Coordination of cough and swallow *in vivo* and *in silico*

T.E. Pitts[1], K.F. Morris[2], B.G. Lindsey[2], P.W. Davenport[1], I. Poliacek[1,3], D.C. Bolser[1]

1. Physiological Sciences, University of Florida, Gainesville, FL
2. Molecular Pharmacology and Physiology, University of South Florida, Tampa, FL
3. Institute of Medical Biophysics, Comenius University JFM, Slovak Republic

The respiratory pattern generation network of the ventrolateral medulla reconfigures to produce cough and swallow. The only extant network model of breathing, cough and swallow is based on data from decerebrated, unanesthetized cats. We compared *in silico* simulations to *in vivo* data from anesthetized cats. Coughs were elicited by mechanical stimulation of the trachea. Electromyograms (EMG) of the parasternal (PS) and transversus abdominis (TA) muscles identified cough. Swallow was elicited by injection of water into the pharynx and EMGs of the thyroarytenoid (ThAr), PS, and geniohyoid (GH) muscles identified swallow. Simulations predicted PS EMG amplitude of "post-swallow" cough would be greater than "pre-swallow" cough and this effect was observed *in vivo*. Simulations also reproduced *in vivo* finding of greater ThAr EMG magnitude during swallow than cough. However, important temporal features that govern cough and swallow coordination when both behaviors are co-expressed were not observed *in silico*, such as, during repetitive coughing, the expiratory phase (E_2) of cough is prolonged when swallow is present. We conclude the current model is predictive; the *in silico* simulations reproduce several important features of *in vivo* airway protection; however some temporal relationships between cough and swallow are not currently accounted for by the model. Supported by NIH HL 89104; HL 89071; HL 103415.