Abstract

Early life adversity (ELA) increases the risk of developing life-long problems with mental health, whereas *environmental enrichment* (EE), in contrast, can serve as a protective factor. To advance our understanding of enrichment effects, our group has developed a new enrichment method (Enrichment Track) which is superior to the standard home cage enrichment protocols. In a previous study we show that enrichment of juvenile mice, with this method, improves mouse's performance on a battery of cognitive tests that lasts for several months. In this proposal, we aim to use our Enrichment Track to study whether enrichment can reverse the adverse effects of early life stress. Given the evidence that ELA affects hippocampal function, we are particularly interested in how EE and ELA alter hippocampal circuit properties. We hypothesize that EE can reverse the behavioral deficits due to chronic early-life stress (CES) and restore proper hippocampal function. After a period of CES, we will train the mice on our Enrichment Track, and then we will test their spatial memory. To study the neural representations in hippocampal 'place cell' maps, we will use a large-scale imaging method (head-mounted Miniscope) which enables us to track the activity of hundreds of neurons across several days and weeks, while mice are freely exploring the environment. We predict that CES mice that are trained on the Enrichment Track will show less memory deficits, and have a more stable 'place map' representation in a familiar environment. To our knowledge, these experiments represent some of the first steps to unravel how environmental enrichment could induce neuroprotection to help resist and contain the deleterious effects of a traumatic event at the neural circuit level.