case the neural network has been used as a processor for human-robot interface. We have shown that the interface can faithfully detect myographic signals, classify them according to hand gestures, and send the corresponding commands to the robot. Although the two applications belong to different areas of the Control Theory and applied Neuroscience, they are based on a common approach of neural computations. We note that in both cases besides neural networks there are no additional external algorithms for the decision-making.Please, make your references list in accordance with the example below (please, notice that it is represented in alphabetical order). Do not force the "References" section to start on a new page.

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Prenatal Development Study On Phenomenon Of Delayed Implantation

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Summary. Delayed implantation is a very widespread in *Mustelidae* family. It was described more than 100 years ago, but its mechanisms are yet poorly understood. We first made a de novo whole genome sequence of three species of mustelids with delayed implantation stage in prenatal development and find out several mutations in their melatonin pathway genes.

Key words. Delayed implantation, Mustelidae, melatonin.

INTRODUCTION

Delayed implantation (DI) is arrest of embryo development at the blastocyst stage, characterized by inhibition of mitotic activity and synthesis of nucleic acids in cells of the inner cell mass of embryo and temporary prevention of it implantation in uterus. The *Mustelidae* family seems to be the most interest for DI research because of extraordinary prevalence of this trait in this family; almost half of mammals with DI are mustelids. Delayed implantation feature is pleomorphic in mustelids. It seems to be inherited from common ancestor. In a process of evolution of this family there were multiple losses of this trait. Furthermore DI length is variable among *Mustelidae* family: from 50-60 days in mink (*Neovison vison*) to 245-275 days in marten (*Martes martes*) or sable (*Martes zibellina*). [*Isakova 2004; Thom et al., 2004*]. Mechanisms of transduction between active and inactive embryo stages and factors underlying the length of embryonic diapause are not clearly understood to date. It has been suggested that melatonin (pineal gland secret) is the crucial regulator of this processes. Melatonin secretion depends on photoperiod length and regulates synthesis of luteinizing hormone (LH), follicle stimulating hormone (FSH) and prolactin [*Jack et al. 1996; Murphy 2012*]. Nonetheless there were no any molecular-genetic studies of DI mechanisms. Research of DI is of great interest for evolutionary biology and may also be important for reproductive medicine and fur industry. Moreover studies showed that presence/absence

of DI in prenatal development are correlated with longevity among mustelids [*Thom et al., 2004*]. We suggest that presence of DI also may have effects on animal behavior. We first made whole genome sequence of three mustelids with delayed implantation stage in prenatal development - mink (*Neovison vison*), marten (*Martes martes*) and sable (*Martes zibellina*). Using the data from whole genome sequencing of these animals and assembled genome of ferret (*Mustela putorius furo*) which is closely related specie that does not display diapause we analyzed the genes involved in melatonin pathway.

CONCLUSIONS

We described a set of genetic alteration in genes of melatonin pathway in mink, marten and sable. The data imply the genetic alteration may lead to changes of quantity and regulation level of melatonin in animals with DI stage in prenatal development.

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The Role Of Cannabinoid Receptors (Type 1 And Type 2) In Implementation Of Neuroprotective And Antihypoxic Effects Of N-Arachidonoyldopamine In Acute Hypoxia *In Vitro*

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Summary. The aim of the investigation was to study a role of cannabinoid receptors type 1 (CB1) and type 2 (CB2) in implementation of antihypoxic and neuroprotective effects of N-ADA in hypoxia model *in vitro*. The experiments were carried out on primary hippocampal cultures. N-ADA effect on the spontaneous bioelectrical and calcium network activity in dissociated hippocampal cultures in normal and hypoxic conditions as well as the role of CB1 and CB2 in the implementation of these effects were investigated. Registration of extracellular action potentials was conducted by MEA systems (Multichannel Systems, Germany) application. For the detection of patterns of spontaneous calcium oscillations we used fluorescent calcium dye Oregon Green 488 BAPTA-1 AM (Invitrogen) and a confocal laser scanning microscope (Zeiss LSM510, Germany). Study the expression of mRNA CB1 receptors was performed using SmartFlare RNA Detection Probes (Merck Millipore, France) and fluorescent microscopy. Our data demonstrated that N-ADA has strong antihypoxic and neuroprotective properties associated with activation of cannabinoid receptors type 1.

Key words. Neuron-glial networks, endocannabinoid system, N-arachidonoyldopamine, hypoxia, primary hippocampal cultures, neuroprotection

INTRODUCTION

Nowadays ischemic stroke is one of the main causes of death and severe disability of the population in Russia and around the world. Hypoxia considered as a key factor of brain cells damage during ischemic stroke. The endogenous cannabinoid system plays an important role in the modulation of synaptic transmission, plasticity and maintaining the normal functioning of the nervous system. The neuronal activity regulation by cannabinoids receptor's activation in ischemia has shown in a number of studies on different models *in vivo* and *in vitro*. A recently discovered and synthesized endocannabinoid N-arahidonoildofamin (N-ADA) is a perspective substance for hypoxic damages correction. N-ADA was described as an agonist both cannabinoids (CB1 and less CB2). In our recent studies neuroprotective and antihypoxic effects of N-ADA were shown [1]. However, a question concerning the molecular mechanisms of N-ADA neuroprotective and antihypoxic actions during hypoxia is still open. The aim of the investigation was to study the role of cannabinoid receptors type 1 and type 2 in antihypoxic and neuroprotective effects of N-ADA in hypoxia model *in vitro*.

MATERIAL AND METHODS

In vitro studies were conducted using hippocampal cells dissociated from 18-day embryonic CBA mice. Hippocampal cells were plated on multielectrode arrays (MEA60, Multichannel Systems) or coverslips. Hypoxia modeling was performed on day 14 of culture development *in vitro* by replacing the normoxic cultural medium with a medium containing low oxygen for 10 min. An application of N-ADA (10 mcM) or N-ADA with CB1 or CB2 antagonist was conducted into hypoxic