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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.

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THE EFFECTS OF LIGHT AND STRESS UPON THE BRAIN

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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.

Conclusions. The cortisol cycle believed to be regulated by light/dark cycle and information send to hypothalamic area via the retina. Important to receive adequate sleep so as not to be over exposed to higher cortisol levels. So don't feel defeated by the pressures of daily life. Get in control of your stress before it takes control of you. There are many ways to reverse what cortisol does to your stressed brain: exercise, meditation, aware and focused on your surroundings, keeping physiological night/day cycle.

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THE INFLUENCE OF MELATONIN ON THE ULTRAMICROSCOPIC STATE OF NEURONS OF THE LATERAL PREOPTIC NUCLEUS OF THE HYPOTHALAMUS DURING LIGHT STIMULATION

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Introduction. Currently, the number of elderly people in the world is increasing. Among the problems that are characteristic of this age group is a violation of the quality and/or duration of sleep, which can affect the development of pathological sleep disorders and the general state of health. Sleep is an extremely complex genetically determined cyclic process that is regulated by homeostatic and circadian components with the participation of various neural structures, among which the lateral preoptic nucleus (LPO) of the hypothalamus plays a key role.

The aim of the study. To investigate the effect of melatonin injection on the ultrastructural characteristics of LPO neurons in the hypothalamus of old rats under light stimulation

Materials and methods. The experiments were performed on 36 old white male rats. The first group of rats was kept under the conditions of a standard herd regime (from 8 am to 8 pm). The second group - is under conditions of round-the-clock lighting. The third group was given melatonin (0.5 mg/kg, Sigma, USA) against the background of round-the-clock lighting. The test material was fixed in a 2.5% solution of glutaraldehyde prepared on the basis of phosphate buffer with a pH of 7.2–7.4. Next, post-fixation was performed in a 1% solution of osmium tetraoxide and dehydrated in propylene oxide, after which it was poured into a mixture of epoxy resins. Ultrathin sections made on an ultramicrotome LKB-3 were contrasted with uranium acetate and lead citrate according to the Reynolds method and studied under an electron microscope PEM - 125K.

Results. The neurons of the LPO of the hypothalamus under the conditions of the standard mode of illumination at 2 am contain nuclei with uneven contours, sometimes with rather deep indentations. The neuroplasm contains well-developed tubules of granular EPR with ribosomes fixed on their membranes. GC cisterns are small and localized paranuclear, but many vesicles and microbubbles are found. Mitochondria rounded, small, with moderately pronounced cristae.

A study of the ultrastructure of LPO of the hypothalamus under light stimulation at 2 am showed that the neurons contain a rounded nucleus with electron-dense karyoplasm and uneven contours of the nuclear membrane, which forms deep intussusception. The hyaloplasm is also compacted, the EPR tubules are determined, which are locally expanded with the formation of vacuole-like structures. Mitochondria are small, vacuolated, with an enlightened matrix and reduced cristae.

At the same time, we investigated that at 2 am LPO neurons of the hypothalamus under light stimulation and injection of the melatonin contain nuclei of rounded irregular shape, with indistinct nuclear membrane contours, and few nuclear pores are visualized. Tubules of the granular endoplasmic reticulum are well-developed and locally expanded. Mitochondria are rounded and elongated, some of them are hypertrophied, with reduced cristae and a lightened matrix.

Conclusions. Neurons of the LPO of the hypothalamus of old rats show increased functional activity in the dark. Light stimulation leads to hypertrophic and initial destructive changes in the nuclei and organelles of the neurons of the LPO of the hypothalamus. Injection of melatonin against the background of round-the-clock lighting leads to a normalization of the submicroscopic state of the LPO of the hypothalamus.