Investigation of the Novel Peptide TUF1 in Context Conditioning

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Introduction

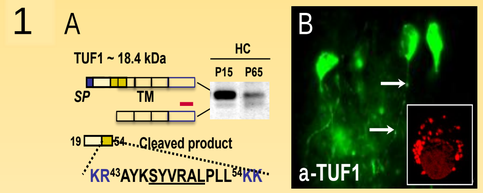
• TUF1 is a newly discovered peptide expressed in the hippocampus, amygdala, hypothalamus, and endocrine tissues (Figure 1B). These regions are crucial for the integration of external stimuli and play an important role in necessary responses for survival, such as fear acquisition to environments.

•This study will measure the role of TUF1 in context and will measure whether TUF1 expression is altered after contextual conditioning.

•Figure 1A shows the predicted structure of TUF1. Illustrated is the signal peptide (SP) and transmembrane region (TM).

•TUF has a p75 receptor-binding domain, a domain commonly found in neurotrophins such as brain-derived neurotrophic factor (BDNF). This indicates that TUF1 could have possible effects on neuronal plasticity.

1



Methods

•24 rats were broken up into 3 groups; immediate shock, delayed shock, and no shock. The immediate and no shock groups are controls and the delayed shock is the experimental group.

•Rats underwent a single trial contextual conditioning paradigm.

•The rats in the immediate shock group received a mild foot shock immediately upon entering the experimental chamber

•The rats in the delayed shock group received a mild foot shock after being placed in the experimental chamber for 2 minutes.

•The last group of rats received startle stimuli without a foot shock.

•While in the experimental chamber, all groups were subjected to 40 minutes of acoustic startle stimuli with a decibel level of 105dB.

•To conclude the animals were euthanized and their brains were obtained for tissue samples.

•A Western Blot was then conducted with the tissue samples.

Results

2

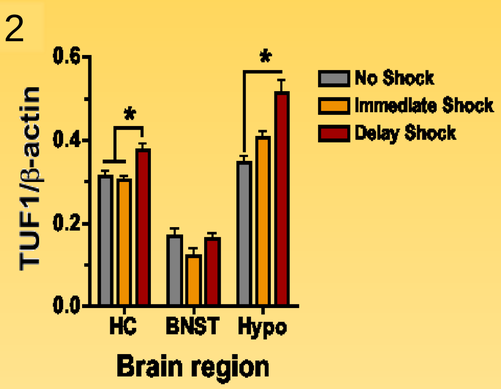


Figure 2: Western analysis of the hippocampus (HC), bed nucleus stria terminalis (BNST), and hypothalamus (Hypo). Values are means ± SEM, n=3-4/group, ANOVA, Bonferroni post hoc t-test.

3

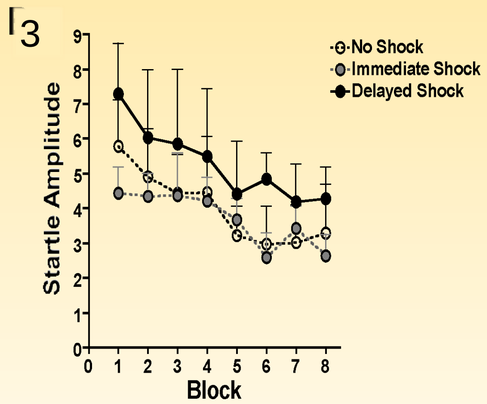


Figure 3: The startle session is divided into blocks of 5 minutes. Values are means ± SEM; n =4. At α= 0.01, required sample size=12, power of 0.8**.**

Conclusions / Discussion

•Delayed-shock rats showed greater fear conditioning which is likely due to the fact that they were able to associate their environment with receiving a shock.

•The no shock group demonstrates that the startle stimuli alone were not producing elevated TUF1 expression. The immediate shock group demonstrates that shock-induced stress alone was not causing elevated TUF1 levels. These two controls insure that any marked elevation in TUF1 was due to the learned shock-context association.

•There was an increase in TUF1 expression in areas thought to be involved in stress regulation, the hypothalamus, and in context conditioning, the hippocampus, of contextual fear-conditioned (Delayed-shock) compared with control (Immediate-shock or No-shock) rats.

• Both our behavioral and immunohistochemistry data strongly indicate that TUF1 is possibly involved in context conditioning.

Broader Impacts

•These positive findings suggest TUF1 might be a new modulator in fear conditioning.

•Any additional research on the role of TUF1 could prove to be beneficial in better understanding the neural mechanisms of fear learning.

•Research into TUF1 could further illuminate causes underlying certain anxiety disorders such as post traumatic stress disorder (PTSD), which involves impairments with context conditioning.

References

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