GEORGIAN MEDICAL NEWS

ISSN 1512-0112

No 10 (307) Октябрь 2020

ТБИЛИСИ - NEW YORK

ЕЖЕМЕСЯЧНЫЙ НАУЧНЫЙ ЖУРНАЛ

Медицинские новости Грузии

საქართველოს სამედიცინო სიახლენი

GEORGIAN MEDICAL NEWS

No 10 (307) 2020

Published in cooperation with and under the patronage
of the Tbilisi State Medical University

Издается в сотрудничестве и под патронажем
Тбилисского государственного медицинского университета

გამოიცემა თბილისის სახელმწიფო სამედიცინო უნივერსიტეტთან
თანამშრომლობითა და მისი პატრონაჟით

ЕЖЕМЕСЯЧНЫЙ НАУЧНЫЙ ЖУРНАЛ

ТБИЛИСИ - НЬЮ-ЙОРК

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 and The International Academy of Sciences, Education, Industry and Arts (U.S.A.) 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 и Международной академией наук, образования, искусств и естествознания (IASEIA) США 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.

МЕДИЦИНСКИЕ НОВОСТИ ГРУЗИИ

Ежемесячный совместный грузино-американский научный электронно-печатный журнал
Агентства медицинской информации Ассоциации деловой прессы Грузии,
Академии медицинских наук Грузии, Международной академии наук, индустрии,
образования и искусств США.
Издается с 1994 г., распространяется в СНГ, ЕС и США

Website:
www.geomednews.org

The International Academy of Sciences, Education, Industry & Arts. P.O.Box 390177,
Mountain View, CA, 94039-0177, USA. Tel/Fax: (650) 967-4733

Версия: печатная. **Цена:** свободная.
Условия подписки: подписка принимается на 6 и 12 месяцев.
По вопросам подписки обращаться по тел.: 293 66 78.
Контактный адрес: Грузия, 0177, Тбилиси, ул. Асатиани 7, IV этаж, комната 408
тел.: 995(32) 254 24 91, 5(55) 75 65 99
Fax: +995(32) 253 70 58, e-mail: ninomikaber@geomednews.com; nikopir@geomednews.com

По вопросам размещения рекламы обращаться по тел.: 5(99) 97 95 93

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; Georgian Academy of Medical Sciences; International Academy of Sciences, Education, Industry and Arts (USA).
Published since 1994. Distributed in NIS, EU and USA.

CONTACT ADDRESS IN TBILISI

GMN Editorial Board
7 Asatiani Street, 4th Floor
Tbilisi, Georgia 0177

Phone: 995 (32) 254-24-91
995 (32) 253-70-58
Fax: 995 (32) 253-70-58

CONTACT ADDRESS IN NEW YORK

NINITEX INTERNATIONAL, INC.
3 PINE DRIVE SOUTH
ROSLYN, NY 11576 U.S.A.

Phone: +1 (917) 327-7732

WEBSITE
www.geomednews.org

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 computer-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.

Содержание:

связанных с вредным воздействием некоторых пищевых добавок (Е 102 - тартразин и Е 110 - желтый «закат»).

Необходимо развивать у пациентов навыки читать и правильно трактовать информацию на упаковке о составе пищевых продуктов. Ярко окрашенные продукты, с интенсивным запахом и долгим сроком хранения часто содержат «вредные» пищевые добавки. Чем длиннее список с составом продукта на упаковке, тем больше вероятность того, что в нем содержатся сомнительные ингредиенты.

რეზიუმე

ჰიპერმგრძნობელობის რეაქციები საკვები დანამატებისადმი საბავშვო პრაქტიკაში (შემთხვევა პრაქტიკიდან)

[1,2]ო.მაციურა, [1,2]ლ.ბეში, [1]ო.ბეში, [1]ო.ტროიანოვსკაია, [1]ზ.სლიუზარი

[1]ლვოვის დანილა გალიცკის სახ. ეროვნული სამედიცინო უნივერსიტეტი; [2]ლვოვის საქალაქო კლინიკური საავადმყოფო, უკრაინა

სტატიაში მოცემულია ბავშვებში საკვების დანამატებისადმი ჰიპერმგრძნობელობის აღმოცენების მიზეზების ანალიზი და საკუთარი დიაგნოსტიკური ძიება.

საკვები დანამატები ბუნებრივი ან ხელოვნური წარმოშობის ნივთიერებებია, სპეციალურად შეტანილი საკვებ პროდუქტებში გარკვეული ტექნოლოგიური ეფექტების (ფერი, სიმყარე, სტრუქტურისა და გარეგანი სახის შენარჩუნება) მიღწევისათვის. სტატიაში ნაჩვენებია, რომ "მავნე" საკვები დანამატები უფრო ხშირად არის ხორცის,რძის და საკონდიტრო პროდუქციაში, სასმელებში, სოუსებში, კონსერვებში, სპეციებში. ბავშვებში ალერგიული რეაქციების (დერმატიტი, ჭინჭრის ციება) განვითარების საფრთხის თვალსაზრისით საღებავებს შორის არის: Е 102 – ტარტრაზინი, Е 103 – ალკანინი, Е 104 – ყვითელი ქინოლინი, Е 105– ყვითელი გამჭვირვალე, Е 110– ყვითელი "დაისი", Е 111 – ნარინჯისფერი ალფა-ნაფტოლი, Е 122 – კარმუაზინი, Е 123 – ამარანტი, Е 124 – პონსო 4R, Е 126 – პონსო 6R. კონსერვანტებს შორის ტრიგერს ყველაზე ხშირად წარმოადგენს ბენზოატები (Е 210-219) და სულფიტები (Е 220-229), რომლებმაც შეიძლება გამოიწვიონ ჭინჭრის ციება, დერმატიტი, ბრონქული ასთმის გამწვავება, ანაფილაქსიური რეაქცია.

ორი კლინიკური შემთხვევის მაგალითზე ნაჩვენებია დაკვირვება ბავშვებზე მძიმე ალერგიული რეაქციით, რომელიც დაკავშირებული იყო ზოგიერთი საკვები დანამატის (Е 102 – ტარტრაზინი და Е 110– ყვითელი "დაისი") მავნე მოქმედებასთან.

პაციენტებისათვის აუცილებელია საკვები პროდუქტების შესახებ შეფუთვაზე დატანილი ინფორმაციის წაკითხვა და სწორად გააზრება. მკვეთრი შეფერადების პროდუქტები, ინტენსიური სუნით და შენახვის ხანგრძლივი ვადით, ხშირად შეიცავს "მავნე" საკვებ დანამატებს. რაც უფრო ხანგრძლივი შენახვის ვადაა მითითებული პროდუქტის შეფუთვაზე, მით მეტია ალბათობა, რომ იგი შეიცავს საეჭვო ინგრედიენტებს.

LYME BORRELIOSIS - ENDEMIC DISEASE IN CHILDREN OF TERNOPIL REGION

Nykytyuk S., Klymnyuk S., Podobivsky S., Levenets S., Stelmakh O.

I. Horbachevsky Ternopil National Medical University, Ukraine

Lyme borreliosis (LB) is an endemic multisystemic disease caused by the *Borrelia burgdorferi sensu lato spirochete (sl)*, which is transmitted to humans by ticks. Ixodes ricinus are carriers of the pathogenic Lyme borreliosis species in Europe [38].

There has been a sharp increase in number of episodes of LB in recent decades in Canada [8], Western Europe [57], especially in its northern region [55]. Incidence of LB in Ukraine is also steadily increasing. For example according to the data from the Center for Public Health of the Ministry of Health of Ukraine [5], only 58 cases of LB were registered in 2000 (0.12 per 100 000 of the population), and in 2018 there were already 5418 cases (12.78 per 100 000 of the population) (Figure 1). Therefore, during this period, the incidence of LB increased 93.4 times [31]. Slight decrease in number of cases was observed in 2019 with 4482 cases (10.6 per 100,000 population).

The incidences of Lyme disease in different areas depends on the frequency of borrelia-infected ticks (0 to 40%) and the lifestyle of the population [18,40]. As children are the most dynamic group of society, they are in a highest risk group of tick bite and therefore, of Lyme borreliosis. Often, ixodic ticks are concurrently infected with several pathogens of human infectious diseases [26,39,42].

Despite high incidence, it is difficult to detect *B. burgdorferi s.l* [32] because it affects multiple organs and systems [18]. Nonspecific symptoms of LB and lack of specific and sensitive laboratory diagnostics of neuroborelliosis complicate verification and classification of LB. Diagnostic criteria of Lyme disease (including Lyme disease of CNS in polyneuropathy) are recommended by European Federation of Neurological Societies: (EFNS). The following 3 criteria are named for diagnosis of late CNS Lyme disease with polyneuropathy: Clinical diagnosis of Peripheral neuropathy, CSF pleocytosis and presence of B. *burgdorferi* - specific antibodies in serum [37]. CNS Lyme disease diagnosis requires 2 of the 3 criteria to be met. In cases when a third criterion is missing, a repeat test is done in 6 weeks and it needs to be positive. Therefore, if the child has only nonspecific symptoms that can be caused by many other illnesses, misdiagnosing is possible. Additionally, the sensitivity of serological testing for LB may be low at an early stage but it increases to about 95% 8 weeks after the onset of the disease [22]. That's why we prescribe Routine two-stage test [53].

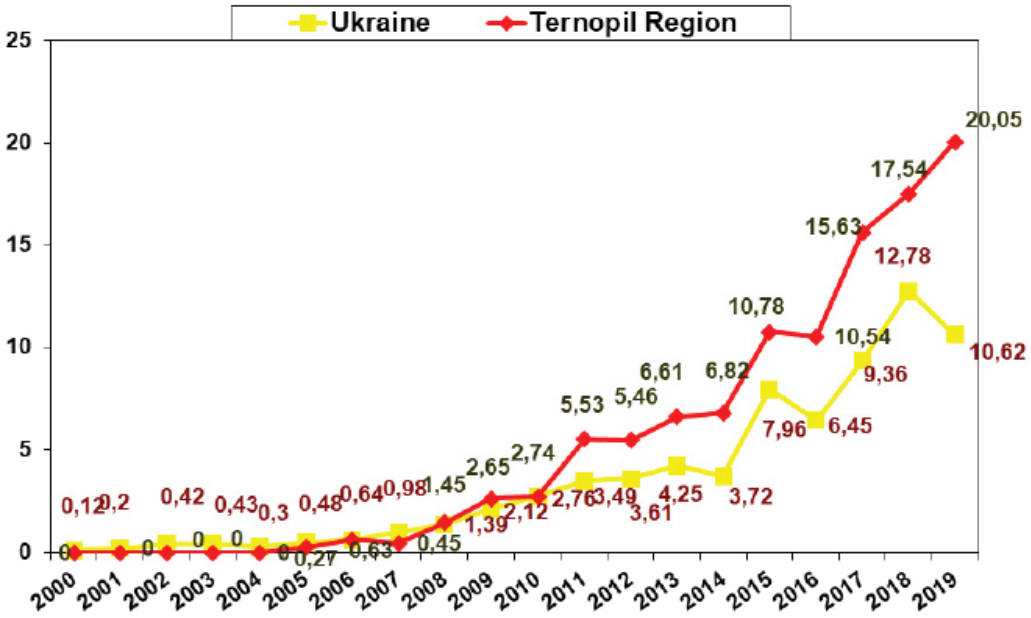

Fig.1. Incidence of LB cases per 100,000 population during 2000-2019 in Ukraine and Ternopil Region

It is very important to characterize the etiologic agents and their role in the pathogenesis and clinical manifestation of LB for two main reasons. First, endemicity' of Lyme disease in an area is an important factor that influences correct diagnosis. Second, the types of pathogens effect Lyme borreliosis symptoms and the timely diagnosis. Knowledge about these two factors helps medical doctors to estimate a patient's exposure and to start timely treatment **[**18,40**].**

Differences in the prevailing clinical picture depend on the genome of Borellia. About 18 genotypes of the complex Borrelia *burgdorferi sensu lato* are detected and studied, of which the pathogenic agents are B. *afzelii*, B. *garini*i, B. *burgdorferi sensu stricto*, B. *bavariensis* and B. *spielmanii* [9]. *B. afzelii* is more associated with skin infections, *B. garinii* – with neurological symptoms, and lesions caused by *B. burgdorferi sensu stricto* – with arthritis [53]. All three causative agents (*Borrelia burgdorferi s.l., Borrelia miyamotoi* and *A. phagocytophilum)* cause erythema migrans (ME). Several genotypes of the pathogen are also possible in one vector, which causes a polymorphic clinical picture [33].

The largest diversity of *B. burgdorferi sensu stricto* genotypes has been described in Europe and Asia [41]. Long-term observations have revealed that in Europe the disease is in most cases is caused by *B. afzelii* and *B. garinii*, [17] whereas in the US – by *B.burgdorferi* [8]. In Russia, the dominant spirochetes are *B. garinii* and B. *afzelii*. [26,34,52]. *B. burgdorferi* is the only cause of infection in the US, and is the most arthritogenic.

Aim of this study is to estimate the percentage of LB-infected ticks and to evaluate LB pathogen's genotype in children with clinical suspicion of Lyme borreliosis in the Ternopil region, Ukraine. A clinical and epidemiological connection between the tick bite and the development of clinical symptoms is explored.

Material and methods. Our study was conducted, in Ternopil region (Western Ukraine) and consists of two parts: during the first study we conducted a survey and in the second study we performed laboratory examination of collected ticks and blood samples.

Study 1. Our survey aimed at determination of complains and clinical features of the children with tick bite, that were admitted to Ternopil Regional Children's Hospital. Altogether 795 children who had clinical suspicion of Lyme borreliosis were enrolled in our survey. Survey was conducted by doctors of Ternopil Region Hospital. All participants completed a questionnaire that consisted of 20 questions. Questionnaire was filled out either by patients or by caregivers in those cases when the child was too young. Survey included questions about geographical location of tick bite, area of tick bite (upper limb, lower limb, neck, chest, shoulders, head, abdomen), time between tick bite and it's removal, method of tick removal, symptoms that occurred after the tick bite, presence of erythema migrans, treatment method of LB and other chronic diseases, having a pet and whether pet has been bitten by a tick. (Survey was done in 2018-2020 years).

Study 2. During the second study, we did laboratory analysis of the collected ticks and blood samples in order to determine the percentage of LB-infected ticks and to evaluate genotype of LB pathogen. This study was conducted in 2017 - 2019. 795 ticks and 109 blood samples were examined.

Ticks were used to detect infectious pathogens with following evaluation of pathogen's genotype. 70.0% of the ticks were extracted and the locus of bite was acepticized using anti-infective agent in Ternopil Children's Hospital. The rest of ticks were extracted by other methods. Examination was carried out in Laboratory of the Center for the study of Lyme borreliosis and other ticks infections of I. Horbachevsky Ternopil National medical university.

In order to detect infected ticks and to evaluate pathogen's genotype we conducted real-time Polymerase Chain Reaction (PCR) using [4]. Presense of the deoxyribonucleoside (DNK) of the following ticks pathogens was evaluated: B.*burgdorferi* s.l. (B. *afzelii*, B. *burgdorferi sensu stricto* and B. *garinii*), A. *phagocytophilum*, B.*miyamotoi*. We also evaluated pathogens in the mixed infections: B.*burgdorferi* s.l. and A.*phagocytophilum*, B. *burgdorferi* s.l. and B.*miyamotoi* and A. *Phagocytophilum*, B.*miyamotoi* with A. *phagocytophilum*, B.*burgdorferi* s.l.and B. *miyamotoi.*

Percentage of infected ticks was calculated from total number of 795 ticks that we studied. Infected ticks were the ticks that tested positively to Borrelia burgdorferi sensu lato DNK during PCR.

In order to detect species of ixodes that attacked children we conducted microscopia of 795 ticks.

According to the recommendations of the US Centers for Disease Control and Prevention (CDC) [6], routine two stage method (Fig. 2) was used to analyse blood samples in order to confirm LB diagnosis, to determine forms of the lesion, and to identify antigens of pathogens: *B. afzelii*, B. *burgdorferi sensu stricto* and B. *garinii*. [39]. 109 blood samples were taken from those children with tick bite who agreed to participate in the study and were able to donate blood for the confirmation of Lyme disease. The test was performed during the period within one and three month after tick bite. During the first stage, the presence of *B. burgdorferi s.l.* was detected by the method of immunoassay analysis using the Euroimmun AG test systems (Germany). Specific IgM were detected using Anti-Borrelia Burgdorferi ELISA (IgM), and antibodies IgG were detected by Anti-Borrelia plus VLsE ELISA (IgG). According to the manufacturer's recommendations, the result ≥ 22 RU/ml was considered positive, while in the range between 16 and 22 RU/ml it was considered intermediate, and if less than16 RU/ml result was negative [6, 17]. During the second stage, those children, (Fig. 2) who showed positive and intermediate result (63 children) in ELISA underwent immunoblot method (EUROLINE Borrelia RN-AT). IgM antibodies were detected by Anti Borrelia EUROLINE Borrelia RN-AT (IgM), and IgG antibody by using Anti-Borrelia EUROLINE RN-AT (IgG). According to the manufacturer's recommendations, the presence of specific IgM antibodies was considered positive, intermediate or negative, depending on the combinations of OspC antigens of the three species of Borrelia (B. *afzelii*, B. *burgdorferi* s.s. and B. *garinii*), p39 and VLsE Bb. At the same time, the presence of IgG was considered to be positive or negative, depending on the combinations of VLsE antigens of the three species of Borrelia (B. afzelii, B. burgdorferi s.s. and B. garinii) and other specific antigens: p18, p19, p20, p21, p58 , OspC (p25), p39, p83, Lipid Ba, Lipid Bb.

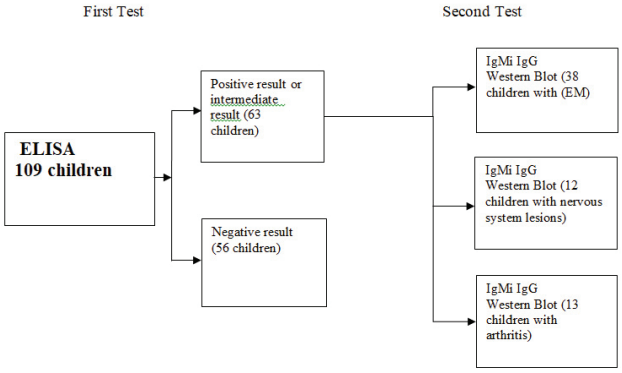

Fig. 2. Two Stage method

Additional examination was carried out in 33 children who had extracutaneus disseminated disease (arthritis=13, neurolyme=20). Out of 20 children with neurolyme 12 children were subject to two-stage test examination. These children did not have examined ticks, as they already developed clinical manifestations of LB. 12 children with neurolyme were subject to obligatory clinical-laboratory examination – CSF (cerebrospinal fuid), PCR, general blood analysis. CSF analyses included cell counts, glucosae, protein [11, 44]. Their CSF was tested by PCR in order to determine acidi nucleinici DNA of the pathogen. 13 children who had arthritis had general clinical examination, acute reumatic test, ultrasound examination of the knee joint.

Results and discussion. In this section we present results of the first study regarding clinical features of the children with tick bite and of the second study that aimed at determination of percentage of LB-infected ticks and genotyping of the infectious pathogens.

Study 1. We found that the average age of children, bitten by tick, was 11.9 years (children were aged from 6 months to 18 years). The gender distribution was 355 (44.6 %) girls, and 440 (55.3%) boys. Children were referred by general practitioners or (mostly general) pediatricians from all over the Ternopil region. Our survey showed that in 30% of tick bite cases 12 hours passed from the moment of the tick bite to tick removal, up to 24 hours – in 34.3%, 24 - 48 hours and more – in 4%, and 31.7% of children did not remember the bite itself.

The most common localizations of the bite are the section of the head 255 (32.%), ear 9%, and lower limbs 180 (22.6%). Torso (trunk front 67 (8,4%), trunk back 69 (8,6%) and abdomen were second most common localizations of the bite in 67 (8.4%) and 57 (7.1%) correspondingly. Neck 76 (9.5%), upper extremities 77 (9.6%) and section of sex organ 14 (1.7 %) are least common localizations.

The average interval between the tick bite and the appearance of clinical symptoms was 12 days. On average, the clinical diagnosis was established 14 days after the bite. Terms for treatment prescription lie within the range of 2 to 31 days.

According to the results of our survey, the leading symptoms of LB were Exanthema – in 83 (10.4 %) children, fever in 17 (2.1%), headache in 14 (1.8%), myalgia – in 15 (1.8%), and enlarged lymph nodes near the tick bite place – in 6 patients (0.75%). 520 (65.4%) respondents didn't report any clinical symptoms. 27 (3.4 %) respondents reported the itching at the bite's place, decreased vision – in 1 patient, pain at the site of bite – 7 (0.9%), infiltration at the bite point – 6 (0.7%), Scleroderma spots originated in 1 child. 11.9% of patients complained of fatigue, myalgias, and cognitive changes were noted in 12 (1.3%) children.

The survey showed that the most common clinical manifestation of LB is a typical skin disorder, known as erythema migrans (ME). EM, a rash spreading slowly from the site of a tick bite that may have been in apparent. Systemic symptoms, including myalgia and arthralgia, can accompany EM, especially in Bb and Bg infections [48]. As noted by G. Stanek (2012) [50], the peculiarities of the clinical manifestations of Lyme disease in children are sometimes similar to those seen in adults, although symptoms may take shorter and the result may be more evident [59]. ME appeared during the period for up to 24 hours in 25 patients (30.1%), 24 to 48 hours in 23 patients (27.7%), more than in 48 hours in 11 patients (13.2%), more than 3 days in 6 patients (7.2%), after several months – in 1 patient (2.3%). 17 people (20.5%) with ME did not remember the bite itself.

Detected ticks were removed with tweezers in 675 (84.9%) children, scratched off with a finger nail in 25 (3.1%), lubricated with fat (e.g. butter, oil) to make it get out - 28 (3.5%), other methods 67 (8.4%). A disinfectant solution was applied only in 701 (88.2%) children.

Our survey determined that the most common geographical location for the tick bite was the city, since 357 (45%) of children were bitten there, while only 143 (18%) reported being bitten in the village. 31 (17.3%) tick bites occurred in the forest, dacha 151(19%), 39 (5%) in the garden, 19 (23%) in the park, and 55 (7%) do not remember being bitten by the tick.

Among the examined group of patients there were detected concomitant diseases. 7 (0.8%) respondents reported Epstein Barr Infection, 23 (3.1%) reported diseases of the upper respiratory tract (bronchitis, adenoid vegetation, pneumonia), changes in the nervous system in 10 (0.8%). Congenital heart defects were reported in 3 cases.

28% of respondents have domestic animals, which lived in families, namely dogs, cats and rabbits. Pets were bitten by a tick in 26% of cases.

Study 2. We found that only 33.5% (267) of children who participated in the study were bitten by infected ticks (Table 1). LB was caused by one or few of the following pathogens: *B.burgdorferi s.l., A.phagocytophilum,* and *B.miyamotoi.* There were 172 tick bites in children registered during 2017 while only 34 (19%) ticks were infected by studied pathogens. *B.burgdorferi s.l.* was detected in 19 (55.9%) ticks*, A. phagocytophilum* – in 12 (35.3%). In 2018, there were 376 registered tick bites in children, and 128 (34%) of the ticks were infected with studied pathogens. Among the 128 infected ticks, removed from children's skin in 2018 *B.burgdorferi s.l.* was detected in 54 (42.3%) ticks, *A. phagocytophilum* – in 53 (41.4%). In 2019, 247 children were affected by ticks, only 105 ticks (42.5%) were infected . B. *burgdorferi* s.l. was detected in 57 (54.3%) of the infected ticks, A. *phagocytophilum* – in 33 (31.4%), B. *miyamotoi* – in 3 (2.8%).

We found that 33 ticks were infected with several pathogens. The DNA of infectious pathogens in mixed infections revealed that B. *burgdorferi* s.l. with A. *phagocytophilum* was found in 24 (8.9%) cases, B. miyamotoi and A. phagocytophilum – in 2 (0.74%), B. burgdorferi s.l., and B. miyamotoi – in 2 (0.74%), B. *burgdorferi* s.l., B. *miyamotoi* and A. *Phagocytophilum* - in 5 (1.8%) ticks (Table 2).

We identified that out of 795 studied ticks, 787 (98.9%) were Ixodes Ricinus and 8 (1.0%) - Dermacentor reticulatus.

Immunological examination of the blood samples, using ELISA method showed that out of 109 children 53 children were seropositive and intermediate and 56 - sero-negative.

In 109 children with lesions the following forms were noted:
- skin - erythema form in 83 (76.1%) cases;
- nervous system in 20 (18.3%) cases;
- arthritis in 13 (11.9%) cases;
- heart in 1 (0.9%) case.

The presence of Erythema migrans is considered the diagnostic criterion of LB disease without confirmation. The biggest group of patients with LB, namely 83 (76.1%) children had Erythema migrans.

Not all parents of the children agreed to participate in study. However, 20 children participated in two-stage study, and 19 respondents participated only in 2nd stage (taking into account that children often refuse injections).

During clinical examination of children with ME lesions of the nervous system with lesions of the neck muscles (1 child) have been identified. EM was pathognomonic syndrome in the beginning of the clinical symptoms in 15 children with disseminated form of LB, arthritis (10 children), and encephalitis (5 children).

20 children were diagnosed with disseminated form of lime borreliosis. Eight patients had a peripheral facial palsy, two patients had acute encephalitis, two had neuromuscular damage that were associated with neuroborreliosis.

We examined blood and spinal fluid in 10 patients and in one boy with nervous system disorder (neuro-lyme) by PCR. A. *Phagocytophilum* of spinal fluid was positive in one patient, B. *burgdorferi* s. was negative. Six patients had a pleocytosis.

Table 3 presents immunoblote results in 38 seropositive cases of erythema migrans, in 12 seropositive cases of neuroborelosis and in 13 seropositive cases of arthritis.

In our laboratory study we determined following indicators: OspC Ba (*B. afzelii),* OspC Bb *(B.burgdorferi)*, OspC Bg (*B. garinii)* to IgM, and OspC (*B. afzelii*) to IgG. Imunoblot method revealed, highly specific IgM for OspC B. *afzelii* in 28,57% cases (from 63 seropositive patiens), Ospc B. *burgdorferri in* 14.28% of cases, OspC Bg (B. *garinii*) in 23.8%, P41 in 46.03%. (For intermediate and high indicator).

Antigen VLsE IgG *B. afzelii* in 25.3%, VLsE *B. burgdorferri* 31.7.%, VLsE B. *garinii 23.8* % in patients with erythema migrans in the acute period of the disease P41 – 63.4 % (Table 3).

Table 1. Number and percentage of infected ticks in 2017-2019 and their genotype (PCR method)

Year	Total number of tick bites	Infected ticks		B.burgdorferi s.l.		A.phagocytophilum		B.miyamotoi	
		abc.	%	abc.	%	abc.	%	abc.	%
2017	172	34	19.7	19	55.9	12	35.3		
2018	376	128	34	54	42.3	53	41.4	3	2.3
2019	247	105	42.5	57	54.3	33	31.4	3	2.8
Total	795	267	48.6	130	48.6	98	36.7	6	2.2

Table 2. Number and percentage of different combinations of pathogens in infected ticks

Year	Infected ticks		B.burgdorferi s.l. and A.phagocytophilum		B. burgdorferi s.l., B.miyamotoi and A.Phagocytophilum		B.miyamotoi with A. phagocytophilum		B.burgdorferi s.l., B. miyamotoi	
	abc.	%	abc.	%	abc.	%	abc.	%	abc.	%
2017	34	19.7	3	8.8						
2018	128	34	14	10.9	4	3.1				
2019	105	42.5	7	6.7	1	0.9	2	1.9	2	1.9
Total	267		24	8.9	5	1.8	2	0.7	2	0.7

Table 3. Antigenic categories of borrelias depending on the pathology (immunoblot method)

IgM					IgG						
Indicator (n/%)	**P41 (n-%)**	**OspC Ba (*B. afzelii)* (n-%)**	**OspC Bb *(B.burg-dorferi)***	**OspC Bg (*B. garinii)* (n-%)**	**VLsE (*B. afzelii)* (n-%)**	**VLsE (*B. burgdor-ferri*) (n-%)**	**VLsE (*B. garinii*) (n-%)**	**Lipid Ba (B.*afzelii)***	**Lipid Bb (B.burg-dorferri)**	**OspC (*B. afzelii*) (n-%)**	**P41**
Arthritis I* (n=3/11.9%)	-	2/ (15.4%)	-	1/ (7.7%)	2/ (15.4%)	2/ (15.4%)	1/(7.7%)		1/(7.7%)	1/(7.7%)	-
Arthritis H (n=13/11.9%)	5/ (38.5%)	2/ (15.4%)	1/ (7.7%)	2/ (15.4%)	3/ (23.1%)	3/ (23.1%)	2/ (15.4%)	1/(7.7%)	1/(7.7%)	6/ (46.2%)	7-53.8%
CNS I* (n=12/11.0%)	3/ (2.7%)	-	-	-	1/ (0.9%)	-	2/(1.8%)	1/(0.9%)	-	-	-
CNS H* (n=12/11.0%)	2/ (1.8%)	4/ (3.7%)	2/ (1.8%)	3/ (2.7%)	-	1/ (0.9%)	-	-	-	3/(2.7%)	6 / (5.4%)
Erythema I* migrans inter-mediate results (N=38/34/9.3.%)	12/ (31.6%)	4/ (10.5%)	3/ (7.9%)	4/ (10.5%)	-	4/ (10.5%)	2/ (5.3%)	-	-	7/ (18.4%)	1/(2.6%)
Erythema migrans high results H* (N=20/13.8%)	7/ (18.4%)	6/ (15.8%)	3/ (7.9%)	5/ (13.2%)	10/ (26.3%)	10/ (26.3%)	8/ (21.1%)	2/(5.3%)	-	8 (21.1%	26/ (69.4%)

*notes: * H –high, I –Intermediate Indicators*

We determined that, in the acute period of the CNS diseases highly specific IgM to OspC *B. afzelii* was found in 3.7% cases, Ospc B. *burgdorferri* in 6.8%, OspC Bg (B. *garinii*) in 2,7%, antigens P41 in 29% and IgG to VLsE B. afzelii 3.7%, Ospc B. *burgdorferri* in 1,8 % of cases VLsE B. *garinii* 1,8%, VLsE *B. burgdorferri 0.9%,* OspC *B. afzelii* in 2 .7%, while P41 in 4.5%.

Our results show that highly specific IgM to OspC B. *afzelii* was detected during the acute period of arthritis in 30.8% of the 13 children. OspC Bg (B. *garinii)* was detected in 23.1% of them, Ospc B. *burgdorferri* in 7.7% of cases and higher rate of positivity of the IgG OspC, VLsE B. *afzelii* - in 38.5% and VLsE (B. *burgdorferri*) in 38.5%, while VLsE (B. *garinii*) in 23.1%, Ospc B. *afzelii in* 53.9%. Lipid Ba (B.*afzelii) 15.4 %.*

Higher rate of positivity of the IgG p58 and OspC Antibodies against OspA, an indicator of later stage infection, occurred more frequently in the refractory group without reaching significant level. Over 85% of IgG - positive serum can only be identified by assessing VlsE antigen of the three species of Borrelia (B. *afzelii*, B. *burgdorferri* s.s. and B. *garinii*) **[9].**

We studied immunological parameters in various forms of LB: antibodies to *B. burgdorferi sensu stricto* was revealed in children with erythema migrans, arthritis and neurolyme; high specificity of IgM to OspC *(B. afzelii)* and *B. garinii* was detected in patients with arthritis and CNS; high levels IgG VLsE (*B. burgdorferri*) and VLsE (B. *burgdorferri*) was found in patients with skin disorders. As a result of immunological testing (immunoblot methods), we estimate organotropism of B. *burgdorfery* to skin lesion (erythema migrans) in 31, 6 %.

We performed survey and laboratory examination of children from a Lyme endemic region.

In our study 787 (98.9%) ticks were Ixodes Ricinus and 8 (1.0%) - Dermacentor reticulatus.

Findings from other studies suggest that in Ukraine are found three species of ticks: I. ricinus, D. reticulatus and R. sanguineus, and I. ricinus dominates [1, 46] This data coincides with findings of scientists from Belgium [29] that the great majority of ticks belonged to *Ixodes ricinus* (99%). Among the 10 species of ticks ixodides found in the Western region of Ukraine, Ixodes ricinus and Dermacentor reticulatus are the most common in the region (Ben, Lozynskyi, 2019) [33]. Prevalence of I. ricinus corresponds to our results, however it contrasts with indicators of infection with I. Ricinus ticks from the Czech Republic (0.8 – 7.2%) [26], Hungary (8.8%) [27], Poland (1.7-14.0%) [58], Slovakia (2.9 – 7.2%) [47].

We found that percentage of Borrelia - infected ticks in children of Ternopil region is 33.5%. This number is relatively higher in contrast to Ukraine in general, where number of infected ticks is 9.7 [5]. Overall, we find that edipemiological situation of LB in Ukraine is understudied, since the retrospective epidemiological analysis of Lyme borreliosis dynamics in the period from 2000 was done only in Sumy, Rivne and Kharkiv regions [31,34,36]. During 2000 – 2018, the incidence of Lyme disease increased 93.4 times in Ukraine. The increase in Sumy region (East of Ukraine) was 75.5 times (Sumy region) [31] and in Ternopil region (Western region) 167 times compared to year 2000 [5].

At the same time, percentage of infected ticks in Poland is 6.2% , in Ukraine - 9.7%, in Belarus - 9.4%, in Lithuania - 11%, in Russia – from 24.5% to 90%, in Latvia – from 18 to 51% [44,47,48]. Therefore our study shows that rate of infected ticks is much higher in Ternopil region than in Ukraine in general and also higher than in other neighbouring countries.

According to our results, the most common localizations of the bite are the section of the head 255 (32.%), ear 9%, lower limbs (22.6%). Our results coincide with other studies of children, that report up to 70% of the infestations take place on the head and its vicinity (behind the ears, on the hair line, neck) [2]. Studies of tick bites in adults report that skin of lower extremities, buttocks, groins and abdomen are the most frequent bite areas [40].

Tick-borne pathogens. Our PCR examination of the bacterial DNA, showed that only 267 (33.5%) ticks of 795 were contaminated by the gene-complex B.*burgdorferi sensu lato*. This finding coincides with the other findings that report number of ticks infected by B. *burgdorferi S. L* range from 0.5 to 85.0% in Europe and 15.3% in Poland [50]. In Germany, the percentage of infected ticks amounted to 11.1% [56]. In Romania and Belgium, the number of infected ticks was – 3.7 and 3.9%, respectively, while the researchers in Italy found a slightly higher rate – 5.7% [10, 29]. In another scientific work from Netherlands B. *burgdorferi* s.l. serologic tests were performed in 310 (95.4%) patients [39] and of these, only 28 children (32.9%) had a diagnosis of LB. Another study from USA reports that 19.2% of ticks are infected with B. *burgdorferi* s. l. [56].

We found B. *Burgdorfery* in 130 (48.6%) infected ticks, A. *phagocytophilum* in 98 (36.7%), and in 6 (2.2 %) – B. *miyamotoi*.

Even though the data on anaplasma infection in Ukraine is scance, according to Morochkovsky, I.I. Ben [36] the presence of A. phagocytophilum was identified by PCR method in 6 patients during the period from 2012 to 2014 in Volyn (Western region). In this research monoinfection (anaplasmosis) was detected in one patient, in other cases it was present an association with Lyme borreliosis. The author indicates that in mix-infection with Lyme disease, the symptoms of Human granulocytic anaplasmosis are weakness and diseases progresses with the prevalence of the clinical picture of borreliosis. Other studies on the structure of tick-borne zoonosis of the region have shown that in the Western Ukraine, the proportion of granulocytic anaplasmosis can be up to 28.6% [3], which is in line with our findings.

Mixed infections. In our study we detected the DNA of combined infections in ticks. We found B. *burgdorferi* s.l. in combination with A. *phagocytophilum* in 24 (8.9%) cases. Our findings correspond to findings of a study of mixed infections that were recorded in four DNA samples, representing the prevalence of B. *burgdorferi* s.l. and Borrelies and A.*phagocytophilum* of ten form combined cells in natural conditions and are able to be transmitted by tick bites as a mix-infection [30].

In our research B. *miyamotoi* and A. *phagocytophilum* was found in 2 (0.74%) cases. B. *burgdorferi* s.l., and B. *miyamotoi* was seen in 2 (0.74%) cases. B. *burgdorferi* s.l., B. *miyamotoi* and A. *Phagocytophilum* was detected in 5 (1.87%) ticks. In general, our findings on tick contamination by several pathogens are in line with the results of studies. However, some of the numbers are lower comparing to findings of other study of mixed infections where tick-borne pathogens, namely spirochetes from B. *burgdorferi* s. l. complex, *A. phagocytophilum*, and Babesia microti, were detected in 11.1% of tested I. ricinus ticks [10]. Other studies also report higher numbers of simultaneously diagnosed DNA of several bacteria – 3.8% [53]. Also in comparison to other study from Canada [15] we see prevalence of Borrelia *miyamotoi* infection, and co-infections with other *Borrelia* s.l. In our study in 2 cases, anaplasmosis was confirmed by IFA in patients' blood while clinically there was migrating erythema present.

These findings are consonant with the results of other studies. In scientific work [40] we found study of coinfection in patients with erythema migrans. In other scientific work B. *afzelii* is the most common genospecies isolated from human skin samples, and is therefore associated with skin manifestations of LB, whereas B. garinii predominates in cerebrospinal fluid specimens from neuroborreliosis patients [**26**]. According to the literature 2.3% - 10% of patients presenting with erythema migrans (acute Lyme disease) are cocomplex [11,17].

In our study genotype of *B. burgdorferi sensu stricto* was revealed in children with erythema migrans, arthritis and neurolyme. High level Ig G VLsE (*B. burgdorferri*) and VLsE (B. *burgdorferri*) was found in skin disorders.

High specificity of Ig M to OspC *(B. afzelii)* and *B. garinii* was presented in patients with arthritis in their blood and CNS (OspC Bg (B. *garinii)* was detected in 15% of them, OspC B. *burgdorferri* in 5% in children with arthritis and IgG OspC, VLsE B. *afzelii* - in 23.1% and VLsE (B. *burgdorferri*) in 38.5%, while VLsE (B. *garinii*) in 23.1%.

We have found antibodies against *B. burgdorferi in 57,7%* child. In the acute period of the CNS diseases highly specific IgM to OspC *B. afzelii* was found in 3.7% cases. specific IgM to OspC B. *afzelii* was detected during the acute period of arthritis in 30.8% of the 13 children. OspC Bg (B. *garinii)* was detected in 23.1% of them, Ospc B. *burgdorferri* in 7.7% of case.Antibodies against *B. burgdorferi* can be detected in 50-90% of patients in stage II of Lyme disease [16,27]. In the early phase of this stage mainly IgM antibodies are present, and in the late phase there are often only IgG antibodies, but the levels of specific IgM can persist for a long time [41].Our data is consonant with the survey of 96 practically healthy donors [38] which had antibodies in various titers to Borrelia burgdorferi s. l., the causative agent of the Lyme boreliosis, identified 11% of cases, to Ehrlichia ch., 4% of cases and 1% of cases to A. *phagocytophilum*., and in 3% of cases it had place of mixed-infection. In our study in one case, Anaplasma was detected by the PCR of spinal fluid. The serologic prevalence ranges from 1.9% to 14% in Germany , while clinically apparent infections of HGE have not been reported [30].

Manifestations of LB. In our study – erythema migrans form was found in 83 (76.1%) cases. This is due to the fact that solitary EM (SEM) is the characteristic sign of early localized LB. At the same time multiple EM (MEM) is one of the main characteristics of early disseminated stage of the disease. Our results coinside with other studies of European continent which report that ME is the most common single manifestation in about 90% of patients in population-based prospective studies [12-14,39] and skin manifestations account for 79–90% of all LB cases in children [33].

We observe 15 children who had out-of-skin forms of lyme borreliosis in the foreplay of the disease had EM. The high rate, early onset, and prolonged duration of risk for spirochetemia are found as possible explanations to why untreated patients with EM are at risk for dissemination of B.*burgdorferi sensu stricto* to anatomic sites beyond the skin lesion site. Differences in the strain of infecting spirochete, as well as host factors, may be important determinants of hematogenous dissemination [2,52].

According to some studies, B. *miyamotoi* is a tick-borne bacterium which has only recently been identified in Europe as a human pathogen causing relapsing fever and little is known about its local impact on human health [8,21,47] while in our study it had asymptomatic progress.

We find that 20 persons had extracutaneus disseminated disease (arthritis = 13, neurolyme = 20). Scientific literature confirm this finding that arthralgia and myalgia can be features of early disseminated disease [38]. Studies report that borreliosis arthritis and carditis are more common in the US, whereas neurological and late cutaneous manifestations are more commonly found in Europe [13,47,48]. According to Klyys [24], 18.3% of cases of LB disease in Ukraine are accompanied by lesions of the musculoskeletal system, while 10.7% by pathology of the cardiovascular system (in our study it is much smaller and only

1%). Klyys also finds that about 40% of lesions are of the nervous system while at our study it is much lower - only 18.3%. In children, the most common manifestations of neuroborreliosis are facial palsy (FP), uncommonly bilateral and meningitis. Some children may present with nonspecific complaints such as malaise, headache, fatigue and neck pain without clear neurological signs at physical examination [44].

In our study we found only two of three diagnostic criteria for CNS Lyme disease, namely clinical diagnosis of Peripheral neuropathy and CSF pleocytosis. Possible CNS Lyme disease requires 2 of the 3 criteria; if a third criterion is missing, a repeat test done 6 weeks later needs to be positive [35].Information on disease endemicity in an geographical area should be regularly provided to clinicians. Type of tick's pathogen and combination of pathogens influence Lyme borreliosis symptoms and course of the disease, therefore clinicians should determine pathogen's genotype to provide timely treatment of Lyme disease. When treating patients who were exposed to a tick in Tenopil region, Ukraine, medical doctors should consider B. *burgdorferi* s.l., B. *Miyamotoi*, A. *Phagocytophilum* pathogens and their combinations as a causative agent of infection.

Conclusions. The types of pathogens influence on Lyme borreliosis clinical symptoms and therefore on the timing of the diagnosing.

Acknowledgment. The survey part of our study was conducted in the framework of the research work "Study of epidemiology, pathogenesis and clinic Lyme borreliosis in endemic regions of Ukraine including Ternopil region and improvement of its diagnosis, therapy, rehabilitation measures and prevention", which is a part of the joint Ukrainian-Polish project.

REFERENCES

1. Andreychyn M.A., Shkilna M.I., Nykytyuk S.O., Podobivskyi S.S., Korda M.M., Klishch I. M., Marchuk O.M., Korda M.M. Frequency of detection of borellia and anaplasma at the tick extracted from the residents of Ternopil region. Epidemiological and clinical complications of infectious and parasitic diseases in modern conditions: abstract Ukraine. Scient. Conf. of Infectionists and Plenum. October 5-6, 2017. Zhytomyr. Ternopil: TSMU, Ukrmedknyha. Ukrainian.
2. Bartosik K., Kubrak T., Olszewski T., Jung M., Buczek A. Prevention of tick bites and protection against tick-borne diseases in south-eastern Poland. Ann Agric Environ Med. 2008;15: 181-5.
3. Ben I.I., Biletska H.V., Koroliuk O.V., Morochkovskyi R.S., Shulhan A.M. Human granulocytic anaplasmosis in the western region of Ukraine: epidemiological and laboratory tests. Sciences. works of co-work. NMAPO by P.L. Shupyk. – Kyiv, 2013 .22(2): 320-323
4. Bondarenko E.I., Timofeev D.I., Fomenko N.V. An integrated approach to identifying tick-borne infections by PCR analysis with real-time detection. Siberian Medical Journal.2012;4: 33-6.
5. Center for Public Health of the Ministry of Health of Ukraine. Statistical data from Regional Laboratory Centre of Ministry of Health Care. Available at: https://phc.org.ua/en.
6. Centers for Disease Control and Prevention. Reported Cases of Lyme Disease by Year, United States, 2002-2011; 2012 Sept 12 [cited 2013 Mar 24]. Retrieved from: http://www.cdc.gov/lyme/stats/chartstables/casesbyyear.html J Chiropr Med. 2016.
7. Dahl V., Wisell K.T., Giske C.G. Lyme neuroborreliosis epidemiology in Sweden 2010 to 2014: clinical microbiology laboratories are a better data source than the hospital discharge diagnosis register separator commenting unavailable. Euro Surveill. 2019;24(20). DOI: 10.2807/1560-7917.ES.2019.24.20.1800453.
8. Dibernardo A., Cote T., Ogden N.H., Lindsay L.R. The prevalence of Borrelia miyamotoi infection, and co-infections with other Borrelia spp. in Ixodes scapularis ticks collected in Canada. Parasit Vectors. 2014;7(1):183.
9. Didyk Y.M., Blaňárová L., Pogrebnyak S., Akimov I., Peko B, Víchová B. Emergence of tick-borne pathogens (Borrelia burgdorferi sensu lato, Anaplasma phagocytophilum, Rickettsia raoultii and Babesia microti) in the Kyiv urban parks, Ukraine. Ticks Tick. Borne. Dis. 2017;8(2): 219-25.
10. Dressler F., Ackermann R., Steere A.C. Antibody responses to the three genomic groups of Borrelia burgdorferi in European Lyme borreliosis. J. Infect. Dis. 1994;169(2): 313-8.
11. Dryden M.S., Saeed K., Ogborn S., Swales P. Lyme borreliosis in southern United Kingdom and a case for a new syndrome, chronic arthropod-borne neuropathy. Epidemiology and Infection. 2015;143(3): 561-72.
12. Dumler J.S, Choi K.S., Garcia-Garcia J.C. Human granulocytic anaplasmosis and anaplasma phagocytophilum. Emerg. Infect. Diseases. 2005;12: 246-8.
13. Fingerle V., Schulte-Spechtel U.C., Ruzic-Sabljic E., Leonhard S., Hofmann H., Weber K., et al. Epidemiological aspects and molecular characterization of Borrelia burgdorferi s.l. from southern Germany with special respect to the new species Borrelia spielmanii sp. nov. Int. J. Med. Microbiol. 2008;298: 279-90.
14. Gałęziowska E., Rzymowska J., Najda N., Kołodziej P., Domżał-Drzewicka R., Rząca M., Muraczyńska B. Prevalence of Borrelia burgdorferi in ticks removed from skin of people and circumstances of being bitten – research from the area of Poland, 2012–2014. Annals of Agricultural and Environmental Medicine. 2018;25(1): 31-35.
15. Habegger Simon, MA, MAS(c) Purple Paper Lyme Disease in Canada: An Update on the Epidemiology. Purple Paper 2014;43.
16. Heikkilä, Tero, Huppertz, Hans-Iko, Seppälä, Ilkka, Lahdenne Pekka. Recombinant or peptide antigens in the serology of Lyme arthritis in children. Journal of Infectious Diseases. 2003;6/15/187(12): 1888-94.
17. Hofhuis A., Bennema S., Harms M., van den Wijngaard C.C., van Pelt W. Decrease in tick bite consultations and stabilization of early Lyme borreliosis in the Netherlands in 2014 after 15 years of continuous increase. BMC Public Health. 2016;16: 425.
18. Hofhuis A., Harms M., Bennema S. Physician reported incidence of early and late Lyme borreliosis. Parasit Vectors. 2015;8: 161.
19. Hornok, S., Meli M.L., Gönczi E., Halász E., Takács N., Farkas R., Hofmann-Lehmann R. et al. Occurrence of ticks and prevalence of Anaplasma phagocytophilum and Borrelia burgdorferi s.l. in three types of urban biotopes: Forests, parks and cemeteries. Ticks Tick. Borne. Dis. 2014;10.1. Available at: https://www.sciencedirect.com/science/article/pii/S1877959X14001435
20. Human granulocytic anaplasmosis in the western region Of Ukraine: Epidemiological and laboratory researches. Collection of Scientific Works by workers of the P.L. Shupyk NMAPGE. Kyiv; 2013. Ukrainian.
21. Karan L., Makenov M., Kolyasnikova N., Stukolova O., Toporkova M., Olenkova O. Dynamics of spirochetemia and early PCR detection of Borrelia miyamotoi. Emerg. Infect. Dis. 2018;24(5): 860-67. DOI: 10.3201/eid2405.1708
22. Karan L.S. Possibilities of using molecular methods in the diagnosis of tick-borne encephalitis, ixodid ticks and borelioses. Laboratory DNA diagnostics of borelioses. Bulletin of the Laboratory of DNA diagnostics. 2012;12-16.

23. Karavayev V.S., Oleynikova E.S., Azaev M. S., Beklemishev A. B. Immunochemical analysis of recombinant chimeric polypeptide OspC (gar'afz) isolates borrelia garini and b. afzelli. Journal of Microbiology, Epidemiology and Immunobiology. 2016;3: 37-44.
24. Klyus V. Multi-organ lesions in Lyme disease. Actual Infectology. 2017;5(5): 256-9. DOI: 10.22141/2312-413x.5.5.2017.121642. Ukrainian.
25. Krause A., Burmester G.R., Rensing A. Cellular immune reactivity to recombinant OspA and flagellin from Borrelia burgdorferi in patients with Lyme borreliosis complexity of humoral and cellular immune responses. J. Clin. Invest. 1992;90: 1077-84. Available at: http://www.jci.org/articles/view/115923/files
26. Kybicová K., Baštová K., Malý M. Detection of Borrelia burgdorferi sensu lato and Anaplasma phagocytophilum in questing ticks Ixodes ricinus from the Czech Republic.Elsevier. Ticks and Tick-borne Diseases. 2017;8(4): 483-7.
27. Leeflang M.M., Ang C.W., Berkhout J., Bijlmer H.A., Van Bortel W., Brandenburg A.H., Van Burgel N.D. et al. The diagnostic accuracy of serological tests for Lyme borreliosis in Europe: a systematic review and meta-analysis. BMC Infect. Dis. 2016;16:140.
28. Levin M.L., Fish D. Acquisition of coinfection and simultaneous transmission of borrelia burgdorferi and Ehrlichia phagocytophila by ixodes scapularis ticks. Infect. Immun. 2000;684(4): 2183-6.
29. Lernout T, Regge NDe, Tersago K, et al. Prevalence of pathogens in ticks collected from humans through citizen science in Belgium. Parasites Vectors. 2019; 12:550
30. Loebermann M. Borrelia burgdorferi and Anaplasma phagocytophilum coinfection. Emerg. Infect. Dis. 2006;12(2): 353-5.
31. Lutai I., Chemych M., Sinuyka V. Lyme disease dissemination in Ukraine. Medicina. (Kaunas). 2020;56(1): 242.
32. Lohr B., Fingerle V., Norris D.E., Hunfeld K.P. Laboratory diagnosis of Lyme borreliosis: Current state of the art and future perspectives. Crit. Rev. Clin. Lab. Sci. 2018;55(4): 21945. DOI: 10.1080/10408363.2018.1450353
33. Lozynskyi Ihor. Ben. Iryna Prevalence of Anaplasma phagocytophilum in Ixodes ricinus and Dermacentor reticulatus and Coinfection with Borrelia burgdorferi and Tick-Borne Encephalitis Virus in Western Ukraine. Vector Borne Zoonotic Dis. 2019 Nov 1; 19(11): 793–801.
34. Maluy V.P., Shepileva N.V., Tkachenko L.V. Tick-borne infections in Kharkiv region. International Medical Journal. 2010;(3): 99-102. Ukrainian.
35.Margos G., Wilske B., Sing A., Hizo-Teufel C., Cao W.-C., Chu C., Scholz H. Borrelia bavariensis sp.nov. is widely distributed in Europe and Asia. Int. J. Syst. Evol. Microbiol. 2013;63: 4284-8.
36.Morochkovsky, I.I. Clinical cases of human granulocytic anaplasmosis are on territory of Volyn. Infectious Diseases. 2015:3(81): 92-4.
37.Mygland A., Ljøstad U., Fingerle V., Rupprecht T., Schmutzhard E., Steiner I., European Federation of Neurological Societies. EFNS guidelines on the diagnosis and management of European Lyme neuroborreliosis. Eur. J. Neurol. 2010;17: 8-16.
38.Nassar-Sheikh Rashid Amara, Boele van Hensbroek Michael, Marion Kolader, Joppe W. Hovius, Dasja Pajkrt. Lyme borreliosis in children: a tertiary referral hospital–based retrospective analysis. Infection Journal of Pediatrics. 2018;37(2): e45-e47.
39.Norman G.L., Antig J.M., Bigaignon G., Hogrefe W.R. Serodiagnosis of Lyme borreliosis by Borrelia burgdorferi sensu stricto, B. garinii, and B. afzelii Western blots (immunoblots). J. Clin. Microbiol. 1996;34(7): 1732-8.
40.Nykytyuk S., Pańczuk A., Shkilna M., Małgorzata Tokarska-Rodak M., Szepeluk A., Melnyk L., Korda M. Awareness of tick-borne bacterial infection of the students of non-medical universities in Ternopil region (Western Ukraine). Health Problem of Civilization. 2017;11(2), 99-102.
41.Officerov V.I. Lime-borreliosis and its diagnosis. Newsletter. 2003;2(28). Available at: http://www.vector-best.com.au/nvb/cont28.htm.
42.Pangrácová L., Derdáková M., Pekárik L., Hviščová I., Víchová B., Stanko M., Hlavatá H. et al. Ixodes ricinus abundance and its infection with the tick-borne pathogens in urban and suburban areas of Eastern Slovakia. Parasites Vectors. 2013;6(238). Available at: https://doi.org/10.1186/1756-3305-6-238.
43. Reye A.L., Stegniy V., Mishaeva N.P., Velhin S., Hübschen J.M., Ignatyev G., Muller C.P. Prevalence of tick-borne pathogens in Ixodes ricinus and Dermacentor reticulatus picks from different geographical locations in Belarus. PLoS One. 2013;8(1): 54476.
44. Robert A.A, Frank G., Stephen C. Diagnostic utility of Borrelia burgdorferi cerebrospinal fluid polymerase chain reaction in children with Lyme meningitis. Eppes. 2005;24(8): 705-7.
45. Sharkova V.A., Chernikova A.A., Savina O.G. The features of the Ixodid tick-borne borreliosis in children of Primorie. National Priorities of Russia. 2016;4(22): 64-8. Russian.
46. Shkilna M.I., Andreychyn M.A., Podobivsky S.S., Fedoniuk L.Ya., Panychev V.A., Ivakhiv O.L., Vyshnevska N.Yu. et al. Infection of ticks collected from humans in Ukraine, by causative agents of some bacteriosis M. Bukovinian Medical Herald. 2020;24;1(93): 195-201. Ukrainian.
47. Siński E., Welc-Falęciak R., Zajkowsk J.M. Borrelia miyamotoi: A human tick-borne relapsing fever spirochete in Europe and its potential impact on public health. Advances in Medical Sciences. 2016;3,61(2).
48. Smith R.P., Schoen R.T., Rahn D.W., Sikand V.K., Nowakowski J., Parenti D.L., Holman M.S., et al. Clinical characteristics and treatment outcome of early Lyme disease in patients with microbiologically confirmed erythema migrans. Ann. Intern. Med. 2002;136: 421-8.
49. Södermark L., Sigurdsson V., Näs W. Neuroborreliosis in Swedish children: A population-based study on incidence and clinical characteristics. Pediatr. Infect. Dis. J. 2017;36(11): 1052-56. DOI: 10.1097/INF.0000000000001653.
50. Stanek G., Wormser G.P., Gray J., Strle F. Lyme borreliosis. Lancet. 2012; 379(9814): 461-73.
51.Steere A.C., McHugh G., Suarez C., Hoitt J., Damle N., Sikand V.K. Prospective study of coinfection in patients with erythema migrans. Clin. Infect. Dis. 2003;36: 1078-81.
52. Steere A.C., Schoen R.T., Taylor E. The clinical evolution of Lyme arthritis. Ann. Intern. Med. 1987;107: 725-31.
53. Svinytsky A.S. Lyme disease as a topical integrated problem of modern internal medicine. News of medicine and pharmacy» Internal Medicine. 2007; 5(5). Available at: /http://www.mif-ua.com/archive/article/3014.
54. Teterin V.Yu., Korenberg E.I., Nefedova V.V. Human granulocytic anaplasmosis and mixed infections with ixodic tick-borne borreliosis. Infectious Diseases. 2013;1:21. Russian.
55. Tijsse-Klasen E., Jacobs J.J., Swart A., Fonville M., Reimerink J.H., Brandenburg A.H., van der Giessen J.W.B., Hofhuis A., Sprong H. Small risk of developing symptomatic tick-borne diseases following a tick bite in the Netherlands. Parasit Vectors. 2011;4: 17.
56. Walls J.J., Greig B., Neitzel D.F., Dumler J.S. Natural infection of small mammal species in Minnesota with the agent of human granulocytic ehrlichiosis. J. Clin. Microbiol. 1997;35: 853-5.

57. Weber K. Aspects of Lyme borreliosis in Europe. European Journal of Clinical Microbiology & Infectious Diseases. 2001;20(1): 6-13.
58. Welc-Falęciak R., Kowalec M., Karbowiak G., Bajer A., Behnke J.M., Siński E. Rickettsiaceae and Anaplasmataceae infections in Ixodes ricinus ticks from urban and natural forested areas of Poland. Parasit Vectors. 2014;7: 121.Published online 2014 Mar 24. DOI: 10.1186/1756-3305-7-121.

SUMMARY

LYME BORRELIOSIS - ENDEMIC DISEASE IN CHILDREN OF TERNOPIL REGION

Nykytyuk S., Klymnyuk S., Podobivsky S., Levenets S., Stelmakh O.

I. Horbachevsky Ternopil National Medical University, Ukraine

The aim of research is to estimate the number of LB-infected ticks and to evaluate their LB pathogen's genotype in children with clinical suspicion of Lyme borreliosis in the Ternopil region, Ukraine.

In our first part of the study we conducted survey of 795 patients with clinical suspicion of Lyme borreliosis. In our second study we did laboratory analysis of the 795 ticks and 109 blood samples from children that were bitten by a tick. Real-time Polymerase Chain Reaction (PCR) using Vector-Best production test systems were used to detect infected ticks and evaluate pathogen's genotype.

Only 267 (33.5%) children from the total number were bitten by infected ticks. The following forms of the lesion were noted:- skin - erythema form in 83 (76.1%) children, nervous system in 20 (18.3%), arthritis in 13 (11.9%) and heart in 1 (0.9%).

The remaining (59.2.%) of children at the time of the study had no external manifestations and other clinical signs of the disease. LB was caused by one or a combination of the few pathogens: *B.burgdorferi s.l., A.phagocytophilum,* and *B . miyamotoi.* The DNA of several infectious pathogens *B.burgdorferi s.l., A. phagocytophilum, B. Miyamotoi* simultaneously were diagnosed in (12.3%). We identify antibodies to the Borrelia *burgdorferi sensu lato* in 57.7.% of the examined children.

The types of pathogens influence on Lyme borreliosis clinical symptoms and therefore on the timing of the diagnosing.

Keywords: Lyme disease, borreliosis, PCR, erythema migrans, lyme arthritis, neuroborreliosis, co-infection, ELISa, Immunoblot.

РЕЗЮМЕ

ЛАЙМ-БОРРЕЛИОЗ - ЭНДЕМИЧЕСКОЕ ЗАБОЛЕВАНИЕ У ДЕТЕЙ ТЕРНОПОЛЬСКОЙ ОБЛАСТИ

Никитюк С.А., Климнюк С.И., Подобивский С.С., Левенец С.С., Стельмах Е.Е.

Тернопольский национальный медицинский университет им. И. Горбачевского, Украина

Лайм-боррелиоз (ЛБ) является эндемическим многосистемным заболеванием, вызванным *Borrelia burgdorferi sensu lato (s.l).* Так как дети являются наиболее динамичной популяцией общества, они находятся в группе высокого риска укуса клещами и, следовательно, развития болезни Лайма.

Целью исследования является определение процента инфицированных лайм-боррелиозом клещей и оценка генотипа ЛБ-патогена у детей с клиническим подозрением на заболевание.

Исследованы 795 детей с клиническим подозрением на Лайм-боррелиоз. Выявлено, что 267 (33,5%) детей из общего числа укушены инфицированными клещами. На момент исследования у 109 детей отмечены следующие формы клинических признаков заболевания: кожа (эритемная форма) – у 83 (76,1%), нервная система - у 12 (11,1%), суставы – у 13 (11,9%), сердце – у 1 (0,9%). У остальных 158 (59.2.%) детей на момент исследования клинических проявлений не выявлено.

С целью выявления инфицированных клещей и оценки генотипа патогена определены Deoxyribonucleoside киназы (DNK) Borrelia burgdorferi sensu lato. системы тестирования vector-Best для в режиме реального времени полимеразной цепной реакции.

В результате исследования выявлено, что ЛБ вызван одним или комбинацией нескольких патогенов: B.*burgdorferi* s.l., A.*phagocytophilum* и B.*miyamotoi.* DNK нескольких инфекционных патогенов B.*burgdorferi* s.l., A. *phagocytophilum*, B. *Miyamotoi* одновременно были диагностированы в 12,3%. Антитела к Borrelia burgdorferi s. l. выявлены у 57,7% обследованных детей.

Типы патогенных микроорганизмов влияют на клинические проявления Лайм бореллиоза и, следовательно, на сроки постановки диагноза.

რეზიუმე

ლაიმ-ბორელიოზი – ენდემური დაავადება ტერნოპოლის ოლქის ბავშვებში

ს.ნიკიტიუკი, ს.კლიმნიუკი, ს.პოდობივსკი,
ს.ლევენეცი, ე.სტელმახი

ტერნოპილის ი. გორბაჩევსკის სახ. ეროვნული სამედიცინო უნივერსიტეტი, უკრაინა

ლაიმ-ბორელიოზი წარმოადგენს ენდემურ მრავალსისტემურ დაავადებას, რომელიც გამოწვეულია *Borrelia burgdorferi sensu lato (s.l)*-თი. ვინაიდან ბავშვები საზოგადოების ყველაზე დინამიკური ჯგუფია, ისინი ტკიპების ნაკბენის და, შესაბამისად, ლაიმის დაავადების მაღალი რისკის ჯგუფს მიეკუთვნებიან.

კვლევის მიზანს წარმოადგენდა ლაიმ-ბორელიოზით ინფიცირებული ტკიპების პროცენტის და ლაიმ-ბორელიოზის გამომწვევი გენოტიპის შეფასება ბავშვებში დაავადებაზე ეჭვის არსებობის შემთხვევაში.

გამოკვლეულია 795 ბავშვი ეჭვით ლაიმ-ბორელიოზზე. პოლიმერაზულ-ჯაჭვური რეაქციის (პჯრ) მეთოდით რეალური დროის რეჟიმში Vector-Best საწარმო ტესტური სისტემების გამოყენებით განისაზღვრა Borrelia burgdorferi sensu lato-ს Deoxyribonucleoside-კინაზები (DNK).

2017-2019 წწ. პერიოდში ლაიმ-ბორელიოზის და ტკიპებით გადაცემული სხვა ინფექციების კვლევის ლაბორატორიულ ცენტრში გამოკვლეულია 795 ბავშვი ტკიპების ნაკბენით, მათგან 267 (33,5%) ბავშვი ნაკბენი იყო ინფიცირებული ტკიპებით. დაზიანების ვარიანტის მიხედვით 109 ბავშვს აღენიშნა შემდეგი

ფორმები: კანის (ერითემული ფორმა) – 83-ს (76,1%), ნერვული სისტემის – 12-ს (11,1%), სახსრების – 13-ს (11,9%), გულის – 1 (0,9%).

პჯრ-მეთოდით ჩატარებული ეპიდემიოლოგიური კვლევის შედეგად გამოვლინდა, რომ ბორელიას პათოგენებით ინფიცირებული ტკიპების სიხშირე მერყეობს 34-42%-ის ფარგლებში. ტერნოპილის ოლქის ბავშვების სისხლის ნიმუშებში ერთდროულად დიაგნოსტირებული იყო რამდენიმე ბაქტერიის DNM - B. burgdorferi s.l.-ის, A. phagocytophilum-ის და B. Miyamotoi-ის. გამოკვლეული ბავშვების 57.7%-ს გამოუვლინდა ანტისხეულები Borrelia burgdorferi sensu lato-ს მიმართ. ჩატარებული კვლევის შედეგად დადგენილია, რომ პათოგენური მიკროორგანიზმების ტიპი მოქმედებს ლაიმ-ბორელიოზის დიაგნოსტიკის ვადებსა და მის სიმპტომებზე.

RISK FACTORS AND COMORBIDITY IN DIFFERENT TYPES OF FUNCTIONAL DYSPEPSIA: RETROSPECTIVE COHORT ANALYSIS

[1,2]Solovyova G., [1]Alianova T., [1]Taran A., [1]Aleksieieva V., [3]Gulieva L.

[1]Bogomolets National Medical University; [2]Medical Centre "Oberig" clinic, Kyiv, Ukraine;
[3]Azerbaijan Medical University, Baku, Azerbaijan

Functional dyspepsia (FD) is one of the most common functional gastrointestinal disorders. Extensive trials demonstrated that FD affects nearly 10-30% of the population worldwide [3, 4, 7]. In global studies it was evaluated that FD was diagnosed in 14-27.5% of European population, 12-28% of USA and Canadian inhabitants, 18-28% of Asian population, up to 45% of men and women in Africa, and 24-39% of Australian inhabitants [2]. In 2012 the Ministry of Health of Ukraine published statistical data for Ukrainian population, according to which the prevalence rate of FD is 30-40%. Experts expect the real level to be significantly higher as around 50% of patients do not visit specialists, and so could not be included in official statistics [1].

According to Rome IV definition (2016) FD is a medical condition that has multifactorial pathophysiological factors [4].

There is a significant data about overlap of FD and irritable bowel syndrome (IBS), however mostly the data is based on the previous diagnostic criteria and do not include other pathologies [6,10].

In the previous researches there were no differential statistical analysis performed for different types of FD – postprandial distress syndrome (PDS) and epigastric pain syndrome (EBS).

Aim of the study - to assess potential risk factors and the prevalence of comorbid conditions associated with FD and to compare their frequency with the same in the group with no dyspeptic complaints and in patients with different types of FD – PDS and EPS.

Material and methods. We performed a retrospective database analysis of the patients with newly set diagnosis of FD on the basis of Gastro center of the Clinic "Oberig" in Kyiv, Ukraine in the period from June 2016 till June 2019. We compared the results of the patients with FD with the control group and in patients with different types of FD – PDS and EPS.

Diagnosis of FD was set if the patients had symptoms according to Rome IV criteria either for postprandial distress syndrome (PDS) (bothersome postprandial fullness or early satiety severe enough to affect daily life or ability to finish a regular-size meal for 3 or more days per week in the past 3 months, with at least a 6-month history) or for epigastric pain syndrome (EPS) (bothersome epigastric pain or epigastric burning 1 or more days per week in the past 3 months, with at least a 6-month history).

Patients with a prior organic upper or lower gastrointestinal diagnosis that might explain their symptoms, such as esophageal, pancreatic or bowel disease, were excluded. Patients with prior cancer, alcoholism or drug dependence recorded within 3 months before the FD was set, as well as pregnant women, were also excluded. Patients with red flag symptoms – onset in the age >45 years, persistent vomiting, signs of bleeding, iron deficiency anemia, family history of upper gastrointestinal cancer, progressive dysphagia and/or odynophagia – were not included into the analysis as well as cases with no details of medical history.
This study was conducted as a cross-sectional study in adult patients with FD and volunteers with no dyspeptic complaints. The 3 study groups were formed:

- Group 1 included 158 patients with PDS;
- Group 2 included 87 patients with EBS;
- Group 3 included 90 volunteers with no dyspeptic complaints.

There were no differences in age, sex, body mass index (BMI) among all study groups, and the duration of symptoms was equal in Group 1 and Group 2. The details are provided in Table 1.

Table 1. Clinical anamnestic characteristics of study participants

Characteristic	Study group			p	
	Group 1 (n=158)	Group 2 (n=87)	Group 3 (n=90)	p_{1-2}	$p_{(1+2)-3}$
Age, years (M±SD)	35.7±7.7	34.2±6.1	33.0±4.5	0.119*	0.007*
Women/men, n	98/60	54/33	58/32	0.948#	0.682#
BMI, kg/m^2 (M±SD)	21.1±1.9	20.9±1.8	21.0±1.8	0.507*	0.671*
Duration of symptoms, months (M±SD)	94.5±11.9	93.6±10.9	-	0.704*	-

** - t-test; # - χ2-test; no statistical significance of differences, p>0.05*