamento de Psiquiatria, Escuela de Medicina, Pontificia Universidad Catolica de Chile

### **Abstract**

The basal forebrain provides modulatory input to the cortex regulating brain states and cognitive processing. Somatostatin-expressing cells constitute a local GABAergic source known to functionally inhibit the major cortically-projecting cell types. However, it remains unclear if somatostatin cells can regulate the basal forebrain's synaptic output and thus control cortical dynamics. Here, we demonstrate in mice that somatostatin neurons regulate the corticopetal synaptic output of the basal forebrain impinging on cortical activity and behavior. Optogenetic inactivation of somatostatin neurons in vivo increased spiking of some basal forebrain cells, rapidly enhancing and desynchronizing neural activity in the prefrontal cortex, inhibiting slow rhythms and increasing gamma oscillations. Locomotor activity was specifically increased in quiescent animals, but not in active mice. Altogether, we provide physiological and behavioral evidence indicating that somatostatin cells are pivotal in gating the synaptic output of the basal forebrain, thus indirectly controlling cortical operations via both cholinergic and non-cholinergic mechanisms.