Antiepileptic property of vitamin B12 in one animal model

Epilepsy –a serious neurological disorder that affects millions of people worldwide– is usually associated with a disturbance of normal activity of the brain, and in most typical form, is accompanied by seizures. Various antiepileptic drugs with different mechanisms are frequently used for treating epilepsy. These drugs are accompanied with side effects. To find more effective and safer new therapeutics several animal models of epilepsy, including acute pharmacological models, were established. In addition to behavioral evaluation, electroencephalographic (EEG) recording of the brain is a scientific tool for documenting this type of experiments.

Vitamin B_{12}, the largest and most complex of all the vitamins, has a key role in the normal functioning of the brain and nervous system. It exerts a potent neuroprotective effect especially on cerebral cortex neurons as well as peripheral neuropathies. Vitamin B_{12} deficiency has been shown to cause epileptic seizures. Benzodiazepines (such as diazepam) are important agents in the management of epilepsy.

Fig. 1. A. Normal brain basal activity in anesthetized rat. B. Spike and sharp waves (arrows) induced by penicillin. C. Effect of a high dose of diazepam on the number and amplitude of spike waves induced by penicillin D. Effect of a high dose of vitamin B12 on the number and amplitude of spike waves induced by penicillin.

Penicillin-induced epileptiform activity in rats has been frequently used to seeking new antiepileptic drugs. In anesthetized rats, injection of the penicillin into the sensory cerebral cortex of brain produced typical disturbances in normal brain electrical activity characterized by spike waves. The number and amplitude of these spike waves can reflect epileptiform and/or anti-epileptiform activities.

Our study aim was to explore the effects of local application of vitamin B_{12} on epileptiform activity induced by penicillin. We also compared the results with the same route administration of diazepam. As shown in figure 1, the normal basal electrical activity of brain has no spikes. Microinjection of penicillin into the sensory cerebral cortex area produced spike waves. Prior microinjection of both vitamin B_{12} and diazepam (an effective drug for terminating seizures) into the sensory cerebral cortex area of the brain significantly reduced both the number and amplitude of spike waves. This indicates an antiepileptic property for vitamin B_{12} that is similar to antiepileptic activity of diazepam.

The results presented here are the first report showing the antiepileptic effect of vitamin B_{12} in an animal model. However, medicine is an over-developing field and more clinical experience will needed to establish this vitamin in clinical usage.

Publication

Effects of intracortical microinjection of vitamin B12 on penicillin-induced epileptiform activity in rats.
Erfanparast A, Tamaddonfard E
Acta Neurobiol Exp (Wars). 2015