

Hnatiuk V. V. Characteristics of melatonin-positive-labeled cells of gastric mucosa amount in rats of different sexes in autumn and winter = Характеристика кількості мелатонін-позитивно-мічених клітин слизової оболонки шлунка у щурів різної статі у осінньо-зимовий період = Характеристика количества мелатонин-положительно-меченых клеток слизистой оболочки желудка у крыс разного пола в осенне-зимний период. *Journal of Education, Health and Sport*. 2016;6(11):622-628. eISSN 2391-8306. DOI <http://dx.doi.org/10.5281/zenodo.200416>  
<http://ojs.ukw.edu.pl/index.php/johs/article/view/4064>

The journal has had 7 points in Ministry of Science and Higher Education parametric evaluation. Part B item 755 (23.12.2015).

755 Journal of Education, Health and Sport eISSN 2391-8306 7

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The authors declare that there is no conflict of interests regarding the publication of this paper.

Received: 02.11.2016. Revised 22.11.2016. Accepted: 30.11.2016.

UDC 612.325: 612.6.057: 616.831.45

## CHARACTERISTICS OF MELATONIN-POSITIVE-LABELED CELLS OF GASTRIC MUCOSA AMOUNT IN RATS OF DIFFERENT SEXES IN AUTUMN AND WINTER

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### Abstract

The objective of presented study was the state of the melatonin-positive-labeled cells of gastric mucosa in rats of different sex and age in the autumn and winter. It was established that during the seasonal physiological desynchronosis – autumn – the amount of melatonin-positive-labeled cells was lower compared to their level in the winter to 13 % – in male rats, 7 % – in female rats. It determined that melatonin-positive-labeled cells in the gastric mucosa presents 3<sup>d</sup> cell types, which differ in size and structure. The number of different cell types different in males and females. Melatonin-positive-labeled cells in male rats were significantly lower than the melatonin-positive-labeled cells in female rats in both seasons.

**Key words:** melatonin, melatonin-producing cells, stomach, pineal gland, seasons, sex.

## **ХАРАКТЕРИСТИКА КІЛЬКОСТІ МЕЛАТОНІН-ПОЗИТИВНО-МІЧЕНИХ КЛІТИН СЛИЗОВОЇ ОБОЛОНКИ ШЛУНКА У ЩУРІВ РІЗНОЇ СТАТІ У ОСІННЬО-ЗИМОВИЙ ПЕРІОД**

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### **Реферат**

Проведено дослідження кількості мелатонін-позитивно-мічених клітин слизової оболонки шлунка щурів різної статі віком 9 міс в осінньо-зимовий період. Встановлено, що в період сезонного фізіологічного десинхронозу – восени – кількість мелатонін-позитивно-мічених клітин була меншою порівняно до їх рівня в зимовий період на 13% – у щурів-самців, на 7% – у щурів-самок. Визначено, що мелатонін-позитивно-мічені клітини в слизовій оболонці шлунка представлені 3-а типами клітин відмінних за розміром на будовою. Кількість різних типів клітин відрізняється у щурів самців та самок. Загальна кількість мелатонін-позитивно-мічених клітин у щурів-самців достовірна нижча за їх кількість у щурів-самок в обидва сезони.

**Ключові слова:** мелатонін, мелатонін-продукуючи клітини, шлунок, епіфіз, сезони, стаття.

## **ХАРАКТЕРИСТИКА КОЛИЧЕСТВА МЕЛАТОНИН-ПОЛОЖИТЕЛЬНО- МЕЧЕННЫХ КЛЕТКОК СЛИЗИСТОЙ ОБОЛОЧКИ ЖЕЛУДКА У КРЫС РАЗНОГО ПОЛА В ОСЕННЕ-ЗИМНИЙ ПЕРИОД**

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### **Реферат**

Проведено исследование количества мелатонин-положительно-меченых клеток слизистой оболочки желудка крыс разного пола в возрасте 9 мес в осенне-зимний период. Установлено, что в период сезонного физиологического десинхроноза – осень – количество мелатонин-положительно-меченых клеток меньше по сравнению с их уровнем в зимний период на 13% – у крыс-самцов, на 7% – у крыс-самок. Определено, что мелатонин-положительно-меченные клетки в слизистой оболочке желудка

представлены 3-я типами клеток, которые отличаются размером и строением. Количество разных типов клеток отличается у самцов и самок. Общее количество мелатонин-положительно-меченых клеток у крыс-самцов достоверно ниже их количества в сравнении с крысами-самками в оба сезона.

**Ключевые слова:** мелатонин, мелатонин-продуцирующие клетки, желудок, эпифиз, сезоны, статья.

Melatonin is the main epiphysis hormone that regulates many physiological and neuroendocrine functions. Melatonin's biorhythmic, antioxidant, immune-modulating, antihypertensive action has already been proven, whereas its participation in other processes is under detailed study [1, 2, 3]. Pineal gland is the main biorhythms' regulator that defines circadian (daily) and circannual (seasonal) changes in bodily functions [4]. Violation of the production of melatonin can lead to the development of chronic diseases of internal organs. In recent years experimental studies were conducted to indicate the role of melatonin in the regulation of functions of the gastrointestinal tract (GIT) [5, 6, 7]. The increased interest to GIT is caused by the fact that due out pineal source of melatonin synthesis in enterochromaffin cells, concentration of melatonin in the digestive canal 10-100 times higher than in blood, and 400 times higher than in the epiphysis. Melatonin synthesis sources in human body were found in the salivary glands, tonsils, esophagus, stomach, duodenum, liver etc. Melatonin producing cells are part of the diffuse neuroendocrine gastrointestinal system, the number changes in various pathological conditions [8]. We know that daylight hours change depending on the season, leading to changes in melatonin secretion of the pineal gland and physiological development of desynchronosis in the autumn and spring [9]. Thus, studies of melatonin producing cells of the gastrointestinal tract, depending on the season and sex were not conducted.

Therefore, *the aim of our work* was to study the amount of melatonin-positive-labeled cells of gastric mucosa in rats of different sex in the autumn and winter.

**Materials and methods.** The research was conducted on 24 rats of different sex aged 9 months, corresponding to the person's age 29-30 years. The animals were divided into 4 groups: 1–2 groups – male and female rats of appropriate age – study of the gastric mucosa was held in autumn: 3–4 groups – male and female rats of appropriate age – study of the gastric mucosa was held in winter. Animals of all groups during the experiment were on a standard diet and temperature conditions under natural light without the influence of artificial light sources. Collection of samples of the gastric mucosa was performed on the 15th day of

the experiment. 242 sections of the pyloric part of the stomach were studied using the method of immunohistochemical staining with primary antibodies to melatonin (Biorbyt, UK) and secondary Alexa Fluor 488 conjugated antibodies (Abcam, UK). Analysis of serial sections was performed using analysis and image processing ImageJ 1.48a (NIH). The number of cells transferred to 1 mm<sup>2</sup>. All interventions and euthanasia of animals were carried out according to the requirements Commission on Bioethics pharmacy and "general ethical principles of animal experiments" that are consistent with the provisions "of the European Convention for the Protection of vertebrate animals used for experimental and other scientific purposes" (Strasbourg, 1986) and the first National Congress on bioethics (Kyiv, 2001). Obtained results were statistically treated by ANOVA. For minimal level of significance was taken  $p < 0.05$  [10]. Was used the programs software «Statistica V.7.0» and Excel.

**Results and discussion.** During the study it was found that the gastric mucosa number melatonin-positive-labeled cells (MPLC) in autumn is lower than the number of MPLC gastric mucosa in winter (Fig. 1).

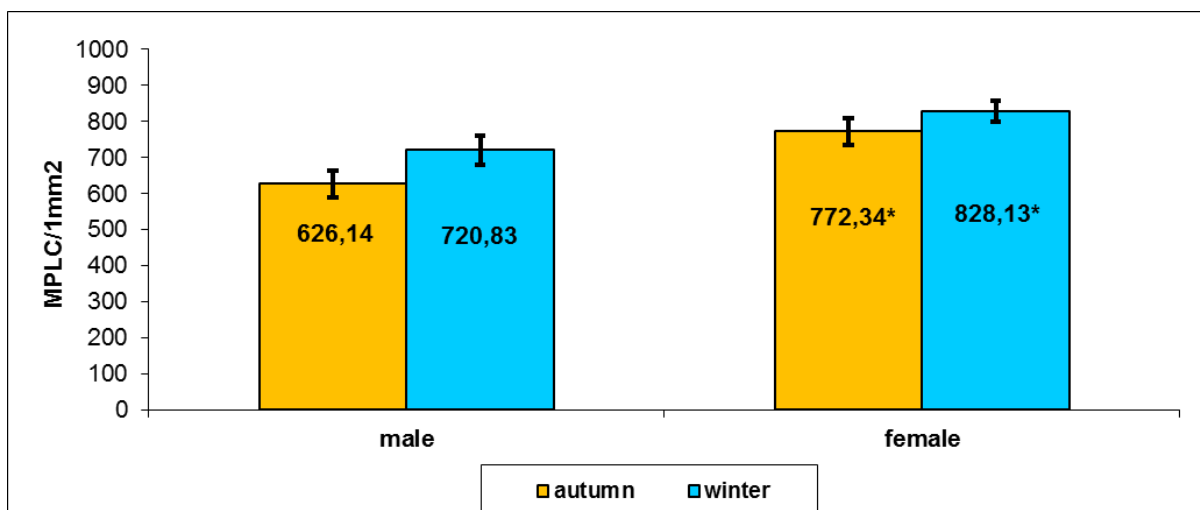


Fig. 1. Number MPLC of the gastric mucosa of rats of different sex in the autumn and winter periods

\*  $p \leq 0.05$  relative to male rats

The number of cells in males fall below 13% ( $p = 0.10$ ), and females below 7% ( $p = 0.24$ ) relative to winter. Significant difference between MPLC in rats of different sex in autumn –19% ( $p = 0.006$ ) and in winter – 13% ( $p = 0.05$ ) was determined.

The data show that physiological desynchronosis which, according to the literature [9] and research affects the ekstrapineal source of melatonin synthesis, particularly in the gastric mucosa. However, more significant changes occur in the gastric mucosa of males compared

to females, which, given the paracrine mechanisms of release of melatonin and its antioxidant and reparative properties, could be an explanation of higher incidence of erosive and ulcerative lesions of the gastric mucosa of men compared to women [11].

During the analysis of serial sections it was found that MPLC have different histological structure and represented by three cell types: type 1– small cell (3,8-7,6 microns), located mainly in the basal gastric gland, type 2 – large cells (11-17 microns) without granules in the cytoplasm and type 3 – large cells with granules in the cytoplasm that occupy basal and middle parts of the gastric gland. No significant differences in the ratio of different types of cells in the total pool MPLC in rats of different sexes during studied seasons were found (Fig. 2).

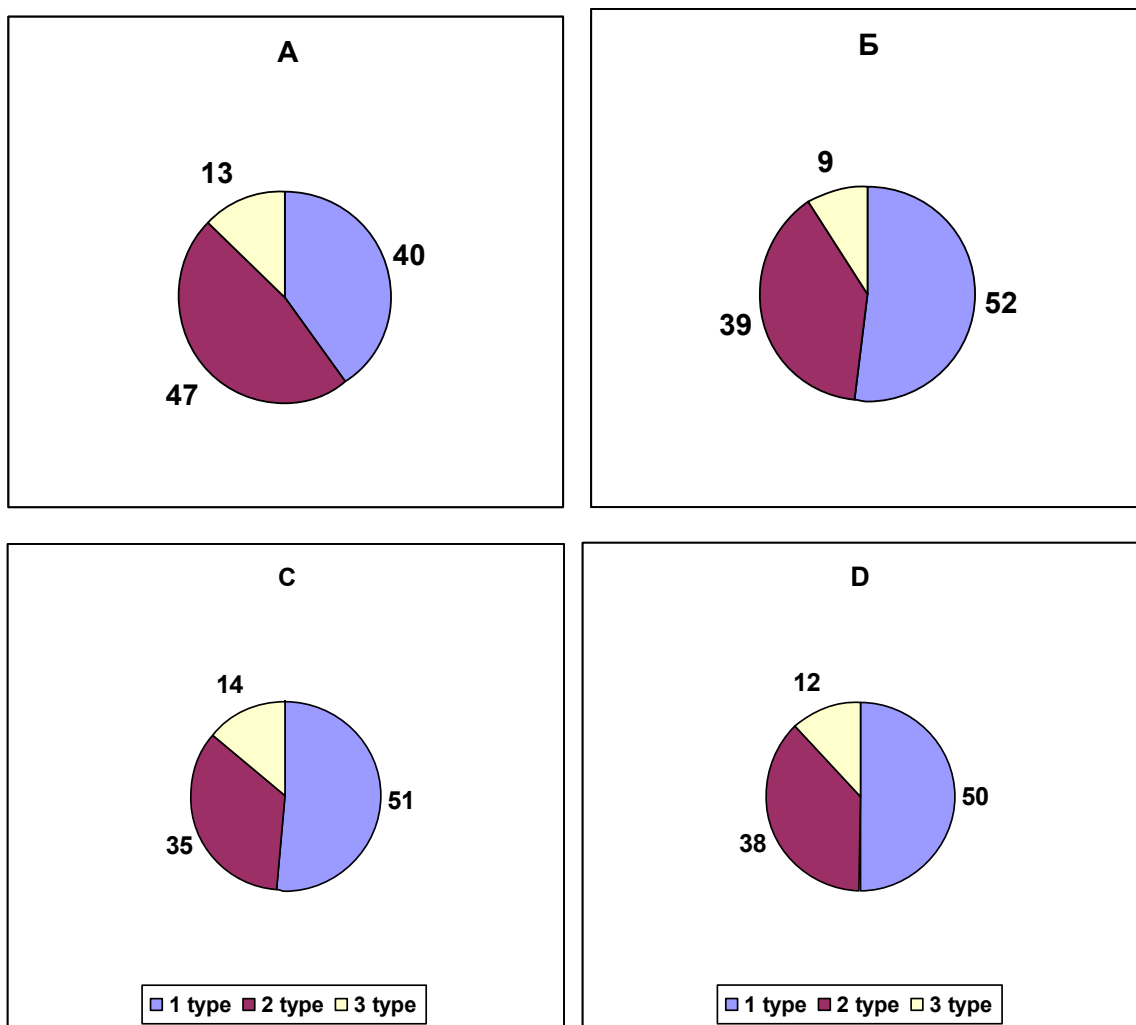


Fig. 2. The percentages of different types MPLC gastric mucosa: A – rats-males in winter; B – rats-males autumn; C – rats-female winter; D – rats-females autumn.

## Conclusions

1. Melatonin-positive-labeled cells in rats of different sex in autumn is lower than the amount of melatonin-positive-labeled cells in winter.
2. Melatonin-positive-labeled cells in male rats were significantly lower than the melatonin-positive-labeled cells in female rats in both seasons.
3. The presence of different types of melatonin-positive-labeled cells in the gastric mucosa with interest difference between the number of males and females was indicated.

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