# Genetic aspects of Epilepsy

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## ABSTRACT

**Background**

Epilepsy or seizure disorder is a chronic illness caused by the electrical imbalance in brain which is ranked as the fourth most common neurodegenerative disorder. It is estimated that around 5 million people are suffering from this ailment worldwide. The rate of incidence in developed and developing countries are 49 and 139 per 100,000, respectively. It is also noted that men are more prone than women because they are greatly exposed to factors like brain damage, head trauma and alcohol consumption. Age, dementia, brain infections and vascular diseases are some of the other factors that give rise to epilepsy which leads to characteristic symptoms such as confusion, anxiety, loss of consciousness, etc. The experimental model of epilepsy is studied using the limbic system, the hippocampus, one of the most prevalent site of focal seizures which becomes hyper excitable and recently it has been discovered that the excitatory neurons stimulate the inhibitory neurons to inhibit the dentate granule cells. This mechanism of hyper excitability has been proven to co-exist in the brain of a person suffering from epilepsy. If the seizures are consequences of any known genetic defect, it is termed as genetic epilepsy

**Objective**

The primary goal of this study is to investigate the novel candidate genes responsible for genetic epilepsy. CDKL5, PCDH19, SLC2A1 and SCN8A are few genes that are known for causing epilepsy

**Conclusion**

Each of these genes plays a significant role in various aspects of epilepsy. Recently newer prognostic markers and therapeutics are being discovered for life threatening conditions like epilepsy

**Keywords**

Epilepsy, neurodegenerative disorder, dementia, seizures, brain damage

## INTRODUCTION

Epilepsy is a neurological disorder that marks the impairment of the brain activity leading to characteristic symptoms such as muscle spasms, anxiety, depression and fatigue caused mainly by factors like brain infections, seizures, dementia etc. Age and family history play a significant role in genetic epilepsy. It is found that there are 84 genes that are responsible for causing epilepsy including CDKL5, PCDH19, SLC2A1 and SCN8A. It is observed that almost 1.2% of the US population was epileptic where the ratio of adults and children were 3 million and 4 lakhs 70 thousand, respectively.

Cyclin-dependent kinase-like5 (CDKL5) is the gene responsible for epileptic encephalopathy with multiple seizures. Epileptic spasms are the most common type of seizures in this case. Ketogenic diet and palliative surgery are the suggested treatments. Protocadherin19 is the causative for PCDH19 female epilepsy with characterized symptoms such as intellectual disability and behavioral disturbances. Implication of neurosteroids as therapeutic is being investigated recently. Due to the changes in the pattern of inheritance of Sodium carrier family 2 member 1(SLC2A1) there is a defect in the production of GLUT1 transporter with eyelid myoclonia, a rare type of seizure associated with drug resistance. Ketogenic diet is the first line therapy for all SLC2A1 mutations. . The autosomal dominant inheritance has caused mutation in the Sodium channel protein type 8 (SCN8A) gene which leads to intellectual disability and abnormal brain functions. The mechanism of epilepsy has been illustrated in the below figure 1.

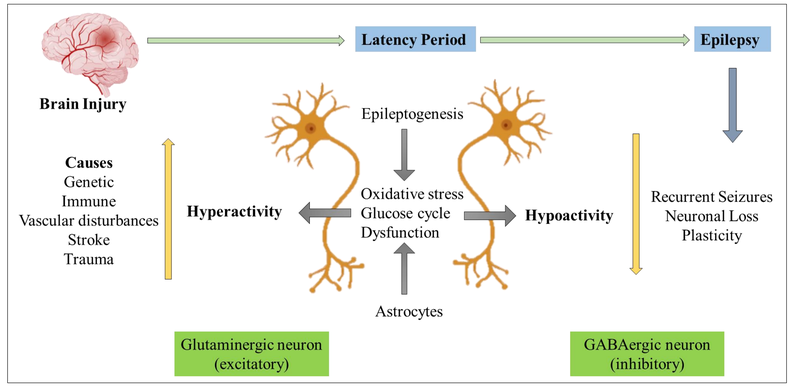


**Figure 1:** Mechanism of Epilepsy

## GENES ASSOCIATED WITH EPILEPSY

**Table1:** Genes associated with epilepsy

| Gene symbol | Gene name | Function |
|---|---|---|
| ***CDKL5*** | Cyclin dependent kinase like 5 | It produces proteins that are necessary for brain development |
| ***PCDH19*** | Protocadherin 19 | It helps in the communication of brain cells |
| ***SLC2A1*** | Solute carrier family 2 member | It plays a major role in the production of GLUT1 |
| ***SCN8A*** | Sodium channel protein type 8 | It helps in the generation and transmission of electrical signals and also provides instructions for sodium channels |

## CONCLUSION

The study investigates some of the novel candidate genes which cause one of the most serious life-threatening diseases, epilepsy and their medicaments. The most recent data suggests that the ketogenic diets and anti-epileptic drugs including neurosteroids are found to be the most effective measures for treating epilepsy.

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