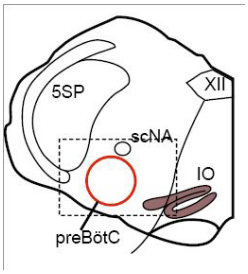
Sleep-disordered breathing after targeted ablation of preBötzinger complex neurons.

Nature Neuroscience, 8:9 (2005), Leanne C. Mckay, Wiktor A. Janczewski, Jack L. Feldman.

Sleep-disordered breathing.

- Obstructive apnea (effortful).
- Central apnea (Cheyne-Stokes) loss of rhythm, hypopnea cycles with hyperpnea, hypoxia and hypercapnia, during REM and NREM.
- preBötzinger complex NK1R ablation leads to ataxic breathing in waking adult rats.

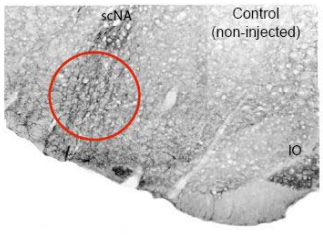
preBötzinger complex.



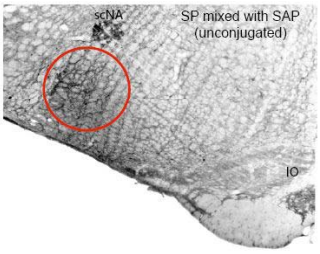
Surgical NK1R neuron ablation.

- EMG and EEG electrodes -> 14 days -> saporin + substance P (or control) injection -> 6, 8, 10.
- Directed at preBötzinger cells with NK1R.
- Possible nucleus ambiguous (vagus and glossopharyngeal) motoneuron damage.
- Look at amplitude, EEG, neck EMG.

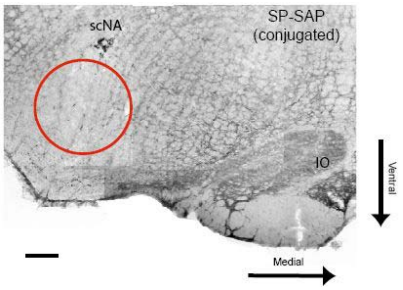
Control.



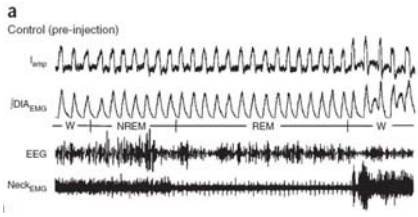
Unconjugated toxin + substance P.



Conjugated toxin + substance P.



Pre-injection.



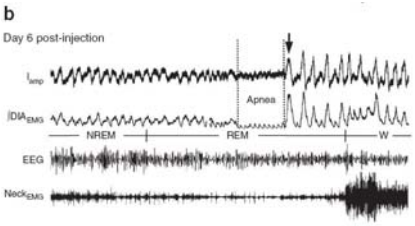
Day 4.

- Hypopnea and central apnea during REM.
- Normal during NREM and wakefulness.

Day 6.

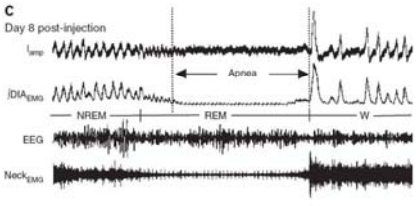
- Hypopnea during NREM -> REM apnea.
- PCO2 increased, PO2 decreased.

Day 6.

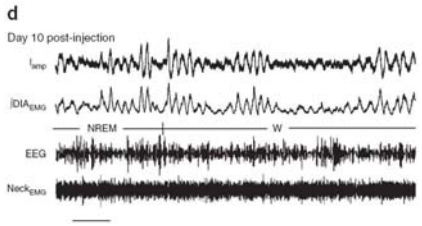


Day 7.

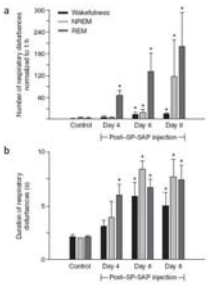
Day 8.



Day 10.

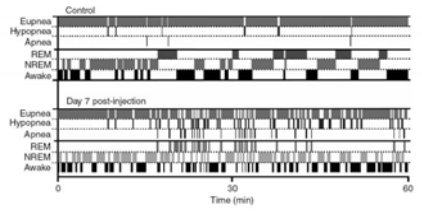


Respiratory disturbances.



- Cheyne-Stokes hypoxia-hypercapnia by day 7.
- Ataxic by day 10.
- Hypoxia led to more neuronal death.
- Inactive 5-HT and NE release during REM, preBötC vulnerable.

Respiration pattern.



Implications.

- ALS, MSA, Parkinson's.
- Cells with low calcium buffers vulnerable.
- Increase in threshold for arousal from apnea.
- Loss of preBötzinger complex cells with age.
- Mechanism for why people die in their sleep.