We hypothesize the MT1KO mice will have a learning deficit, and the melatonin may be playing in this process. By completing this experiment, it will help us better understand learning and memory in humans, demonstrating decreased learning and memory compared to wild-type (WT).

The system that controls this is known as the circadian system, which is centralized in the suprachiasmatic nucleus. Melatonin (MLT) is a hormone that is released from the pineal gland following circadian rhythm with increased levels at night. Melatonin is a hormone released from the pineal gland, following circadian rhythm with increased levels at night. There are two main G protein-coupled receptors that MLT acts on, MT1 and MT2, which are both expressed in the central nervous system. MT1 through action on the MT1 receptor has been shown to inhibit long term potentiation (LTP) [1] LTP is considered a critical part of the learning and memory process [2]. In studies previously run in the lab mice lacking the MT2 receptor fail to develop a place preference for the drug methylphenidate, potentially through a deficit in forming an association between the drug and the environment it was given in. The goal of this proposal is to assess whether MLT has an effect on learning and memory. For this study, we will run a Novel Object Recognition Paradigm (NOR) which has been previously used in mice and rats to study short-term memory. This task is based on the fact that rodents are novelty preferring, therefore when placed in a chamber with a novel vs. familiar object the mouse or rat will spend more time with the novel object. It is expected that the mice that lack the MT1 receptor and therefore may inhibit learning and memory. For this study, we will run a Novel Object Recognition Paradigm (NOR) which has been previously used in mice and rats to study short-term memory. This task is based on the fact that rodents are novelty preferring, therefore when placed in a chamber with a novel vs. familiar object the mouse or rat will spend more time with the novel object.

Hypothesis
We hypothesize the MT1KO mice will have a learning deficit, thus not showing a preference for the novel object.

INTRODUCTION

Daylight Suppresses the Synthesis of Melatonin in the Mouse Pineal Gland
Melatonin Modulation of Novel Object Recognition

Melatonin is a hormone released from the pineal gland, following circadian rhythm with increased levels at night. Melatonin, a pineal hormone, exerts its effect through action on two G protein-coupled receptors: MT1 and MT2 [1].

MT1 and MT2 are potential therapeutic targets, ranging from cancer to depression to cardiovascular disease [2].

Melatonin inhibits long term potentiation through action on the MT1 receptor and therefore may inhibit learning and memory. Novel Object Recognition (NOR) is a study that is used in mice and rats to study short-term memory.

NOR is based on the idea that rodents have a preference for novel objects over objects that are familiar [3].

Hypothesis
We hypothesize the MT1KO mice will have a learning deficit, thus not showing a preference for the novel object.

OVERALL GOAL

To develop a Novel Object Recognition Paradigm using C57 mice

To determine the learning and memory differences in Novel Object Recognition between WT (wild type) and MT1KO mice.

APPARATUS AND METHODS

Paradigm 1: C57 WT

Familiar Object Exposure (% Time Spent with Familiar Objects)

Familiar Object Test (% Time Spent with Familiar vs. Novel Object)

Novel Object Exposure (% Time Spent with Familiar Objects)

Novel Object Test (% Time Spent with Familiar vs. Novel Object)

Paradigm 2: C57 MT1KO MICE

Familiar Object Exposure (% Time Spent with Familiar Objects)

Familiar Object Test (% Time Spent with Familiar vs. Novel Object)

Novel Object Exposure (% Time Spent with Familiar Objects)

Novel Object Test (% Time Spent with Familiar vs. Novel Object)

REFERENCES


SUMMARY & CONCLUSIONS

Paradigm 1:
• No recognition for novel object produced.

Paradigm 2:
• Strong preference for novel object observed in WT mice.
MT1KO mice showed no significant difference in time spent with novel vs. familiar object, suggesting an impairment in learning and memory.

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