INTRODUCTION

The neural basis of post-traumatic stress disorder (PTSD) is under active investigation. Brain areas such as the hippocampus and the amygdala have been implicated, due to their functions in stress, memory and in fear conditioning.

It has been shown that PTSD patients often suffer from drug addiction and/or reward sensitivity deficiencies. Both have been linked to the ventral tegmental area (VTA).

Moreover, the VTA projects to areas that have been previously implicated in anxiety disorders (Vermetten and Bremner, 2002).

Thus we investigate the role of the VTA in the development of anxious behavior. We also study the long-term consequences of the trauma on the firing of VTA neurons.

RESULTS

Reversible Inactivation

Animals that had VTA inactivation during the shock procedure had less avoidance for the place where the trauma was induced.

Electrophysiology

VTA cells respond in complex ways to electrical footshock

There was a significant long-term difference in the baseline firing rate of VTA dopamine neurons after trauma.

There were short-term but no long-term changes in the baseline firing rate of GABAergic neurons.

METHODS

Behavior

- Open field test (4)
- Pain (Tail Flick) and tactile (von Frey) sensitivity tests
- Black and white box test
- Elevated plus maze test
- Open field test
- Pain and tactile sensitivity tests

- No procedures
- Pre-shock testing procedures
- Post-shock testing procedures

High density electrophysiology

- Animals were implanted with a 50-channel recording array in the VTA to allow multi-channel recording of cell activity.

Data Analysis and Statistics

- ANOVA was used to analyze group differences.
- Two-way ANOVA was used to analyze group differences.
- Student's t-test was used to analyze group differences.

REFERENCES

Frey S. Role of the ventral tegmental area in anxiety disorders: electrophysiological and reversible inactivation studies in a rodent model of posttraumatic stress disorder

CONCLUSIONS

- We found that shocked rats show elevated stress levels, higher anxiety levels and increased reward sensitivity.
- Natural intracranial injections of 2.5% bupivicaine targeting the VTA decreases avoidance for the place where the trauma was induced, reduces anxiety levels and reduces hyperalgesia.
- We also show with electrophysiological experiments that VTA cells undergoes complex changes in response to the shock procedure. We found short-term changes in the baseline firing rates of non-dopamine neurons and long-term changes in the baseline firing rates of dopamine neurons.
- These findings indicate that VTA neurons undergoes short-term and long-term changes triggered by a traumatic event and the stress in VTA, maybe a crucial component of neural substrate responsible for the appearance of PTSD symptomatology.

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