

Recapitulation of REM sleep behavior disorder in rat model of Parkinson's disease

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Background: REM sleep is a phase of sleep characterized by rapid eye movement and atonia. REM sleep behavior disorder (RBD) is a clinical condition in humans where atonia is lost during REM sleep, and dream enactment often occurs. Studies show that idiopathic RBD cases commonly convert to a Lewy body disease, such as Parkinson's disease or Dementia with Lewy bodies. RBD therefore represents a specific risk factor for the development of Parkinson's disease, as it presents prior to the onset of motor symptoms.

Objective: The objective of this study was to evaluate RBD-like abnormalities in the paraquat and lectin rat model of Parkinson's disease.

Methods: Male Sprague-Dawley rats (n=7) were implanted with stainless steel screws and a wire electrode for polysomnographic (PSG) analysis, including EOG, EEG, and EMG. Rats began 90 day oral administration of paraquat (P, 0.078mg/kg) and lectin (L, 0.004%) with i.p. cholecystokinin (CCK, 3ug/kg) to induce a progressive parkinsonism. Motor behaviors and PSG recordings were taken every two weeks. EOG, EEG, and EMG waveforms were segmented into 10s epochs and features of EOG, EEG, and EMG were analyzed to determine when the rat was in REM sleep. The percentage of REM epochs with EMG activity was calculated as the percentage of REM epochs without atonia.

Results: Rats progressively declined in motor function over the course of 22 weeks, with the first sign of motor deficit at 4 weeks. Preliminary results indicate rats (n=3) show REM sleep without atonia at 2 weeks post-P+L initiation, prior to development of motor deficits.

Conclusions: REM sleep without atonia prior to the onset of motor deficits indicates a recapitulation of RBD-like abnormalities in the P+L rat model of Parkinson's disease. This data strengthens the face and construct validity of the P+L rat model as a model of both nonmotor and motor symptomatology.

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