Sleep Fragmentation and Corticosterone Response in Wild Type and Sodium Pump Alpha-2 Knockout Mice

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Introduction

Knockout mice for the alpha2 subunit of the sodium pump (*ATP1A2*) are a purported animal model of mania. In testing these mice for effects of sleep fragmentation on mania, corticosterone levels were measured as an indicator of stress.

Methods

Alpha-2 knockout and wild-type mice were raised from birth, separated by gender between 3-4 weeks of age, and sleep fragmented using the moving bar method for 1, 3, or 5 days. A given cage contained 3-5 mice per trial. Sleep fragmentation was performed in the same room as non-sleep deprived mice, with similar availability of food and water.
Serum was obtained immediately after completion of a trial. 1 microliter of serum was used to perform a corticosterone immunoassay (DetectX from Arbor Assays, Ann Arbor, Michigan).

Disclosure Statement

The authors do not have any potential conflict of interests in connection with this study.

Results

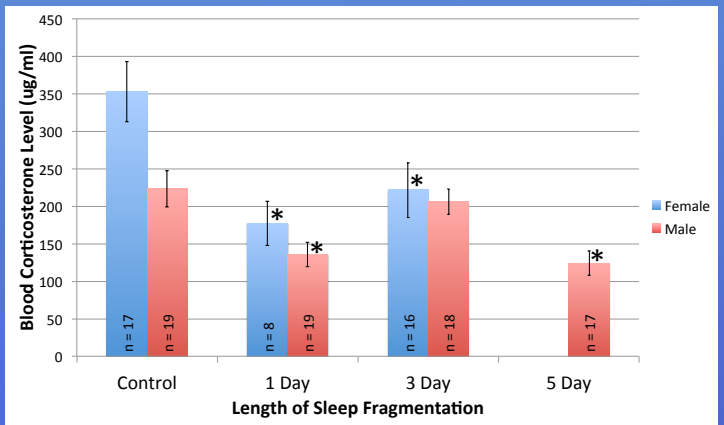

Fig. 1 Blood serum corticosterone concentrations after sleep fragmentation in knockout and wild-type mice. *p < 0.05 compared to gender control group.

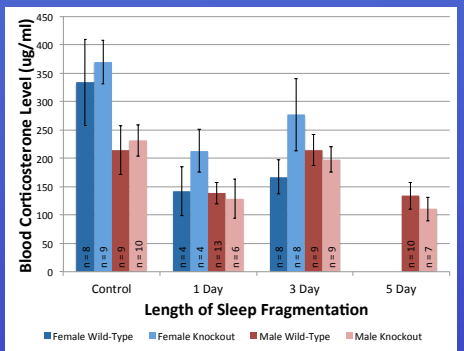

Fig. 2 Blood serum corticosterone concentrations after sleep fragmentation in knockout and wild-type mice, separately. Knockout groups did not show significance when compared to their matched wild-type.

Fig. 3 Sleep deprivation test chamber, sold by Lafayette Instrument Company, Lafayette, IN.

Conclusions

- No significant difference was found between wild-type and knockout populations in terms of corticosterone levels. Both groups were combined to calculate mean corticosterone levels.
- The corticosterone tests show below baseline levels in almost all time periods of sleep fragmentation, as opposed to the increase usually associated with sleep deprivation and sleep fragmentation.

Discussion

- Direct comparisons could not readily be made to previous literature, because previous tests of sleep fragmentation tended either to use very short periods (less than a day) or very long periods (a week or more) and generally did not report intermediate periods unless unrestricted sleep periods were also included at these intervals.
- Differing patterns of sleep fragmentation have been shown to produce very different effects on hormone levels and metabolism. The moving bar method of sleep fragmentation is a relatively new procedure, and this may suggest that the physiology produced by it is different in some significant way from previous models of sleep fragmentation.