GEORGIAN MEDICAL NEWS

ISSN 1512-0112

NO 7-8 (352-353) Июль-Август 2024

ТБИЛИСИ - NEW YORK

ЕЖЕМЕСЯЧНЫЙ НАУЧНЫЙ ЖУРНАЛ

Медицинские новости Грузии

საქართველოს სამედიცინო სიახლენი

GEORGIAN MEDICAL NEWS

Monthly Georgia-US joint scientific journal published both in electronic and paper formats of the Agency of Medical Information of the Georgian Association of Business Press. Published since 1994. Distributed in NIS, EU and USA.

GMN: Georgian Medical News is peer-reviewed, published monthly journal committed to promoting the science and art of medicine and the betterment of public health, published by the GMN Editorial Board since 1994. GMN carries original scientific articles on medicine, biology and pharmacy, which are of experimental, theoretical and practical character; publishes original research, reviews, commentaries, editorials, essays, medical news, and correspondence in English and Russian.

GMN is indexed in MEDLINE, SCOPUS, PubMed and VINITI Russian Academy of Sciences. The full text content is available through EBSCO databases.

GMN: Медицинские новости Грузии - ежемесячный рецензируемый научный журнал, издаётся Редакционной коллегией с 1994 года на русском и английском языках в целях поддержки медицинской науки и улучшения здравоохранения. В журнале публикуются оригинальные научные статьи в области медицины, биологии и фармации, статьи обзорного характера, научные сообщения, новости медицины и здравоохранения. Журнал индексируется в MEDLINE, отражён в базе данных SCOPUS, PubMed и ВИНИТИ РАН. Полнотекстовые статьи журнала доступны через БД EBSCO.

GMN: Georgian Medical News – საქართველოს სამედიცინო სიახლენი – არის ყოველთვიური სამეცნიერო სამედიცინო რეცენზირებადი ჟურნალი, გამოიცემა 1994 წლიდან, წარმოადგენს სარედაქციო კოლეგიისა და აშშ-ის მეცნიერების, განათლების, ინდუსტრიის, ხელოვნებისა და ბუნებისმეტყველების საერთაშორისო აკადემიის ერთობლივ გამოცემას. GMN-ში რუსულ და ინგლისურ ენებზე ქვეყნდება ექსპერიმენტული, თეორიული და პრაქტიკული ხასიათის ორიგინალური სამეცნიერო სტატიები მედიცინის, ბიოლოგიისა და ფარმაციის სფეროში, მიმოხილვითი ხასიათის სტატიები.

ჟურნალი ინდექსირებულია MEDLINE-ის საერთაშორისო სისტემაში, ასახულია SCOPUS-ის, PubMed-ის და ВИНИТИ РАН-ის მონაცემთა ბაზებში. სტატიების სრული ტექსტი ხელმისაწვდომია EBSCO-ს მონაცემთა ბაზებიდან.

WEBSITE

www.geomednews.com

К СВЕДЕНИЮ АВТОРОВ!

При направлении статьи в редакцию необходимо соблюдать следующие правила:

1. Статья должна быть представлена в двух экземплярах, на русском или английском языках, напечатанная через **полтора интервала на одной стороне стандартного листа с шириной левого поля в три сантиметра**. Используемый компьютерный шрифт для текста на русском и английском языках - **Times New Roman** (**Кириллица**), для текста на грузинском языке следует использовать **AcadNusx.** Размер шрифта - **12**. К рукописи, напечатанной на компьютере, должен быть приложен CD со статьей.

2. Размер статьи должен быть не менее десяти и не более двадцати страниц машинописи, включая указатель литературы и резюме на английском, русском и грузинском языках.

3. В статье должны быть освещены актуальность данного материала, методы и результаты исследования и их обсуждение.

При представлении в печать научных экспериментальных работ авторы должны указывать вид и количество экспериментальных животных, применявшиеся методы обезболивания и усыпления (в ходе острых опытов).

4. К статье должны быть приложены краткое (на полстраницы) резюме на английском, русском и грузинском языках (включающее следующие разделы: цель исследования, материал и методы, результаты и заключение) и список ключевых слов (key words).

5. Таблицы необходимо представлять в печатной форме. Фотокопии не принимаются. **Все цифровые, итоговые и процентные данные в таблицах должны соответствовать таковым в тексте статьи**. Таблицы и графики должны быть озаглавлены.

6. Фотографии должны быть контрастными, фотокопии с рентгенограмм - в позитивном изображении. Рисунки, чертежи и диаграммы следует озаглавить, пронумеровать и вставить в соответствующее место текста **в tiff формате**.

В подписях к микрофотографиям следует указывать степень увеличения через окуляр или объектив и метод окраски или импрегнации срезов.

7. Фамилии отечественных авторов приводятся в оригинальной транскрипции.

8. При оформлении и направлении статей в журнал МНГ просим авторов соблюдать правила, изложенные в «Единых требованиях к рукописям, представляемым в биомедицинские журналы», принятых Международным комитетом редакторов медицинских журналов - http://www.spinesurgery.ru/files/publish.pdf и http://www.nlm.nih.gov/bsd/uniform_requirements.html
В конце каждой оригинальной статьи приводится библиографический список. В список литературы включаются все материалы, на которые имеются ссылки в тексте. Список составляется в алфавитном порядке и нумеруется. Литературный источник приводится на языке оригинала. В списке литературы сначала приводятся работы, написанные знаками грузинского алфавита, затем кириллицей и латиницей. Ссылки на цитируемые работы в тексте статьи даются в квадратных скобках в виде номера, соответствующего номеру данной работы в списке литературы. Большинство цитированных источников должны быть за последние 5-7 лет.

9. Для получения права на публикацию статья должна иметь от руководителя работы или учреждения визу и сопроводительное отношение, написанные или напечатанные на бланке и заверенные подписью и печатью.

10. В конце статьи должны быть подписи всех авторов, полностью приведены их фамилии, имена и отчества, указаны служебный и домашний номера телефонов и адреса или иные координаты. Количество авторов (соавторов) не должно превышать пяти человек.

11. Редакция оставляет за собой право сокращать и исправлять статьи. Корректура авторам не высылается, вся работа и сверка проводится по авторскому оригиналу.

12. Недопустимо направление в редакцию работ, представленных к печати в иных издательствах или опубликованных в других изданиях.

При нарушении указанных правил статьи не рассматриваются.

REQUIREMENTS

Please note, materials submitted to the Editorial Office Staff are supposed to meet the following requirements:

1. Articles must be provided with a double copy, in English or Russian languages and typed or compu-ter-printed on a single side of standard typing paper, with the left margin of **3** centimeters width, and **1.5** spacing between the lines, typeface - **Times New Roman** (**Cyrillic**), print size - **12** (referring to Georgian and Russian materials). With computer-printed texts please enclose a CD carrying the same file titled with Latin symbols.

2. Size of the article, including index and resume in English, Russian and Georgian languages must be at least 10 pages and not exceed the limit of 20 pages of typed or computer-printed text.

3. Submitted material must include a coverage of a topical subject, research methods, results, and review.

Authors of the scientific-research works must indicate the number of experimental biological species drawn in, list the employed methods of anesthetization and soporific means used during acute tests.

4. Articles must have a short (half page) abstract in English, Russian and Georgian (including the following sections: aim of study, material and methods, results and conclusions) and a list of key words.

5. Tables must be presented in an original typed or computer-printed form, instead of a photocopied version. **Numbers, totals, percentile data on the tables must coincide with those in the texts of the articles.** Tables and graphs must be headed.

6. Photographs are required to be contrasted and must be submitted with doubles. Please number each photograph with a pencil on its back, indicate author's name, title of the article (short version), and mark out its top and bottom parts. Drawings must be accurate, drafts and diagrams drawn in Indian ink (or black ink). Photocopies of the X-ray photographs must be presented in a positive image in **tiff format**.

Accurately numbered subtitles for each illustration must be listed on a separate sheet of paper. In the subtitles for the microphotographs please indicate the ocular and objective lens magnification power, method of coloring or impregnation of the microscopic sections (preparations).

7. Please indicate last names, first and middle initials of the native authors, present names and initials of the foreign authors in the transcription of the original language, enclose in parenthesis corresponding number under which the author is listed in the reference materials.

8. Please follow guidance offered to authors by The International Committee of Medical Journal Editors guidance in its Uniform Requirements for Manuscripts Submitted to Biomedical Journals publication available online at: http://www.nlm.nih.gov/bsd/uniform_requirements.html
http://www.icmje.org/urm_full.pdf
In GMN style for each work cited in the text, a bibliographic reference is given, and this is located at the end of the article under the title "References". All references cited in the text must be listed. The list of references should be arranged alphabetically and then numbered. References are numbered in the text [numbers in square brackets] and in the reference list and numbers are repeated throughout the text as needed. The bibliographic description is given in the language of publication (citations in Georgian script are followed by Cyrillic and Latin).

9. To obtain the rights of publication articles must be accompanied by a visa from the project instructor or the establishment, where the work has been performed, and a reference letter, both written or typed on a special signed form, certified by a stamp or a seal.

10. Articles must be signed by all of the authors at the end, and they must be provided with a list of full names, office and home phone numbers and addresses or other non-office locations where the authors could be reached. The number of the authors (co-authors) must not exceed the limit of 5 people.

11. Editorial Staff reserves the rights to cut down in size and correct the articles. Proof-sheets are not sent out to the authors. The entire editorial and collation work is performed according to the author's original text.

12. Sending in the works that have already been assigned to the press by other Editorial Staffs or have been printed by other publishers is not permissible.

Articles that Fail to Meet the Aforementioned Requirements are not Assigned to be Reviewed.

ავტორთა საყურადღებოდ!

რედაქციაში სტატიის წარმოდგენისას საჭიროა დავიცვათ შემდეგი წესები:

1. სტატია უნდა წარმოადგინოთ 2 ცალად, რუსულ ან ინგლისურ ენებზე,დაბეჭდილი სტანდარტული ფურცლის 1 გვერდზე, 3 სმ სიგანის მარცხენა ველისა და სტრიქონებს შორის 1,5 ინტერვალის დაცვით. გამოყენებული კომპიუტერული შრიფტი რუსულ და ინგლისურენოვან ტექსტებში - **Times New Roman (Кириллица)**, ხოლო ქართულენოვან ტექსტში საჭიროა გამოვიყენოთ **AcadNusx.** შრიფტის ზომა – 12. სტატიას თან უნდა ახლდეს CD სტატიით.

2. სტატიის მოცულობა არ უნდა შეადგენდეს 10 გვერდზე ნაკლებს და 20 გვერდზე მეტს ლიტერატურის სიის და რეზიუმეების (ინგლისურ, რუსულ და ქართულ ენებზე) ჩათვლით.

3. სტატიაში საჭიროა გაშუქდეს: საკითხის აქტუალობა; კვლევის მიზანი; საკვლევი მასალა და გამოყენებული მეთოდები; მიღებული შედეგები და მათი განსჯა. ექსპერიმენტული ხასიათის სტატიების წარმოდგენისას ავტორებმა უნდა მიუთითონ საექსპერიმენტო ცხოველების სახეობა და რაოდენობა; გაუტკივარებისა და დაძინების მეთოდები (მწვავე ცდების პირობებში).

4. სტატიას თან უნდა ახლდეს რეზიუმე ინგლისურ, რუსულ და ქართულ ენებზე არანაკლებ ნახევარი გვერდის მოცულობისა (სათაურის, ავტორების, დაწესებულების მითითებით და უნდა შეიცავდეს შემდეგ განყოფილებებს: მიზანი, მასალა და მეთოდები, შედეგები და დასკვნები; ტექსტუალური ნაწილი არ უნდა იყოს 15 სტრიქონზე ნაკლები) და საკვანძო სიტყვების ჩამონათვალი (key words).

5. ცხრილები საჭიროა წარმოადგინოთ ნაბეჭდი სახით. ყველა ციფრული, შემაჯამებელი და პროცენტული მონაცემები უნდა შეესაბამებოდეს ტექსტში მოყვანილს.

6. ფოტოსურათები უნდა იყოს კონტრასტული; სურათები, ნახაზები, დიაგრამები - დასათაურებული, დანომრილი და სათანადო ადგილას ჩასმული. რენტგენოგრამების ფოტოასლები წარმოადგინეთ პოზიტიური გამოსახულებით **tiff** ფორმატში. მიკროფოტოსურათების წარწერებში საჭიროა მიუთითოთ ოკულარის ან ობიექტივის საშუალებით გადიდების ხარისხი, ანათალების შეღებვის ან იმპრეგნაციის მეთოდი და აღნიშნოთ სურათის ზედა და ქვედა ნაწილები.

7. სამამულო ავტორების გვარები სტატიაში აღინიშნება ინიციალების თანდართვით, უცხოურისა – უცხოური ტრანსკრიპციით.

8. სტატიას თან უნდა ახლდეს ავტორის მიერ გამოყენებული სამამულო და უცხოური შრომების ბიბლიოგრაფიული სია (ბოლო 5-8 წლის სიღრმით). ანბანური წყობით წარმოდგენილ ბიბლიოგრაფიულ სიაში მიუთითეთ ჯერ სამამულო, შემდეგ უცხოელი ავტორები (გვარი, ინიციალები, სტატიის სათაური, ჟურნალის დასახელება, გამოცემის ადგილი, წელი, ჟურნალის №, პირველი და ბოლო გვერდები). მონოგრაფიის შემთხვევაში მიუთითეთ გამოცემის წელი, ადგილი და გვერდების საერთო რაოდენობა. ტექსტში კვადრატულ ფჩხილებში უნდა მიუთითოთ ავტორის შესაბამისი N ლიტერატურის სიის მიხედვით. მიზანშეწონილია, რომ ციტირებული წყაროების უმეტესი ნაწილი იყოს 5-6 წლის სიღრმის.

9. სტატიას თან უნდა ახლდეს: ა) დაწესებულების ან სამეცნიერო ხელმძღვანელის წარდგინება, დამოწმებული ხელმოწერითა და ბეჭდით; ბ) დარგის სპეციალისტის დამოწმებული რეცენზია, რომელშიც მითითებული იქნება საკითხის აქტუალობა, მასალის საკმაობა, მეთოდის სანდოობა, შედეგების სამეცნიერო-პრაქტიკული მნიშვნელობა.

10. სტატიის ბოლოს საჭიროა ყველა ავტორის ხელმოწერა, რომელთა რაოდენობა არ უნდა აღემატებოდეს 5-ს.

11. რედაქცია იტოვებს უფლებას შეასწოროს სტატია. ტექსტზე მუშაობა და შეჯერება ხდება საავტორო ორიგინალის მიხედვით.

12. დაუშვებელია რედაქციაში ისეთი სტატიის წარდგენა, რომელიც დასაბეჭდად წარდგენილი იყო სხვა რედაქციაში ან გამოქვეყნებული იყო სხვა გამოცემებში.

აღნიშნული წესების დარღვევის შემთხვევაში სტატიები არ განიხილება.

GEORGIAN MEDICAL NEWS
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Содержание:

GEORGIAN MEDICAL NEWS
No 7-8 (352-353) 2024

REGULATION OF SPONTANEOUS ELECTRICAL ACTIVITY IN THE ORGANS OF REPRODUCTIVE SYSTEM BY OXYTOCIN

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Abstract.

The influence of oxytocin on spontaneous electrical activity of the ovarian horn areas as well as the uterine corpus has been studied. Analysis of the main characteristics of activity parameters (amplitude of action potentials, spike generation frequency and total duration of bursts in 1 minute time frame) revealed some notable differences between above mentioned areas. In norm, the highest values of automatism indicators were noted for the left horn. Oxytocin, however, significantly enhances all three parameters. Under its influence, the indicators of the right horn predominate over the values of their own norm, thus emerging among all rhythmogenic loci. Perhaps oxytocin contributes to the activation not only of both fallopian tubes but also of the uterine corpus itself, facilitating the regulation of activity in all three areas.

Key words. Fallopian tubes, ovarian horn areas, uterine corpus, spontaneous activity, oxytocin.

Introduction.

The complex of reproductive organs, including the right and left fallopian tubes, as well as the uterine corpus, is characterized by autonomous electrical rhythmogenesis. The main functional role of the above-mentioned structures is realized through contractile activity, provided by spontaneous electrical activity in the form of high-frequency action potentials which are gathered in discrete groups or bursts of spikes: each burst of electrical activity is accompanied by contractile event with a short delay [1-3]. To maintain persistence of this process, genesis of coordinated multiple, high-frequency spikes of high-amplitude is necessary. Such bursts determine the main characteristics of electrical activity discharges that contribute to the spread of excitability along the organs of the system [1,4-6].

Unlike the uterine corpus, rhythmogenic areas of the uterine tubes are located at the opposite ends of each horn. Impulses of electrical activity propagating in the caudal direction arise in the ovarian horn areas, which play a leading role in the genesis of spontaneous contractions [4,7,8]. At the same time, very interesting is the fact that there is a certain asymmetry between the parameters of automatism in the fallopian tubes, while the physiological role of both horns is same [9].

Even though the uterine corpus has its own autonomy, there is some similarity in characteristics with the upper horn areas [1,10]. Based on the above, it is interesting to study the relationship between electrical activities of all three organs, that ensure the coordinated peristalsis.

Oxytocin is a peptide hormone that has a wide range of effects on the functional properties of reproductive organs and significantly enhances electrical activity [11-13]. Oxytocin exposure and activation of oxytocin receptors cause an increase in myometrial contractions due to elevation of the intracellular Ca^{2+} ions concentration [14,15]. Additionally, an increase in frequency of spike discharges and smooth muscle cells membrane depolarization is observed, contributing to the spread of excitation [16,17]. This ability of oxytocin may help to reveal the integrative activity process, occurring in the myometrial rhythmogenic areas. In the present work, combined electrophysiological and morphofunctional investigations were done to clarify the above-mentioned questions.

Materials and Methods.

In vivo experiments were carried out on non-pregnant female rats weighing 200-250g. Animals were anesthetized by intraperitoneal injection of Nembutal (40-45mg/kg). The peritoneal cavity was opened, and the uterine corpus with the uterine horns from two sides were exposed.

The uterus was denervated by transection of the nerves plexus hypogastricus, uterinus, uterovaginalis [18]. Oxytocin (5 IU/ml, Gedeon Richter, Hungary) loading dose 10^{-1}µg/kg was administered intravenously. Depending on the animal weight, such concentration was possible to administrate by different injection volumes – from 0.2 to 0.3 ml.

To record electrical activity of the muscle tissue, bipolar electrodes with distance of 5 mm in between, were used. The potential difference formed among the electrodes was transmitted to a specially developed four-channel electronic device, which provided amplification and digitization of the incoming signals. The digitized signals were then transmitted to computer for visualization, storage, and subsequent analysis. The signal registration program was developed by using National Instruments (NI) Lab View BMTK (Biomedical Toolkit). It

should also be noted that the developed device ensures reliable recording of changes in electrical signals between different areas of muscle tissue with an accuracy of up to 5 μV.

The analysis of the results was carried out by determining values of the main parameters of spontaneous action potentials: A – the amplitude, F -the spike generation frequency and D – the total duration of bursts in 1 minute time frame.

The subsequent statistical analysis of recorded signals was carried out by using the Origin-8.5 and Sigma Plot 11.0 softwares. Student's t-test was used to calculate the standard error of the difference between the means and determine statically significant changes.

To study the morphofunctional properties of the rat uterine horns, a histochemical method was used to detect Ca^{2+}-dependent acid phosphatase (AP) activity [19]. In living organisms, enzymes serve as biocatalysts that facilitate the progression of metabolic reactions due to the presence of active centers that convert a substrate specific to each enzyme. The applied method adheres to all requirements of this principle. This methodological approach is based on the detection of intracellular phosphorus-containing compounds that play key roles in the energetic processes aimed at preserving and reproducing vital systems. When AP activity is tested, the phosphate ions released under the action of the enzyme can freely move in the mixture and react with different structures, regardless of their spatial arrangement, and after incubation in the solution of sodium sulfide it turns into a visible dark brown precipitate of lead sulfide. The resulting image is adequate, highly informative, and allows judgments to be made about specific links in the metabolism of the examined structures.

For histochemical analysis, the animals were anesthetized with pentobarbital (40 mg/kg, intraperitoneal) followed by ureter extraction. The extracted ureter was fixed in a 5% solution of neutral formalin prepared in 0.1 M phosphate buffer (PBS, pH=7.4) for 48 hours at +4°C. Sections of the relevant ureter regions were prepared in the frontal plane. Frozen sections, with a thickness of 30-40 μm, were transferred to freshly prepared incubation mixtures designed to detect the activity of Ca^{2+}-dependent AP. Incubation was carried out in a thermostat at 37°C for 1.5 hours. Subsequently, the sections were washed in distilled water, developed in a sodium sulfate solution, rinsed again, and mounted in balsam, followed by the description of the preparations under a light microscope. Subsequent images of the obtained preparations were captured using the OPTON M-35 camera and the AmScope MU800 camera attachment through the OPTON microscope (West Germany).

All experiments with animals were carried out in accordance with the rules of "European Convention for the protection of animals used for experimental and other scientific purposes" (Directive 2010/63/EU).

Results and Discussion.

Simultaneous registration of electrical activity in the myometrial rhythmogenic areas allowed us to analyze the spike activity characteristics (Figure 1). Activity discharges arise asynchronously and autonomously in each of those areas [20,21]. The ovarian ends of both horns play a unique role among all the rhythmogenic areas of non-pregnant rats due to providing directional activity propagation along each of the fallopian tubes to the uterine corpus [1,22]. Thus, this fact indicates complete dependence of the uterine corpus activity on automatisms of the upstream rhythmogenic areas.

Analysis has revealed significant differences in characteristics of automatism of the studied areas, in norm (Table 1). The highest values of activity parameters were observed in the left ovarian horn area, in comparison with the gradually decreasing values of similar characteristics in the right ovarian horn area and uterine corpus. Regarding the latter, all three parameters of activity (amplitude, active state duration, frequency of action potentials) were relatively close to each other in values.

Oxytocin significantly enhances the parameters of rhythmogenesis (Table 2). The amplitude and active state duration in both horns had similar values, under its influence. However, the frequency of rhythmogenesis behaves somewhat differently; in particular, higher values were mainly registered from the right horn. Based on the data obtained, it can be assumed that oxytocin differently affects parameters of activity in the different rhythmogenic areas.

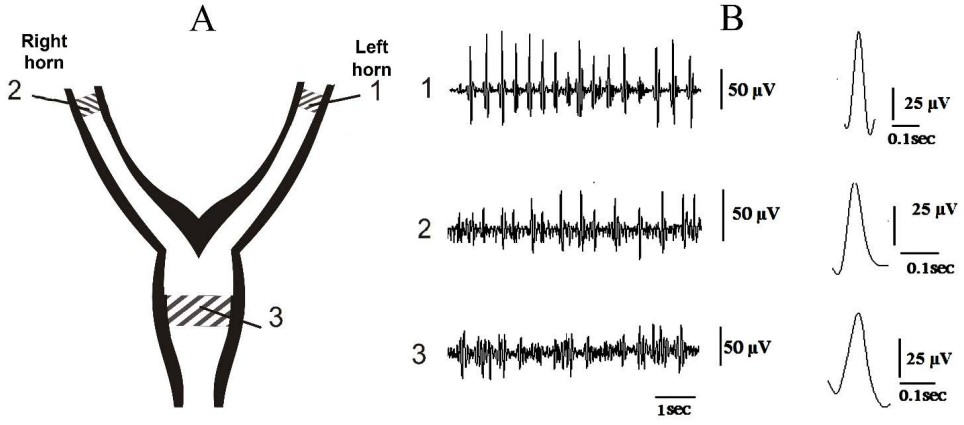

Figure 1. *A. Schematic representation of the rat's uterine corpus and horns. 1,2,3 –activity registration from the left and right ovarian horn areas and the uterine corpus. B. Bursts of action potentials recorded from areas 1,2,3. On the right, averaged forms of action potentials from the respective 1,2,3 areas are shown.*

Table 1. *Activity parameters of action potentials in the ovarian horn areas and uterine corpus in norm.*

Registration areas and number of experiments, n	Amplitude of action potentials (A), μV	Duration of bursts in minute (D), min.	Spike generation frequency (F), Hz
Left ovarian horn area, n=12	84.5 ± 6.44	0.65 ± 0.03	1.28 ± 0.09
Right ovarian horn area, n=12	57.1 ± 4.86	0.54 ± 0.04	1.25 ± 0.08
Uterine corpus, n=12	53.0 ± 3.68	0.52 ± 0.04	1.23 ± 0.08

Table 2. *Activity parameters of action potentials in the ovarian horn areas and uterine corpus under the effect of oxytocin.*

Registration areas and number of experiments, n	Amplitude of action potentials (A), μV	Duration of bursts in minute (D), min.	Spike generation frequency (F), Hz
Left ovarian horn area, n=12	101.2 ± 8.63	0.74 ± 0.06	1.85 ± 0.09
Right ovarian horn area, n=12	91.2 ± 7.44	0.68 ± 0.06	2.30 ± 0.16
Uterine corpus, n=12	65.1 ± 5.86	0.59 ± 0.04	1.80 ± 0.14

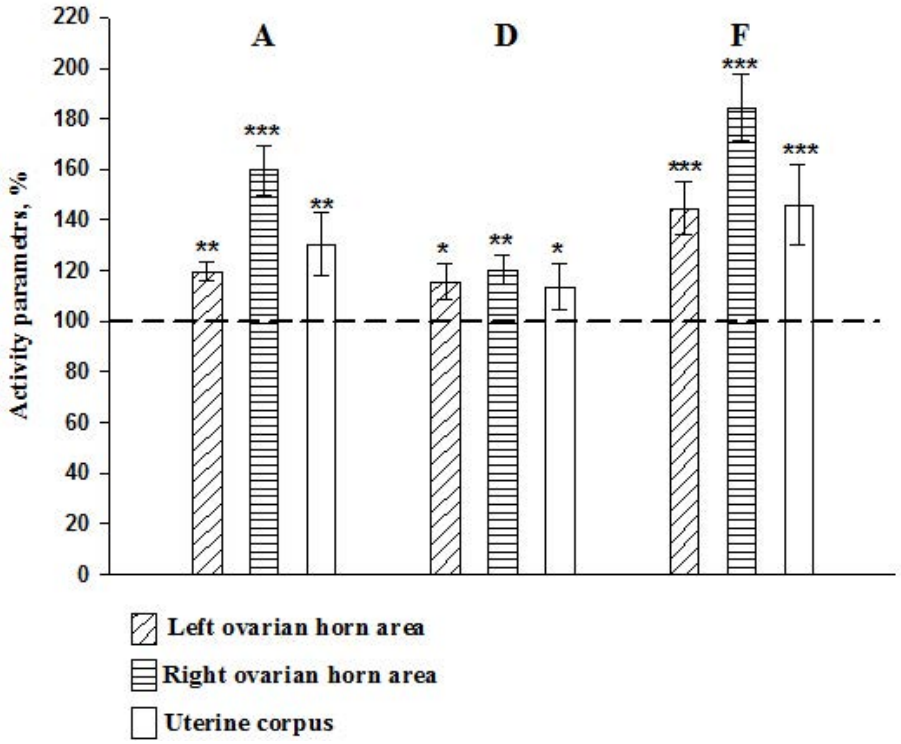

Figure 2. *A-the effect of oxytocin on the amplitude of action potentials in bursts, recorded from the horns and the uterine corpus. D-the effect of oxytocin on the duration of burst genesis in the horns and the uterine corpus. F - the effect of oxytocin on the burst frequency of the horns and the uterine corpus. The dashed line indicates the norm.*
*Statistical significance in changes of activity parameters (A, D, F), compared to the norm, is marked with asterisks. *P<0.05, **P<0.01, and ***P<0.001, respectively.*

Figure 2 presents histograms illustrating the effect of oxytocin on the amplitude of action potentials, duration of discharge genesis and frequency of spikes within the bursts. All results are presented in percents of their norms. According to Figure 2, oxytocin sharply increases the amplitudes of action potentials in the right uterine horn (by 59.8 %). A smaller effect is seen for the left uterine horn - by 19.7 %, and the uterine corpus – by 30.4 %.

However, under these conditions, the active state duration of burst discharges (D) raised to 115% in the left horn, 120% in the right horn and 113% in the uterine corpus. Thus, under the influence of oxytocin, the characteristics of activity parameters, to a greater or lesser extent, were distinctly highlighted in the right uterine horn.

In early studies, the presence of pacemaker regions determining the direction of excitation propagation has been confirmed [1,2,23]. On the other hand, the contractile activity of rhythmogenic areas located in the ovarian ends of horns ensure the coordination of all pacemaker regions. This fact may indicate the complete dependence of uterine corpus rhythmogenesis on the upper loci of the myometrium [4,8,22]. According to Table 1, the activity characteristics of the uterine

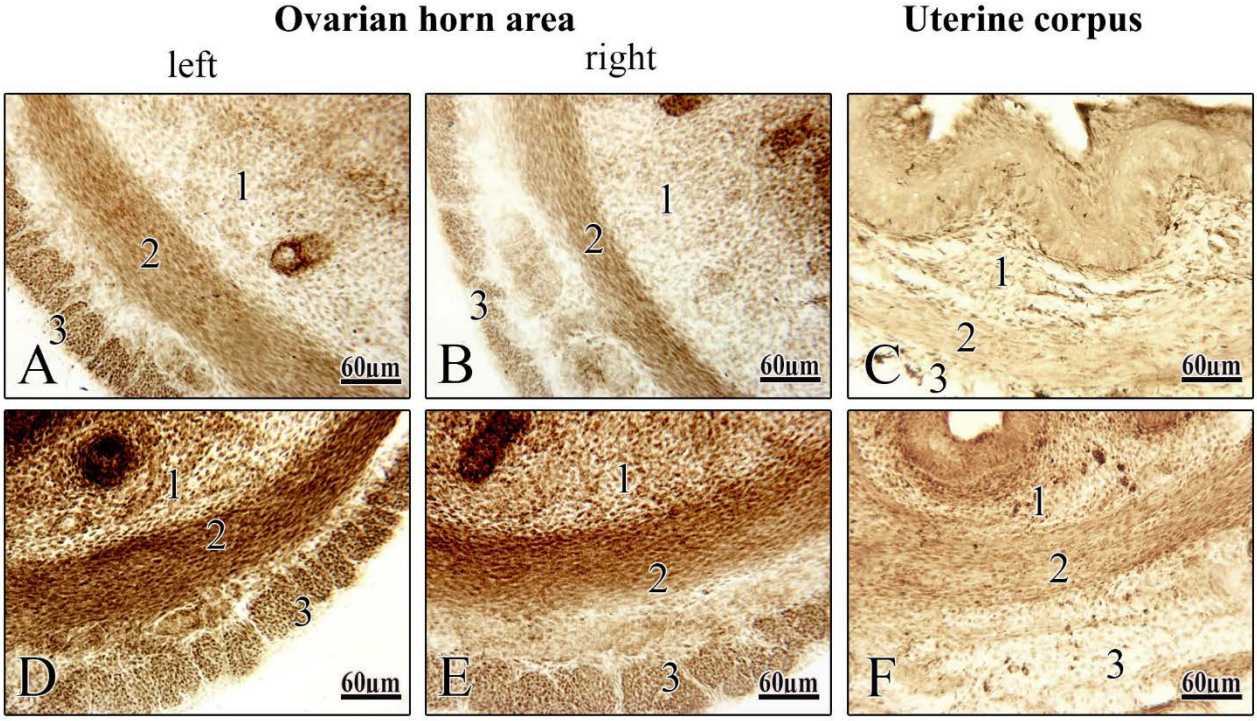

Figure 3. *Frontal sections of the rat uterus in norm (A-C) and under the effect of oxytocin (D-F): A, D – left ovarian horn area; B, E - right ovarian horn area; C, F – uterine corpus; 1 - inner layer, 2 - middle layer, and 3 - outer layer of the myometrium. Method for detecting the activity of Ca^{2+}- dependent acid phosphatase. Magnification: 160x (A-F), digital magnification - 8MP.*

corpus likely correspond only to those of the right horn, in norm. At the same time, oxytocin significantly enhances the activation of both fallopian tubes (including the right one), possibly acting as a regulator of rhythmogenesis in all areas simultaneously and contributing to an increase of automatism in the uterine corpus (Table 2).

Analysis of morphochemical data revealed the activity of Ca^{2+}-dependent acid phosphatase in the frontal sections of both ovarian horn areas. Immunohistochemical examination of the organ in its various parts has shown myometrial three layers of the fallopian tubes and the uterine corpus, with inner (submucosal) circularly oriented myocytes; middle (vascular) layer with a small number of smooth myocytes of obliquely-transverse orientation and large blood vessels; and outer (supravascular) layer with obliquely - longitudinal arrangement of muscle cells but intersecting with respect to the vascular layer [24].

Morphochemical studies have shown the presence of various "physiological" states in the examined areas, confirming the obtained electrophysiological results. All three layers of the fallopian tubes were identified in the sections, with no significant differences in the degree of staining intensity of different regions observed in the mucous and serous membranes (Figure 3A-F). However, significant differences in the metabolism of myogenic elements have been observed in the myometrium, with the right and left horns and the uterine corpus reacting differently under normal conditions and while influenced by oxytocin (Figure 3A-F). In intact animals, myogenic structures were the most intensely stained in the left ovarian horn area (Figure 3A). In the right ovarian horn area and the uterine corpus, relatively similar moderate staining of myogenic structures was observed (Figure 3B and 3C).

However, under the influence of oxytocin, there is an increase in the activity (enhancement of metabolism) of smooth muscle cells along the right and left horns as well as the uterine corpus (Figure 3D and 3F) compared to intact animals (Figure 3A and 3C). Moreover, myogenic cells in the ovarian horn areas are no longer represented as individual units but rather as masses of cytoplasm with many nuclei since these cells merge. The activity of acid phosphatase sharply intensifies, and intracytoplasmic granulation becomes indistinguishable. In the uterine corpus, acid phosphatase activity also increases under the influence of oxytocin, but to a much lesser extent (Figure 3F). The ovarian horn areas exhibit higher enzymatic activity (Figure 3D and 3E) compared to the uterine corpus (Figure 3F). As evident from Table 2 and Figure 2, activity of the right horn, compared to the left fallopian tube, was more influenced by oxytocin, allowing for a significant approximation of its activity to that of the left horn. It cannot be excluded that the morphofunctional state of different myometrial regions, based on the peculiarities of myogenic activity, contributes to the occurrence of peristalsis.

Conclusion.

Myomerium is characterized by a special response to the hormone oxytocin, which is one of the main regulators of contractile activity during childbirth. Simultaneous regulation of three rhythmogenic areas by oxytocin allows for an increase in uterine activity compared to the norm, thereby ensuring the final role of the entire reproductive organ.

Fallopian tubes are paired organs with identical physiological characteristics, but there is an asymmetry in relation to the

parameters of rhythmogenesis in the ovarian horn areas that can be attributed to myogenicity, syncytial organization of myometrium, specificity of innervation, vascular supply, humoral influence, etc. [25,26,27].

Due to the high electrophysiological activity, the left fallopian tube generates strong myometrial contractions in norm, compared to the right horn. However, since oxytocin plays a fundamental role in the activity stimulating process, administration of this hormone sufficiently enhances rhythmogenesis in the right ovarian horn area. Thus, this fact may indicate that there are some reserve possibilities for realization of the main role of the reproductive organ and in case of any severe damage, one of horns may compensate the functional loss of the affected horn. Mechanisms behind the differential response of the left and right ovarian horn areas after oxytocin administration, remain a subject of our future investigations.

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