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### **Classical neurotransmitters and neuropeptides involved in generalized epilepsies: How to improve the antiepileptic effect?**

Generalized epilepsies have a prevalence of 0.7% in the population and are treated with antiepileptic drugs. In this neurological disease, alterations of ion channels and of classical neurotransmitters and neuropeptides have been reported. Here, we describe the alterations of classical neurotransmitters and neuropeptides in the hippocampus, thalamus and cerebral cortex. In the epileptic foci, there is a neurotransmitter imbalance between presynaptic inhibitory GABAergic neurons, via GABAA receptors, and excitatory and partly presynaptic inhibitory glutaminergic neurons, via ionotropic receptors, as well as between hyperactive dopaminergic neurons, via D2 receptors, and hypoactive serotonergic neurons. The mechanisms of action of some newer antiepileptic drugs are described according to a neural network. Lamotrigine blocks voltage-gated sodium channels, alpha4beta2 nACh receptors, NMDA and partly AMPA receptors. Levetiracetam enhances the presynaptic inhibitory effect of GABAergic neurons and blocks NMDA and partly AMPA receptors. Rufinamide prolongs the inactivity of sodium channels. Topiramate blocks NMDA and, to a weaker extent, AMPA and kainate receptors and stabilizes dopaminergic neurons. Zonisamide blocks sodium and calcium channels and augments dopamine contents by inhibiting the MAOB enzyme. Combined GABAA agonists and NMDA antagonists could furthermore stabilize the neural network. The interaction with other sub-receptors of classical neurotransmitters and neuropeptides could achieve an additional antiepileptic effect, for example 5-HT7 agonism, alpha7 nAChR agonism, NPY1 receptor antagonism, m5GluR antagonism and A2A adenosine receptor antagonism

#### **Biography**

Felix-Martin Werner studied Human Medicine at the University of Bonn. He has been working as Medical Teacher training geriatric nurses, occupational therapists and assistants of the medical doctors at the Euro Academy in Pößneck since 1999. He has been doing scientific work at the Institute of Neurosciences of Castilla and León in Salamanca in Spain since 2002. With Prof. Rafael Coveñas, he assisted over 30 national and six international congresses of Neurology and published over 20 reviews about neural networks in neurological and psychiatric diseases. Since 2014, he has been a member of the Editorial Board of the *Journal of Cytology & Histology*.

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