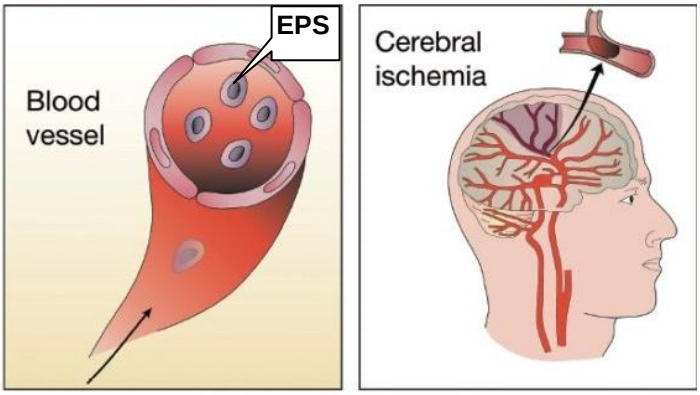
Research (What is it about?)	**Adaptive molecular factor for neural network stress function**
UNN authors	*Vedunova M., Mitroshina E., Mishchenko T., Shishkina T., Shirokova O., Pimashkin A., Kastalskiy I., Mukhina I., Kazantsev V.*
We find (The result)	Glial cell line-derived neurotrophic factor (***GDNF***) counteracts hypoxic damage to hippocampal neural network function. These proteins have a marked neuroprotective and antihypoxic effect under ischemia modeling *in vivo*.
Abstract	During the last years, the number of ischemic brain injury incidents has increased dramatically. The consequences of cerebral ischemia are directly related to memory and neurological status deteriorations as well as to impairment of learning capabilities and cognitive functions. A promising approach to improve adaptive capabilities of nervous system consists in activation of endogenous systems promoting the survival of nervous cells under stress factors and maintaining their functional activity. The use of neurotrophic factors such as glial cell line-derived neurotrophic factor (GDNF) is of special interest. These proteins are produced in the processes of synapses formation, and have a pronounced effect on growth and reconstruction of axons and dendrites of cortical and hippocampal neurons. GDNF is produced by nervous cells for maintaining the viability of neurons under stress conditions. By investigating the effect of GDNF on primary hippocampal cultures during acute normobaric hypoxia *in vitro* we find that these proteins are regarded as a potent neuroprotector and a corrector of neural network activity in stress conditions. GDNF protects from cell death and maintains the network activity during hypoxia. It creates unique conditions that supported the viability of cells even in cases of cellular mitochondrial damage. *In vivo* studies were carried out on animals. Ischemia modeling was performed by bilateral irreversible occlusion of both carotid arteries. A neurological status as well as an orientative-exploratory behavior of experimental animals and their learning capability in the post-ischemic period were analyzed. GDNF application in bilateral occlusion of carotid arteries was found to contribute to the neurological status recovery. Moreover, it normalizes oxygen uptake rate of mitochondria in the post-ischemic period.

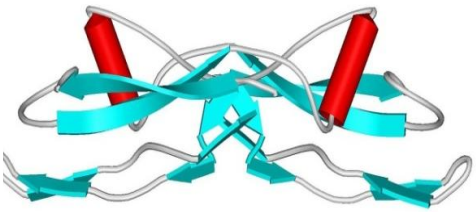
Representative articles 2017-2018, quartiles	1. *Shishkina T.V., Mishchenko T.A., Mitroshina E.V., Shirokova O.M., Pimashkin A.S., Kastalskiy I.A., Mukhina I.V., Kazantsev V.B., Vedunova M.V.* Glial cell line-derived neurotrophic factor (GDNF) counteracts hypoxic damage to hippocampal neural network function in vitro. Brain research. **1678**, 310–321 (2018). 2. *Mitroshina E.V., Abogessimengane B.Zh., Urazov M.D., Hamraoui I., Mishchenko T.A., Astrakhanova T.A., Shchelchkova N.A., Lapshin R.D., Shishkina T.V., Belousova I.I., Mukhina I.V., Vedunova M.V.* Adaptive role of glial cell line-derived neurotrophic factor in cerebral ischemia. Sovremennye tehnologii v medicine. **9**(1), 68–77 (2017).	Q2 – **1.5**
	Q-index (Qi) for the result	
	medial yellow	

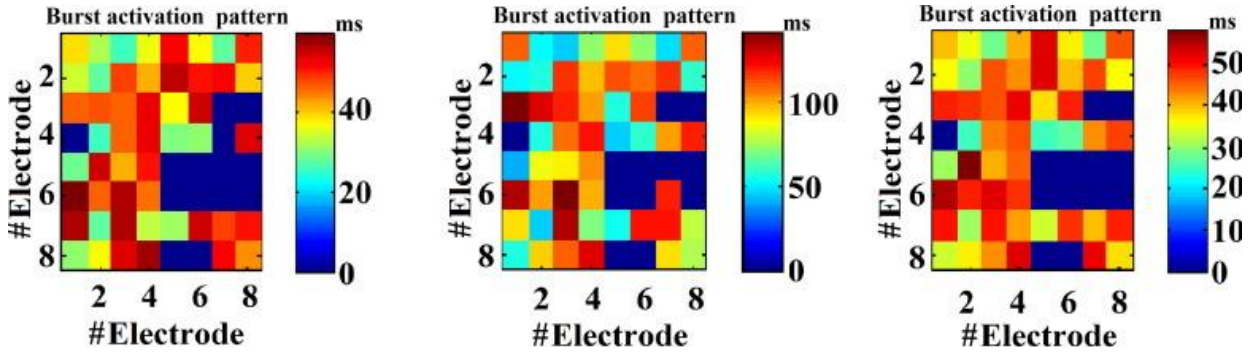
In collaboration	Privolzhsky Research Medical University, Nizhny Novgorod 603005, Russia



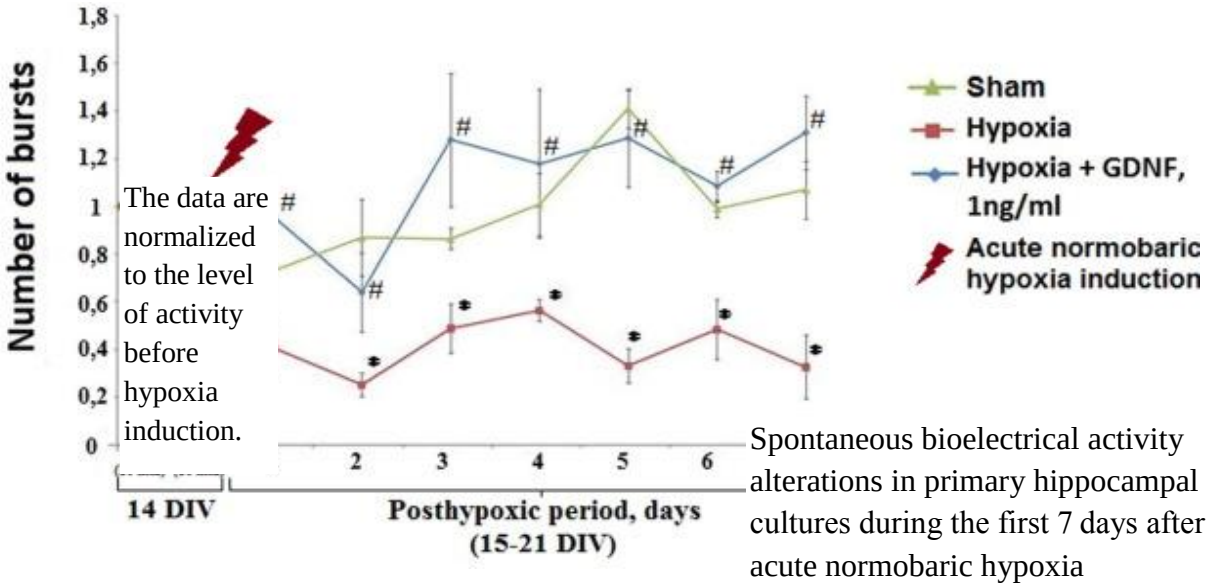
EPCs migrate towards a gradient of cytokines produced by injured tissue or hypoxia.

The recombinant form of ***GDNF*** was shown to promote the survival and differentiation of neurons in culture. The encoded protein is processed to a mature secreted form that exists as a homodimer.





Functional structural features of neural networks in response to GDNF (1 ng/ml) application on day 14 of primary hippocampal culture development *in vitro* (**14 DIV**). Activation patterns of spontaneous bioelectrical activity in primary hippocampal cultures: (a1) before GDNF application, (a2) 20 min after GDNF addition, and (a3) 2 h after GDNF addition. The colour scale corresponds to the time of occurrence of the first spike in the network burst and is presented in squares according to the electrodes of the multielectrode array.



Spontaneous bioelectrical activity alterations in primary hippocampal cultures during the first 7 days after acute normobaric hypoxia induction: number of small network bursts/10 min.