

# *Analysis of the effect of sodium valproate on neuroimmune response in patients with refractory epilepsy*

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**Abstract:** Epilepsy belongs to a typical group of chronic nervous system diseases, which is characterized by abnormal neuronal discharge. Patients with refractory epilepsy have poor response to traditional antiepileptic drugs. It is of great significance to select an effective regimen for the treatment of patients. Sodium valproate (VPA) is widely used as a first-line AED in the treatment of epilepsy, and the application of this drug is of great significance for the treatment of patients with epilepsy. This article is divided into four aspects to describe in detail the effects of sodium valproate on neuroimmune response in patients with refractory epilepsy. Firstly, the pharmacological effect of sodium valproate is analyzed, then the research progress of sodium valproate combined with other drugs in the treatment of refractory epilepsy is discussed, the specific effect of sodium valproate on neuroimmune response in patients with refractory epilepsy is discussed, and the research situation of this topic is prospected. It is hoped that this paper can provide reference materials for the research work of relevant personnel.

Sodium valproate belongs to a class of antiepileptic drugs, and its efficacy has been widely recognized in clinical practice. "It is worth noting, however, that although the efficacy of this drug is obvious, the mechanism of action is still controversial, and this is mainly reflected in the neuroimmune response of patients." Relevant literature has confirmed that there is a close interaction between the nervous system and the immune system. Such utility plays an important role in maintaining the normal function of the nervous system and the development of diseases. Based on this background, it is of great significance to analyze the effect of sodium valproate on neuroimmune response in patients with refractory epilepsy [1]. Hereby, this paper analyzes the above propositions.

## **1. Pharmacological effects of sodium valproate**

Sodium valproate is a classical antiepileptic drug. It can inhibit seizures by reducing the expression of SCN3A. The drug has significant effect on generalized tonic-clonic seizures, absence seizures and myoclonic seizures, and shows a high total effective rate in the treatment of symptomatic epilepsy.

Studies have shown that drugs can show good effects in promoting angiogenesis and functional

recovery after cerebral ischemia in rats, and the reason for this situation is related to the inflammatory response induced by drug ischemia. This product can reduce the inflammatory response of patients with severe craniocerebral injury and improve neurological function. Studies have shown that the drugs have neuroprotective effects on rats with autoimmune encephalomyelitis (EAE).

Sodium valproate has also shown a good effect in antidepressant. After entering the human body, it can reduce the expression of brain-derived neurotrophic factor (BDNF) and inhibit the destruction of oxidative stress balance. It shows good antidepressant effect.

Drugs can improve islet function, which has been shown to be effective in the treatment of alloxan diabetic mice. Affective disorders and schizo-related disorders are common clinical diseases in psychiatry. Sodium valproate has a satisfactory effect in the treatment of acute depressive episode of bipolar disorder.

Adverse reactions included nervous system, digestive system, skin and subcutaneous tissue. Some patients may have serious adverse reactions such as liver damage and hyperammonemia after treatment. Based on this situation, in clinical application, doctors should fully consider the specific conditions of patients, adjust the dose reasonably, actively monitor the blood concentration of patients, and adjust the dose reasonably.

## **2. Research progress of sodium valproate combined with other drugs in the treatment of refractory epilepsy**

### **2.1. Combined treatment with lamotrigine**

The combination of sodium valproate and lamotrigine can significantly improve the therapeutic effect of patients with refractory epilepsy. Combined treatment can significantly reduce the frequency of seizures and effectively improve EEG abnormalities. This means that the combination of sodium valproate and lamotrigine can not only ensure the therapeutic effect, but also maintain a good safety profile. Studies have shown that sodium valproate combined with lamotrigine can positively improve patients' physiological function, health status, body pain, energy status, social function, emotional function and mental health. In addition, although the current research is mainly focused on adults and children with refractory epilepsy, the regimen is equally effective in the treatment of patients with different seizure types, and its application range is wide.

### **2.2. Combined with sertraline treatment**

Relevant literature shows that [2] : sertraline combined with sodium valproate in the treatment of epilepsy with mental disorders has significant efficacy, which can significantly improve the symptoms of mental disorders in patients. This protocol can relieve the symptoms of mental disorders caused by epilepsy. For elderly patients with epilepsy and mental disorders, the use of this scheme can actively relieve neurological damage and improve immune function. In terms of the safety of the drug, although the original evidence did not mention the safety data. However, it can be indirectly inferred from the efficacy evaluation that the safety of this regimen is strong, and the reason for this situation is that the drug can significantly improve the total effective rate of the disease treatment and reduce adverse reactions. The above results show that the combination of sodium valproate and sertraline in the treatment of refractory epilepsy has good safety, especially in terms of improving the therapeutic effect, improving the symptoms of mental disorders, and additional benefits for special populations such as elderly patients. But despite the positive results, direct evidence is still lacking. Therefore, in the actual application process, the relevant staff should consider individual differences and hidden risks.

### **2.3. Combined treatment with topiramate**

Studies have shown that sodium valproate combined with topiramate in the treatment of refractory epilepsy can also significantly improve the clinical efficacy, and has a lower incidence of adverse reactions. For example, one study found that topiramate was associated with a higher overall response rate and a lower incidence of adverse effects than sodium valproate alone. This suggests that the combination of sodium valproate and topiramate is an effective treatment strategy that can provide better treatment results and higher quality of life for patients with refractory epilepsy.

Sodium valproate combined with lamotrigine and topiramate show high clinical efficacy and good safety in the treatment of refractory epilepsy. However, due to the lack of direct evidence, the efficacy and safety of the combination of sodium valproate and sertraline need to be further studied. Future studies should pay attention to the efficacy and safety of more drug combinations in order to provide more treatment options for patients with refractory epilepsy.

## **3. Specific effects of sodium valproate on neuroimmune responses in patients with refractory epilepsy**

### **3.1. Effects on cognitive function and neurological impairment status**

For the specific mechanism of sodium valproate improving cognitive function in patients with refractory epilepsy, it involves many aspects. Sodium valproate can directly reduce the damage caused by epilepsy to the brain by reducing the number and duration of seizures. Valproic acid sodium can improve the patient's level of serum, such as the lower specificity of neurons enolization enzyme (NSE) and interleukin - 6 (IL6), allergic C - reactive protein (hs - CRP) the levels of inflammatory markers, such as, in the process of development and incidence of epilepsy, these factors play an important role. In addition, sodium valproate can also improve the cognitive function of patients, which may be related to the improvement of abnormal EEG effects. Studies have found that [3] sodium valproate can significantly increase the frequency of EEG and reduce the amplitude, which is helpful for the improvement of brain function.

Studies have also found that sodium valproate can effectively improve the instant memory and long-term memory ability of elderly patients with epilepsy. Although this improvement was not significant compared to the control group, it was still able to indicate a positive effect on cognitive function [4]. In addition, when sodium valproate was used in combination with other S drugs, the cognitive function was further improved and the frequency of seizures was decreased in young patients with intractable epilepsy.

The specific mechanisms of sodium valproate in improving cognitive function in patients with refractory epilepsy include: reducing the number and duration of seizures, reducing brain damage [5]; The levels of inflammatory factors in serum were improved; And may promote the recovery of brain functional status by improving EEG abnormalities. In addition, sodium valproate can further improve cognitive function and reduce seizure frequency when combined with other drugs.

### **3.2. Effects on the levels of inflammatory factors**

By reducing the levels of inflammatory factors, the mechanism of sodium valproate in reducing systemic inflammatory response in patients with refractory epilepsy can be explained from the following aspects: the significant effect of sodium valproate combined with topiramate in the treatment of epilepsy may be due to the reduction of inflammatory factors (IL-2 and TNF-a). This suggests that for reducing the levels of these key inflammatory factors, sodium valproate has a significant effect, thereby being able to reduce the inflammatory response in patients. Another study

[6] showed that sodium valproate combined with topiramate treatment could effectively reduce the inflammatory response of patients and improve the clinical treatment effect. This provides further confirmation of the efficacy of sodium valproate in reducing the inflammatory response, especially when combined with topiramate.

"Effects on plasma homocysteine: Although plasma homocysteine levels may be elevated by sodium valproate administration, this does not provide a direct account of how sodium valproate reduces systemic inflammation by lowering levels of inflammatory factors." However, this potential side effect management is important to ensure overall patient health and reduce the risk of long-term complications.

By reducing the levels of inflammatory factors such as IL-2 and TNF- $\alpha$ , sodium valproate is able to alleviate the systemic inflammatory response in patients with refractory epilepsy. This mechanism may be related to its direct or indirect effects on the expression of inflammation-related genes, the regulation of immune system response, or the improvement of the overall health status of patients [7]. In addition, the reduction of inflammatory response may be enhanced by the combination of sodium valproate with other drugs, such as topiramate. Therefore, considering the use of sodium valproate in the treatment of patients with refractory epilepsy can not only improve the therapeutic effect, but also improve the quality of life of patients by reducing the inflammatory response.

### 3.3. Effects on immunoglobulin levels

Although there are few specific data on the changes of immunoglobulin IgA, IgG, and IgM, some studies have shown that sodium valproate combined with other drugs can significantly improve the immunity of children with refractory epilepsy. This may indirectly reflect that sodium valproate can have a certain effect on immunoglobulin levels [8].

### 3.4. Effects on neurotransmitter levels

Relevant literature has confirmed that drugs can actively stabilize the level of neurotransmitters in the body and reduce the level of inflammatory mediators. Literature has confirmed that for patients with epilepsy after craniocerebral trauma surgery, the frequency and duration of seizures, glutamate, aspartate and other neurotransmitters were significantly decreased after the application of this product, and the level of  $\gamma$ -aminobutyric acid showed an upward trend [9].

This means that this product can regulate the balance of neurotransmitters and reduce the rate of seizures in patients. In addition, it is worth to note that the drug can reduce the phosphorylation of ERK1/2 in hippocampal neurons after epileptiform discharge. Effect of sodium valproate on the phosphorylation of extracellular signal-regulated kinase: Sodium valproate could significantly inhibit the phosphorylation of ERK1/2 in hippocampal neurons after epileptiform discharge. ERK1/2 belongs to a class of signaling pathways involved in cell growth and differentiation. The abnormal activation of this pathway is related to the occurrence and development of epilepsy. Drugs entering the human body can play an antiepileptic effect and reduce epileptiform discharges. Relevant literature has confirmed [10] that sodium valproate can reduce the frequency of seizures, actively improve the coagulation function of patients, and effectively improve the clinical symptoms of patients with epilepsy after stroke.

## 4. Conclusions and prospects

In summary, drugs can not only play an anti-epileptic effect, but also play a protective effect on brain damage caused by epilepsy within the established dose range, actively induce neurotrophic, avoid the loss of neurons and prevent cell apoptosis after epileptic seizures in patients [11-12]. The

use of this drug in the treatment of epilepsy can improve the neurological function of patients through its neuroprotective mechanism. Drugs entering the human body can cause changes in immune and metabolic pathways in patients with epilepsy. The reason for this situation is related to the regulation of MAGED1, FBXO31 and other genes by drugs. In addition, it is worth noting that drugs can positively improve the neurological function and inflammatory response of patients [13-14]. This product has shown satisfactory effects in the treatment of refractory epilepsy, improving the safety of disease treatment and enhancing the cognitive function of patients. It has application value in epilepsy patients of different ages [15]. In terms of the research direction of this proposition, due to the potential role of this drug in neuroprotection and immunomodulation, related studies in the future need to explore its detailed mechanism of action, which is mainly reflected in the gene level. In addition, it is worth mentioning that relevant staff need to conduct more in-depth research on the application effect and safety of sodium valproate in patients with epilepsy at different ages, which is helpful to optimize the treatment plan and improve the treatment effect.

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