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Modeling Depression with Genetic Modified Animals

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Globally, depression is a leading psychiatric disorder with limited neurobiological knowledge. It affects around 20% of population from the view of lifetime population prevalence [1]. Symptoms of depression include depressed mood, dysregulated sleep or appetite, lack of energy and concentration, feelings of unhappiness, no value or guilt, and thoughts of suicide. Depression has caused a significant public health burden.

Because of the different etiology, the symptoms of depressive patients vary a lot, which caused the inefficient treatment. Further research is required and it is developed with the progress of animal models of Depression. Although it is very hard to model depression with mono-gene modification, some genetic modified animal models can mimic at least some key aspects of the disease.

Vesicular Glutamate Transporter 1 (VGLUT1) Deficient Animal

VGLUT1 is one of three vesicular glutamate transporters [2]. It is highly expressed in glutamatergic neurons in the cerebral cortex [3]. It regulates glutamatergic neurotransmission via mediating glutamate release from synaptic terminals [4,5]. Clinical reports show that there exists an imbalance between excitatory and inhibitory control system in the depressive cortex [6,7]. Furthermore, postmortem studies show VGLUT1 expression is decreased in depressed subjects [8]. VGLUT1 deficient mice exhibit deficiency of glutamate transmission and depression-like behavior [9].

Cannabinoid 1 Receptor (CB1R) Deficient Animal

CB1R is involved in one of the major neuromodulatory systems - the endocannabinoid system, which plays important roles in the regulation of emotional behavior [10]. Blockade of CB1R causes depression-like behavior in knockout animals [10-14].

Although the genetic causes of depression are not well-defined and the occurrence of the disease is usually companied with social-environmental factors, genetic modified animal models will help us understand the development of this complex disorder from some defined aspects. These animal models will also offer a useful in vivo tool to test the drug candidates for the treatment of depression.

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