

Changes of systemic arterial blood pressure alter the cough reflex

Computational network models & *in vivo* experiments

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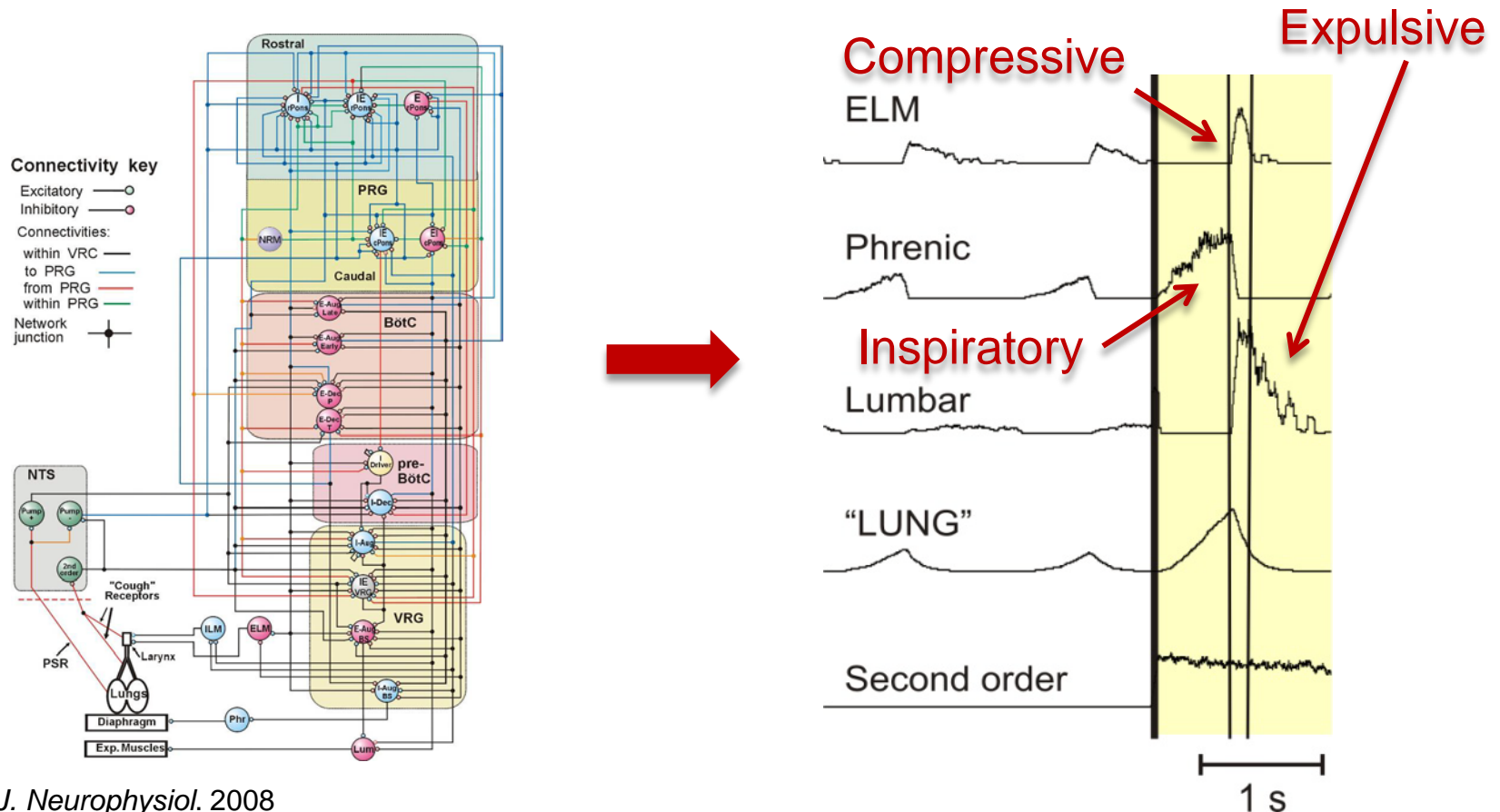
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Hypothesis: Common circuits for breathing & coughing

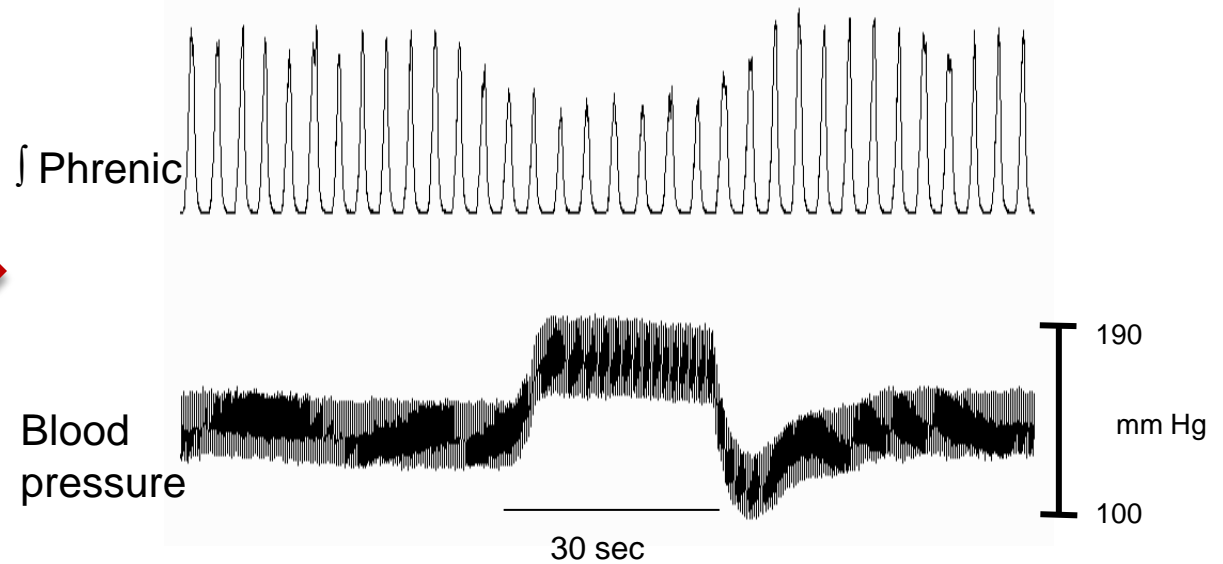
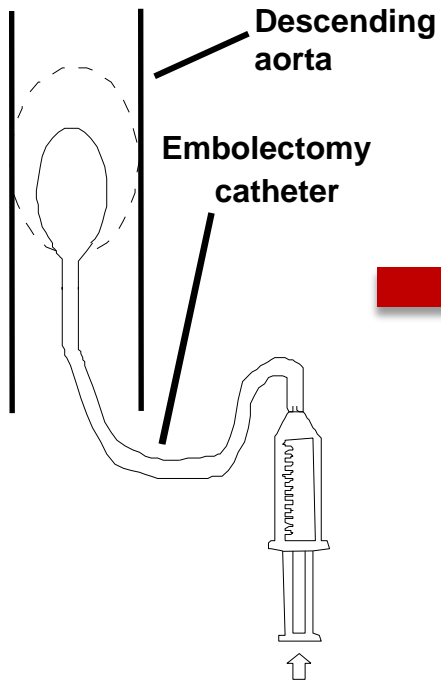
- Multi-site neuronal recordings, evoked cough motor pattern, & spike train analysis
- Network simulations: interconnected populations of IF neurons



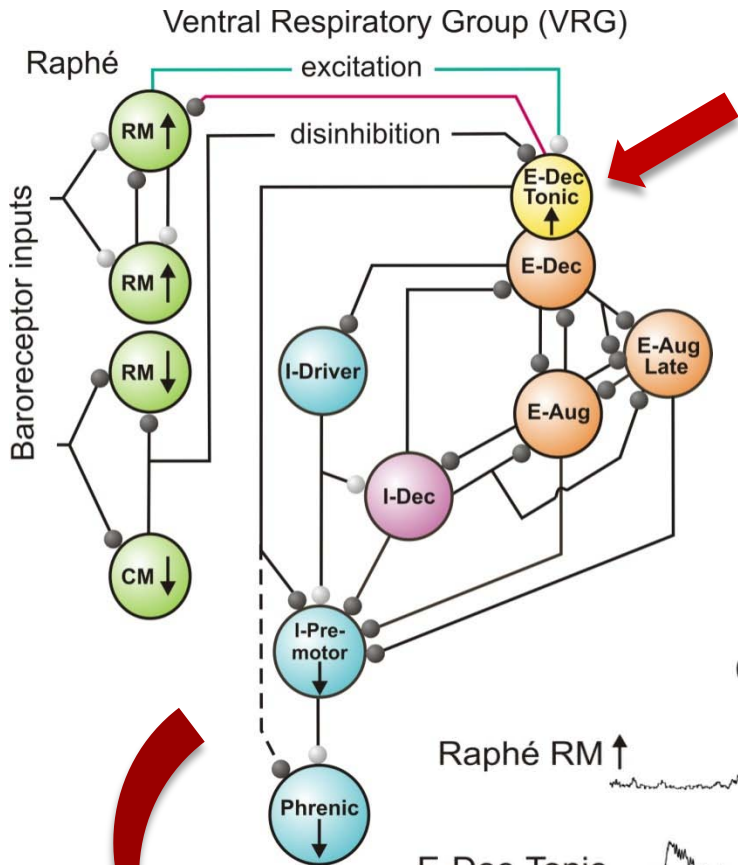
Rybak et al., *J. Neurophysiol.* 2008

Parallel studies on baroreceptor modulation of breathing...

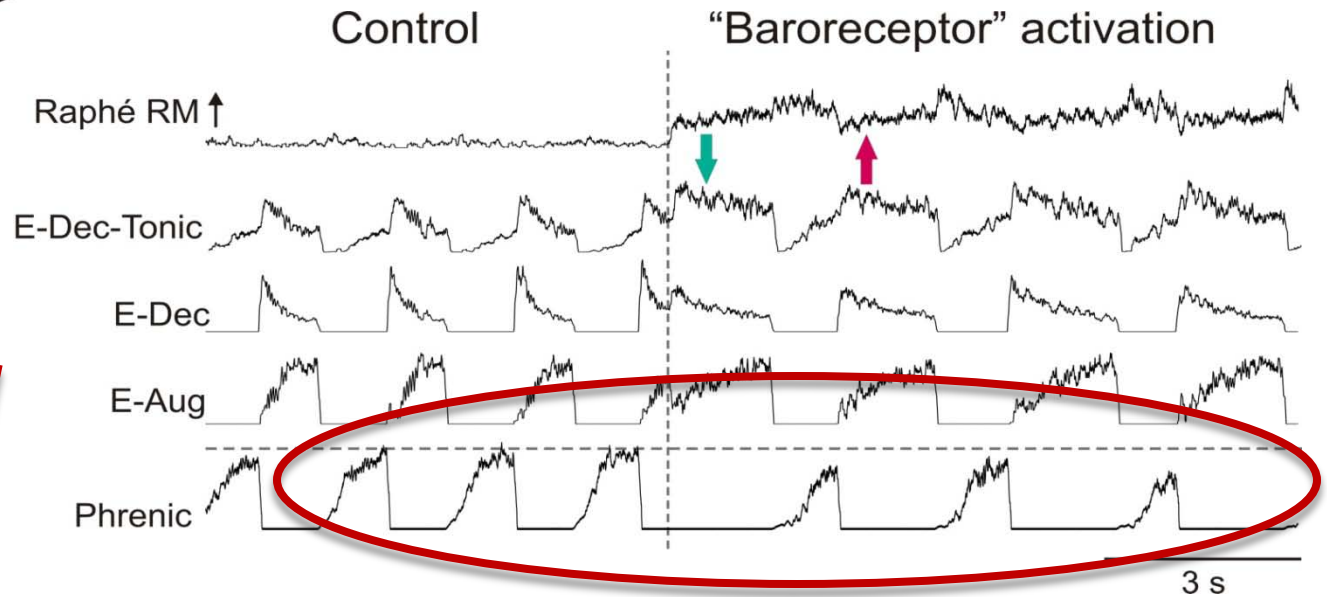
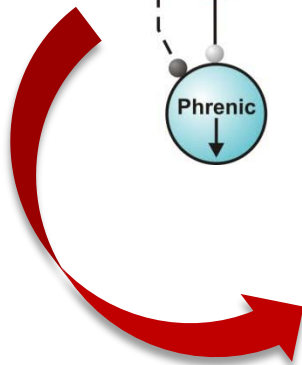
Baroreceptor stimulation reduces inspiratory drive



Spike train analysis led to a network model...



Model: Increased E-Dec neuron activity {tonic, phasic populations} reduces inspiratory drive and prolongs the expiratory phase.



Lindsey et al., 2007

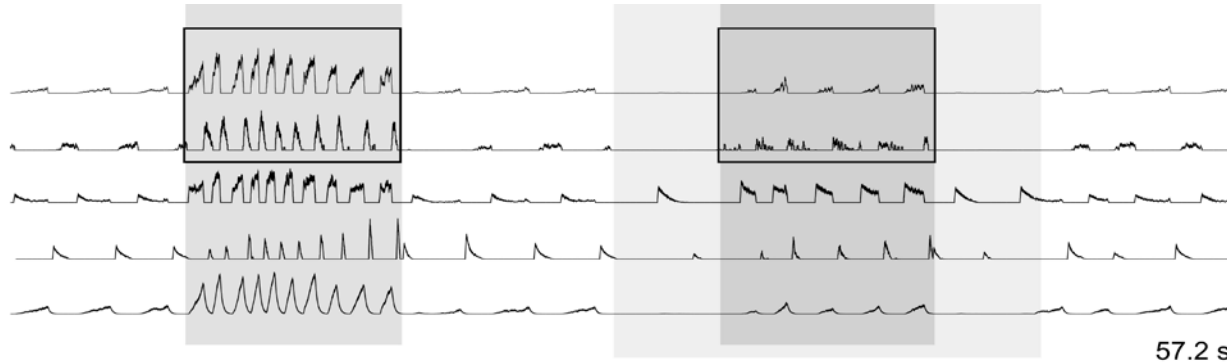
Next step: Influence of this “baroreceptor” modulation on cough?

Model

CONTROL cough

Baroreceptor & cough

PHRENIC
LUMBAR
ILM
ELM
LUNG



57.2 s

Prediction: Transient elevation of BP reduces cough frequency & intensity

In vivo

CONTROL

BP increases

CONTROL

Stimulation — — — — —

BP

EP

PCA

ThAr

ABD

PS

200 mmHg

20 cm H₂O

100
0
100
0
100
0
100
0
% of average amplitudes during control coughs

1 min