Fear conditioning

Maladaptive behaviors such as anxiety disorders are associated with learning andmemory processes.

Fear conditioning is often used as a model for understanding anxietydisorders including post-traumatic stress disorder (PTSD). Like CPP experiments, fearconditioning is based on Pavlovian conditioning in which an organism learns to predictaversive events based on associative learning. The expression of learned fear functions toprepare an organism for “ fight or flight” responding. An investigation of how memory strength influences the recruitment of differentsignaling molecules will be of immense clinical value that could be applicable to thetreatment of many debilitating learning and memory diseases. I had shown that alteringthe stimulus salience of cocaine reward engages different neural substrates. However, it isunclear whether this effect is specific to appetitive learning and memory or if thisphenomenon is applicable to other paradigms of learning and memory.

My preliminarywork used the fear conditioning model to assess how changing the stimulus salienceaffects the acquisition of fear memory. Mice were divided into two groups: a) Fixedshock: mice given 4 shocks, each at 1. 1mA intensity and b) Escalating shock: micegiven 4 shocks at increasing intensities (0. 6, 0. 8, 1.

2 and 1. 8mA). The intensity for thefixed shock group represents the average shock intensity over 4 shocks of the escalatingshock group. Thus, I controlled for the total shock intensity to which mice were exposed. Figure 5.

2 shows the effect of the different training schedules on conditioned contextualfreezing response. Mice conditioned by escalating shock

intensities show higher freezingwhich was generally resistant to unreinforced exposures to the training context. However, mice conditioned by fixed shock intensities showed a significantly lower magnitude offreezing and freezing levels at the second test (re-test 1; day 6) and subsequent tests werenot statistically different from basal freezing levels.

Results suggest that an escalatingregimen of conditioning, be it appetitive or aversive, results in ‘ stronger’ memory. Futurestudies should investigate whether these behavioral differences between conditioning byfixed and escalating shock intensities engage different signaling pathways in theformation of fear memory. Additionally, an investigation of the contribution of NR2BcontainingNMDARs in determining memory strength would solidify the involvement ofthe NR2B subunit as an important regulator of memory strength. This would thereforeidentify NR2B-containing NMDARs as potential targets for the treatment of myriadmaladaptive behaviors that arise from Pavlovian conditioning.