Effects of increasing adult hippocampal neurogenesis in mice during exposure to chronic stress

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INTRODUCTION

Local changes in the hippocampal network (addition of new neurons in the dentate gyrus) might change the activity of neural circuitry in the areas to which the hippocampus projects. Among those structures are the mPFC (medial prefrontal cortex), amygdala and nucleus accumbens (NAc), which has a crucial role in reward and motivation. There are two notable effects of chronic stress on neurogenesis (dcx 1) and ΔFosB (T).

AIM OF THE STUDY

- Investigate depressive-like behavior
- Mechanism: Long-term neuronal activity (ΔFosB) in the NAc and other areas?

HOW?

Using a transgenic mouse line (IBax), in which neural stem cells apoptosis was diminished, enhancing survival and functional integration of new born neurons in the adult brain.

WHAT WE WANTED TO DO

Increase neurogenesis during unpredictable chronic mild stress and behaviorally test these mice (with a focus on anhedonic features) when neurogenesis is at its peak

WHY?

Increasing neurogenesis is sufficient to reduce some of depressive-like behaviors (ΔFosB) in mice, but the mechanism has not been elucidated.

DISCUSSION AND CONCLUSIONS

Tamoxifen treatment induced an increase of neurogenesis in mice aged 13-16 weeks at the time of the injections. We observed an increase in the cookie consumption in the cookie test for the UCMS-TAM group, and such an increase may be related to hedonic features. We also observed a difference in the light-dark box test, where the UCMS-TAM group spent significantly more time in the light box, pointing to a less anxious phenotype. However, we did not detect a significant difference in coat state. No statistically significant difference was found between groups in locomotor activity, suggesting that the differences found in other tests are not due to different mobility. No statistically significant difference was found between groups in basal corticosterone, suggesting that the HPA axis was functioning normally during baseline conditions. Also, we did not observe any significant difference in neuronal activity in the NAc (core and shell), which prompts us to perform a brain-wide ΔFosB expression analysis and functional network construction.

Overall, we found that increasing adult hippocampal neurogenesis provided a buffer against the effects of stress on the behavioral level in regards to anhedonia in anxiety-like behavior, and further analyses are underway to examine these findings in more detail.

REFERENCES