МІНІСТЕРСТВО ОХОРОНИ ЗДОРОВ'Я УКРАЇНИ
БУКОВИНСЬКИЙ ДЕРЖАВНИЙ МЕДИЧНИЙ УНІВЕРСИТЕТ»

М А Т Е Р І А Л И

104-ї підсумкової науково-практичної конференції
з міжнародною участю
професорсько-викладацького персоналу
БУКОВИНСЬКОГО ДЕРЖАВНОГО МЕДИЧНОГО УНІВЕРСИТЕТУ
06, 08, 13 лютого 2023 року

Конференція внесена до Реєстру заходів безперервного професійного розвитку, які проводитимуться у 2023 році №5500074

Чернівці – 2023

plays an important role in neuroprotection and maintaining the oxidant-antioxidant balance of the human body. The injection of exogenous melatonin on the background of constant illumination leads to the normalization of the R/B ratio in the neurons of the LPO of the hypothalamus. In particular, at 2 p.m. it was 1.08±0.007, and at 2.00 a.m. – 1.16±0.004 ($p<0.001$).

Conclusions. 1. The described characteristic indicates a high intensity of exchange and oxidation of proteins in the neurons of the lateral preoptic nucleus of the hypothalamus of rats. 2. Light stimulation leads to an increase in the R/B ratio, which can be interpreted as an increase in the intensity of protein oxidative modification processes in the hypothalamus lateral preoptic nucleus neurons. 3. Injection of melatonin on the background of constant lighting leads to the normalization of the R/B ratio in the neurons of the lateral preoptic nucleus of the hypothalamus.

Smetaniuk O.V.

THE INFLUENCE OF MELATONIN UPON THE IMMUNOHISTOCHEMICAL STATUS OF MELATONIN TYPE 1A RECEPTORS IN THE NEURONS OF THE SUPRAOPTIC NUCLEUS OF THE HYPOTHALAMUS UNDER LIGHT STRESS

Department of Medical Biology and Genetics
Bukovinian State Medical University

Introduction. Biological rhythms are a fundamental property of the organic world, which ensures the organism's ability to adapt and survive in cyclically changing environmental conditions. One of the important links of the neuroendocrine system of the hypothalamus is the supervisory supraoptic nuclei (SON). They are involved in ensuring the neuroendocrine response to various types of stress - immobilization, pain, hypoxia, light, and other stress. Numerous clinical and experimental data indicate the key role of melatonin (MT) in the regulation of the main circadian rhythm of the body - the sleep-wake cycle. Receptors to MT have been found in various nuclei of the hypothalamus, retina, neurogenic tissues, etc.

The aim of the study. To study the optical density of specific staining for type 1A melatonin receptors in SON neurons of the hypothalamus of rats under conditions of 24-hour illumination and injection of melatonin.

Materials and methods. The experiments were conducted on 36 white male rats. The animals of the first group were kept for 7 days under the conditions of a standard lighting regime (light from 8 am to 8 pm). The rats of the second group were exposed to 24-hour lighting for 7 days. The animals of the third group were given intraperitoneal daily melatonin (Sigma, USA) at a dose of 0.5 mg/kg of rat body weight on the background of round-the-clock lighting. Taking into account the cyclic nature of melatonin synthesis, the material was collected at 12-hour intervals (2:00 pm and 02:00 am). Polyclonal antibodies to melatonin receptors type 1A (Abcam, Great Britain) and streptavidin-biotin visualization system LSAB2 (peroxidase label + diaminobenzidine) manufactured by Chemicon International Inc. (USA) were used to perform the immunohistochemical technique.

Results. The optical density of the specific staining of MT-receptors type 1A in hypothalamus SON neurons of rats is subject to circadian organization. The highest level of optical density of a specific color is observed at 2 am, and at 2 pm it decreases. Modifications of the photoperiod led to a marked violation of the diurnal fluctuations of the investigated values. Under light stress, the optical density of the specific color of the studied structures is probably lower than under light deprivation. In addition, the immunohistochemical study showed that under conditions of constant lighting, the circadian rhythm of the functioning of MT receptors in neurons of the hypothalamus is disturbed, which is characterized by an improbable difference in indicators ($p>0.05$) in the studied periods of the day.The weekly injection of MT on the background of long-term lighting is manifested by a tendency to normalize the optical density of specific staining for type 1A MT receptors in neurons of the SON of the hypothalamus of rats, which is especially noticeable in the samples taken at 2 am when the indicator was within 0.412±0.0025 units of optical density.

Conclusions. The optical density of type 1A melatonin receptors in neurons of the supraoptic nucleus of the hypothalamus of rats is characterized by a clear circadian rhythm. Light stimulation leads to a probable decrease in the optical density of specific staining for type 1A melatonin receptors in the neurons of the supraoptic nucleus of the hypothalamus. The injection of melatonin leads to the normalization of the optical density of specific staining for type 1A melatonin receptors in the neurons of the supraoptic nucleus of the hypothalamus of rats.

Vlasova K.V.

THE EFFECTS OF LIGHT AND STRESS UPON THE BRAIN

Medical Biology and Genetics department
Bucovinian State Medical University

Introduction. If you sleeping restlessly, feeling irritable or moody, forgetting little things, and feeling overwhelmed and isolated, so you are probably stressed out. Stress isn't always a bad thing. It can be handy for a burst of extra energy and focus, like when you are playing a competitive sport, or have to speak in public. But when it's continuous, the kind most of us face day in and day out, it actually begins to change your brain.

The aim of the study. To analize reference data on the influence of stress and light upon brain structures.

Materials and methods. The databases Pubmed, Scopus, Jama were analized.

Results. Chronic stress like being overworked or having arguments at home, can affect brain size, it's structure and how it functions, right down to the level of your genes. Stress begins with something called the hypothalamus pituitary adrenal axis, a series of interactions between endocrine glands in the brain and on the kidney, which controls your body's reaction to stress. When your brain detects a stressful situation, your HPA axis is instantly activated and releases a hormone called cortisol, which primes your body for instant action. But high levels of cortisol over long periods of time wreak havoc on your brain. For example, chronic stress increases the activity level and number of neural connections in the amygdala, your brains fear center. And as level of cortisol rise electric signals in your hippocampus, the part in your brain associated with learning, memories, and stress control, deteriorate.

The hippocampus also inhibits the activity of the HPA axis, so when it weakens, so does your ability to control your stress. That's not all, though. Cortisol can literally cause your brain to shrink in size. Too much of it results in the loss of synaptic connections between neurons and the shrinking of your prefrontal cortex, the part of your brain the regulates behaviors like concentration, decision making, judgement, and social interaction. It also leads to fewer new brain cells being made in the hippocampus. This means chronic stress might make it harder for you to learn and remember things, and also set the stage for more serious mental problems, like depression and eventually Alzheimer's disease.

The effects of stress may filter right down to your DNA. An experiment showed that the amount of nurturing a mother rat provides its newborn baby plays a part in determining how that baby responds to stress later in life. The pups of nurturing moms turned out less sensitive to stress because their brains developed more cortisol receptors, which stick to cortisol and dampen the stress response. The pups of negligent moms had the opposite outcome, and so became more sensitive to stress throughout life. These are considered epigenetic changes, meaning that they affect which genes are expressed without directly changing the genetic code. And these changes can be reversed if the moms are swapped. But there's a surprising result. The epigenetic changes caused by one single mother rat were passed down to many generations of rats after her. In other words, the results of these action were inheritable. It's not all bad news, though. There are many ways to reverse what cortisol does to your stressed brain. The most powerful weapons are exercise and meditation, which involves breathing deeply and being aware and focused on your surroundings. Both of these activities decrease your stress and increase the size of the hippocampus, thereby improving your memory.