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Possible mechanism of antiepileptic effect of the vagus nerve stimulation in the context of recent results in sleep research

Ivan N. Pigarev¹, Marina L. Pigareva² and Ekaterina V. Levichkina^{1,3}

^{1,2}Russian Academy of Sciences, Russian Federation

³The University of Melbourne, Australia

Vagus nerve stimulation is widely used for seizure prevention in otherwise incurable epilepsy. Vagus nerve is engaged in bidirectional information transfer between internal organs and the brain, but how activity of the visceral pathways may be related to paroxysmal events in the brain remained unclear. It has been recently shown that during sleep signals from internal organs are directed towards all areas of the cerebral cortex for comprehensive analysis and restoration of body functionality. Visceral organs often have rhythmic activity and neuronal messages from such organs to the cerebral cortex are also rhythmic. Epileptogenic effect of rhythmic sensory stimulation is well known. Thus it is possible that during developing sleep and in deep sleep rhythmic visceral afferentation may provoke paroxysmal activity in cerebral cortex. Stimulation of vagus nerve can change the frequency of this seizure-promoting activity of internal organs from the resonance range thereby blocking paroxysmal activity. Proposed mechanism of epileptiform activity resulting from visceral signaling do not exclude that paroxysmal activity can be initiated in otherwise healthy brain. The cause of this type of epileptic events may be related to a deviation from the normal rhythmic working of some internal organs and transmission of these signals to the cerebral cortex during local or total sleep.

Biography

Ivan Pigarev, electrophysiologist, graduated from biological department of Moscow State University in 1963. Since that time till the present he is working in the Institute for Information Transmission problems (Kharkevich Institute) of Russian Academy of Sciences in Moscow, at present as leading scientist. His studies were mainly concentrated in the field of vision. Since 1991 Pigarev began to investigate sleep. He proposed and confirmed by direct experiments the visceral theory of sleep according to which cortical sensory areas during sleep switch to processing of the visceral information thus supporting animal homeostasis. Pigarev has published more than 90 papers.

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