

Poster session: Respiratory Physiology

Role of the parafacial respiratory group in the recruitment of abdominal activity across sleep states

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Introduction: In resting conditions, breathing is typically characterized by an active inspiratory phase and a passive expiratory phase. Expiration may become active through abdominal (ABD) muscle recruitment during periods of increased inspiratory requirements. This respiratory rhythm is thought to be controlled by three coupled oscillators: preBötzinger complex (preBötC) for generating inspiration, the parafacial respiratory group (pFRG) for generating active expiration, and the post-inspiratory complex (PiCo) which is thought to control the post-inspiratory phase. Research addressing the role of pFRG in ventilation and rhythm generation across sleep states is limited. Recent work in our laboratory reports the occurrence of ABD recruitment during REM sleep, despite the induction of muscle paralysis during this sleep state. This ABD recruitment was associated with a stabilization of breathing in healthy rats. Because pFRG generates active expiration through the engagement of ABD muscles, we hypothesize that the expiratory oscillator is also responsible for the ABD recruitment observed during REM sleep in healthy rats.

Objective: To demonstrate of the parafacial respiratory group in the recruitment of abdominal activity across sleep states.

Material and Methods: To test this hypothesis, we inhibited and activated the pFRG oscillator using a chemogenetic approach (DREADDs) while simultaneously recording EEG, airflow, DIA, ABD and neck EMG of transfected rats across sleep/wake cycles.

Results: Manipulation of pFRG activity does not affect the sleep architecture. However, activity of pFRG seems to have an effect in the occurrence of ABD recruitment events during REM sleep. Inhibition of pFRG (N=7) significantly reduced the number of REM events with ABD recruitment and the intensity of these events (described as the ABD to

DIA ratio), whereas activation of this oscillator (N=8) resulted in an increase of the number of REM events in which ABD recruitment was observed and the intensity of those events. Interestingly, modulation of pFRG activity did not seem to affect the occurrence of ABD recruitment during NREM sleep.

Conclusions: The occurrence of ABD recruitment during sleep may be state dependent. Further research investigating the mechanisms behind the recruitment of ABD activity specifically during REM and NREM sleep will be necessary.

Keywords: sleep state, rats, parafacial respiratory group