МІНІСТЕРСТВО ОХОРОНИ ЗДОРОВ’Я УКРАЇНИ
БУКОВИНСЬКИЙ ДЕРЖАВНИЙ МЕДИЧНИЙ УНІВЕРСИТЕТ»

М А Т Е Р І А Л И

**105-ї підсумкової науково-практичної конференції
з міжнародною участю
професорсько-викладацького персоналу
БУКОВИНСЬКОГО ДЕРЖАВНОГО МЕДИЧНОГО УНІВЕРСИТЕТУ
присвяченої 80-річчю БДМУ
05, 07, 12 лютого 2024 року**

Конференція внесена до Реєстру заходів безперервного професійного розвитку,
які проводитимуться у 2024 році № 3700679

Чернівці – 2024

УДК 001:378.12(477.85)
ББК 72:74.58
М 34

Матеріали підсумкової 105-ї науково-практичної конференції з міжнародною участю професорсько-викладацького персоналу Буковинського державного медичного університету, присвяченої 80-річчю БДМУ (м. Чернівці, 05, 07, 12 лютого 2024 р.) – Чернівці: Медуніверситет, 2024. – 477 с. іл.

ББК 72:74.58

У збірнику представлені матеріали 105-ї підсумкової науково-практичної конференції з міжнародною участю професорсько-викладацького персоналу Буковинського державного медичного університету, присвяченої 80-річчю БДМУ (м. Чернівці, 05, 07, 12 лютого 2024 р.) із стилістикою та орфографією у авторській редакції. Публікації присвячені актуальним проблемам фундаментальної, теоретичної та клінічної медицини.

ISBN 978-617-519-077-7

Under light stress in the hypothalamic pPVN nucleus at night, a significant increase in the neuronal body area by 9.3 % was found compared to that in intact old animals at 2 a.m. This pattern was caused by a significant increase in the nucleus by 16.1 % and the nucleolus by 27.3 %. Constant illumination was also reflected in a significant increase in RNA concentration in the nucleus by 5.5%, in the nucleolus by 9.2%, and in the cytoplasm by 7.9% compared with the group of the previous time interval.

Conclusions. The functioning of the neurons of the medial small-cell and posterior large-cell subnuclei of the rat hypothalamic paraventricular nucleus is characterized by circadian rhythmicity. Under conditions of light deprivation, desynchronization of the activity of the studied structures and a shift in the largest values of the neuronal area from 2 p.m. to 2 a.m. were observed. There is no pronounced increase in the functional activity of the median small cell subnuclei and no significant differences in the area of neuronal bodies, their nuclei, nucleoli, cytoplasm, concentration of RNA, specific volumes of nuclei and cytoplasm in animals exposed to standard light conditions and light stress regimes suggests wide limits of plasticity of the studied neurosecretory cells when animals were kept under constant light conditions for a week.

Vlasova K.V.

THE ROLE OF LEPTIN AND GHRELIN IN THE REGULATION OF FOOD INTAKE AND BODY WEIGHT

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Introduction. Food intake and energy expenditure must be balanced to maintain a healthy body weight. This balance is kept by the central nervous system which controls feeding behavior and energy metabolism.

The aim of the study. To analyze reference data about the influence of stress and diet on obesity.

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

Results. Several brain systems are involved including the brainstem which receives neural inputs from the digestive tract, and the hypothalamus which picks up hormonal and nutritional signals from the circulation. These two systems collect information about the body's nutrient status and respond accordingly. They also interact with the reward and motivation pathways which drive food seeking behavior. The arcuate nucleus, ARC, of the hypothalamus emerges as the major control center. There are two groups of neurons with opposing functions in the ARC. The appetite stimulating neurons expressing NPY and AGRP peptides and the appetite suppressing neurons producing POMC peptide. Appetite stimulating neurons are activated by hunger, while appetite suppressing neurons are stimulated by satiety or fullness. Neurons of the ARC project to other nuclei of the hypothalamus of which the paraventricular nucleus PVN is most important. PVN neurons further process the information and project to other circuits outside the hypothalamus, thus coordinating our response that controls energy intake and expenditure. Short-term regulation of feeding is based on how empty or how full the stomach is, and if there are nutrients in the intestine. In the fasting state and empty stomach sends stretch information to the brainstem signaling hunger. It also produces a peptide called ghrelin which acts in the arcuate nucleus to stimulate feeding. Ghrelin also acts directly on the PVN to reduce energy expenditure. Upon food ingestion, distention of the stomach is perceived by the brainstem as satiety. Ghrelin is no longer produced. Instead, several other gut peptides are released from the intestine and act on the hypothalamus and other brain areas to suppress appetite and increase energy expenditure. Long-term regulation on the other hand takes cues from the amount of body fat: low body fat content encourages feeding and energy preservation, while high body fat suppresses appetite and promotes energy expenditure. Two hormones are involved: leptin and insulin. Insulin is a hormone produced by the pancreas and is released into the bloodstream upon food ingestion, when blood glucose starts to rise. Leptin is a hormone secreted by adipose tissues in a process dependent on insulin. The amount of circulating leptin in the plasma is directly proportional to the body fat content. Increased leptin levels in the blood signal to the brain that the body has enough energy storage, and that it has to stop eating and burn more energy.

Conclusions. Obesity results from the dysregulation of feeding the behaviors and energy metabolism. Obesity is most commonly associated with chronic low leptin activities, which trick the brain into thinking that the body is always starved. This leads to overeating and excessive energy storage as fats. Both genetic and lifestyle factors contribute to low leptin signaling, but the contribution of each factor varies widely from person to person. The major lifestyle factor is high-fat, energy-rich diet. In an early stage of high fat diet induced obesity, increased amounts of saturated fatty acids cross the blood brain barrier and provoke an inflammatory response in hypothalamic neurons. Inflammation induces stress in these neurons, blunting their response to leptin. This is known as leptin resistance. Leptin levels are high, but because the cells cannot react to leptin the brain interprets it as low and triggers the starvation response. A major risk factor for childhood obesity is maternal obesity and mothers' high fat diet during pregnancy and lactation. A maternal diet rich in saturated fats can cause inflammation in the infant's hypothalamus. It may also prime the reward pathways in infants influencing their food choice toward energy rich foods.

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CHARACTERISATION OF PROTEIN ACCUMULATION PROCESSES IN NEURONS OF THE LATERAL PREOPTIC NUCLEUS OF THE RAT HYPOTHALAMUS AT DIFFERENT PHOTOPERIOD DURATIONS

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Introduction. Biological rhythms are the result of natural adaptation and synchronization of the human body with the environment. Most of our body's functions are subject to the daily periodicity. In particular, biorhythms affect metabolism, biochemical, endocrine and hematological parameters, respiratory rate and depth, heart rate and blood pressure, body temperature, etc. The most obvious circadian rhythm observed in humans and many animals is the sleep-wake cycle. An important component in the regulation of the sleep-wake cycle is the lateral prefrontal nucleus (LPN) of the hypothalamus. Some proteins may be a key biochemical marker of the functional activity of nervous system cells. They are involved in the proliferation and differentiation of nerve and glial cells and are involved in the organization of many metabolic and immune functions of the brain.

The aim of the study. To determine the effect of changing the lighting regime (twenty-four-hour darkness and twenty-four-hour light) on the processes of protein accumulation in the neurons of the rat hypothalamus.

Material and methods. The experiments were performed on 36 mature white male rats. Material was sampled at 12-hour intervals (2 p.m. and 2 a.m.) due to the cyclicity of melatonin synthesis. The histological sections were stained with bromophenol blue according to the Mikel-Calvo method. Quantitative assessment of the staining results was performed by computer microspectrophotometry on digital copies of images.

Results. The study found that the optical density of histochemical staining for protein in the neurons of the LPN under standard lighting conditions at 2 p.m. was 0.274±0.0017 units of optical density, and at 2 a.m. - 0.271±0.0016 units of optical density. Under conditions of twenty-four-hour darkness, the optical density of specific staining for protein in the neurons of the hypothalamic LPN on average does not change regardless of the time of day and is at 2 p.m. 0.273±0.0018 units of optical density, and at 2.00 a.m. - 0.276±0.0015 units of optical density ($p<0.001$).

At the same time, round-the-clock illumination leads to an increase in the average intensity of protein staining in the neurons of the hypothalamic LPN in mature rats. The data on the optical density of histochemical staining for protein in the neurons of the LPN under conditions of round-the-clock illumination in mature rats were at 2 p.m. 0.321±0.0017 units of optical density, and at 2 a.m. - 0.326±0.0014 units of optical density ($p<0.001$).