



Center for Behavioral Health Studies



RIMROCK FOUNDATION

COMMUNITY BULLETIN

Experience Sculpts Brain Circuitry: Reduces Stress

Allowing laboratory animals to experience control over stress can immunize them from depression. This is true even when they later encounter stressors that they can't control. Scientists are now unraveling the workings of the brain's circuitry that inoculates it against such hard knocks - called the **circuitry of resilience**.

Research Study

In 2007, a National Institute of Mental Health (NIMH) research team reported that the prefrontal cortex quelled the brainstem center's alarmist tendencies. The study sought to pinpoint how and when the cortex influenced the alarm center to produce the stress immunity.

The researchers chemically inactivated the animals cortex at critical stages of experiencing and reacting to controllable and uncontrollable stress. Simultaneously, they measured neurotransmitter activity and gene expression in cells of the alarm center via chemical monitoring and brain mapping techniques.

Brain Circuitry Experience

Control circuits activate the brain's executive hub located in the prefrontal cortex. These circuits can alter the hub so that when they are activated by uncontrollable outside stressors, the animals were able to effectively manage stress.

What happens is this activation turns off mood regulating cells in the brain's alarm center. The first immunizing effect was so powerful that weeks later when experienc-

ing an uncontrollable stressor, the rats behaved as if the stressor were controllable. This has the effect of protecting the animal's stress levels.

"It's as if the original experience with control leads these animals to later have the illusion of control even when it's absent. This produces resilience even in the face of significant challenge", explained Mona Sumner, Chief Operations Officer, Rimrock Foundation.



Medically, the prefrontal cortex processes information about the controllability of stressors and applies this information to regulate responses to new stressors.

Various animals exposed to uncontrollable stress develop a syndrome similar to depression and post-trauma stress disorder (PTSD). With these experi-

ences, they lose the ability to learn how to escape stressors and behave more fearfully.

The Serotonin Effect

Results showed increased secretion of serotonin (a mood regulating chemical) and gene expression in the alarm center. The depression like symptoms no longer occurred following an uncontrollable stressor because a controllable stressor had been experienced as much as a week earlier.

When the prefrontal cortex was experimentally turned off during the controllable stressor, the animals failed to develop such immunity. Similarly, turning the cortex area off prior to the uncontrollable stress also abolished the usually protective effect of a prior controllable stress experience.

Summary

Understanding how the brain encodes the experience control should help us develop better treatments for mood and anxiety disorders.

Perceived control, or coping, can buffer individuals against the

negative emotional and physiological impact of stress.

Enhancing the cortex's control over the brain stem and other stress responsive structures appears to be critical for preventing and treating mood and anxiety disorders.

Editorial Staff

Editor in Chief:
David W. Cunningham

Assistant Editors:
Hugh Kilbourne
Kay Seder

Art/Graphics Designer:
Lenny Joyce



**Center for Behavioral
Health Studies**

**Rimrock Foundation
P.O. Box 30374
Billings, MT 59107**

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