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ЕЖЕМЕСЯЧНЫЙ НАУЧНЫЙ ЖУРНАЛ

Медицинские новости Грузии

საქართველოს სამედიცინო სიახლენი

GEORGIAN MEDICAL NEWS

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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.

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HISTOCHEMICAL CHANGES OF THE PULMONARY HYDATID CYSTS IN SHEEP INFECTED WITH CYSTIC ECHINOCOCCOSIS

Buthaina H. Al-Sabawi[1], H. S. Sadoon[2]*.

[1]*College of Medicine, University of Mosul, Mosul, Iraq.*

[2]*College of Education for Pure Science, University of Mosul, Mosul, Iraq.*

Abstract.

Background: Hydatid cyst (Hydatidosis) is considered one of the parasitic diseases that pose a threat to both animals and humans alike.

Objectives: the present study was aimed to investigate cystic echinococcosis in sheep. By employing a variety of specific stains, we sought to uncover the mesmerizing histochemical changes associated with this condition.

Methods: Twenty lung samples infected with hydatid disease were obtained. The samples were fixed in 10% formalin and processed and then stained with haematoxylin and eosin and some special stains such as Periodic Acid Schiff (PAS), Gomri's aldehyde fuschin, Best Carmine, Van Gieson, Toluidine blue and Alcian blue to investigate the histochemical changes that occurred in the lung tissue.

Results: Chemical changes were observed in the lung tissue affected by hydatid cysts, revealing insights into the underlying pathological processes. The presence of hydatid cysts was characterized by encapsulation within the lung tissue, consisting of a laminated layer surrounded by a fibrous membrane. Severe pneumonia was evident, accompanied by the infiltration of inflammatory cells and the presence of necrotic cells containing lytic nucleic acids. These changes resulted in atelectasis (partial or complete lung collapse) and emphysema (destruction of alveolar walls). Despite these pathological changes, intact elastic fibers were observed surrounding the bronchiole, indicating preserved structural integrity. Necrosis of epithelial cells in the bronchiole was also observed, disrupting normal respiratory system functioning.

Conclusions: The hydatid cyst has a clear effect on the lung tissue, represented by the histochemical changes that certainly cause damage to the lung and this is reflected in its vital function inside the body.

Key words. Histopathological changes, Hydatid cysts, Lung.

Introduction.

Echinococcus granulosus is a tapeworm that infects the canine family as a final host, causing echinococcosis, while its larval stages infect mammals as intermediate hosts, causing hydatidosis [1]. Hydatid cyst is considered one of the diseases of health and economic importance, especially in developing countries. Because of the slaughter of livestock outside the slaughterhouses and the throwing of infected guts that are within the reach of loose dogs, this type of unsanitary behaviour contributes significantly to the transmission of disease to humans and domestic animals [2].

Infection of animals with hydatid disease leads to a decrease in milk and wool production, fertility, and the slow growth of animals, in addition to the damage to the affected organs [3].

The liver is the first organ to be affected by a hydatid cyst, followed by the lungs. Any other organ, on the other hand, can be affected by this disease. The lung is one of the most critical and important organs for all animals [4]. Hydatid cyst usually develops quietly over years, if not decades, before presenting with clinical symptoms. Clinical signs are mostly determined by the location, size, and the number of lesions. Cough is the most prevalent symptom of a pulmonary hydatid cyst, followed by chest pain, dyspnoea, expectoration, fever, haemoptysis, and allergic reactions [5]. The current study was focused on knowing the histochemical changes in the sheep lung tissue infected with this disease by using many special stains.

Methods.

In a research study conducted from September to November 2021, twenty lung samples infected with hydatid cyst disease were collected from sheep at local slaughterhouse in Mosul city. After slaughtering the sheep, the lung samples were carefully obtained and stored in a refrigerated cork container to maintain their integrity during transportation to the laboratory. Upon arrival, the specimens were prepared for analysis by being chopped into approximately 1 cm long pieces. Standard laboratory techniques were employed to process the samples, which involved fixation in 10% formalin and subsequent embedding in paraffin. To facilitate histological evaluation, the samples were sectioned into thin slices with a thickness ranging between 4 to 6 microns. These sections were then stained using a variety of specific stains, including hematoxylin and eosin, periodic acid-Schiff (PAS), Best carmine, Alcian blue, Toluidine blue, Van Gieson's, Gomori's aldehyde fuschin, and Mansso's trichrome. These staining techniques allowed for the identification and characterization of various cellular components and structures within the lung samples, aiding in the comprehensive assessment of the hydatid cyst disease [6].

Results.

In comparison to the control groups, which appeared normal, our current findings revealed the presence of hydatid cysts in the lung tissue with a laminated layer surrounded by a fibrous membrane and severe pneumonia with filtration of inflammatory cells, atelectasis, and necrosis of epithelial cells of the bronchiole in sections stained with hematoxylin and eosin stain.

PAS stain revealed lesions in the lung of the affected groups represented by bronchopneumonia, with infiltration of peribronchial inflammatory cells surrounding the bronchiole and in the alveolar walls without magenta colour, atelectasis, and emphysema.

The infected sections showed destruction and necrosis of the bronchiole, pneumonia, and bronchopneumonia. There was a severe infiltration of inflammatory cells and inflammatory exudate in the bronchi. The sections stained with Gomori's aldehyde appeared dark green compared to the control group, which appeared normal. Sections stained with Best's Carmine stain showed a laminated membrane of a hydatid cyst with a

fibrous tissue capsule surrounding the lung. There was also bronchopneumonia with severe infiltration of inflammatory cells and emphysema in the alveolar walls.

Through sections stained with Van Gieson stain, it indicates the presence of severe pneumonia with inflammation in the cells, bronchopneumonia with extensive inflammation around the bronchioles and alveolar walls, and emphysema when compared to the control group.

Infected groups sections stained with Toluidine blue stain, showed the presence of dark blue colour of acidic components of the laminated membrane of hydatid cyst with necrotic cells of lytic nucleic acids in the interstitial tissue with increased fibrous connective tissue in pink colour.

Through sections stained with Alcian blue stain, the architecture of the control group was normal. While the affected groups had blue mucopolysaccharide reactivity in the proteoglycans of the hydatid cyst laminated surrounding the lung, they also had severe infiltration of inflammatory cells surrounding the bronchiole and in the alveolar walls (Table 1 and Figure 1).

Discussion.

The lung represents the second station after the liver for hydatid cyst stability. The hexacanth embryo in eggs of this parasite turns into a hydatid cyst that gradually grows in the lung, and its growth rate is related to the softness of the organ and the elasticity of the surrounding tissues. The low resistance of lung tissue makes it an ideal environment for the rapid formation of hydatid cysts [7].

The host's reaction to the injury begins with the formation of fibrous tissue around the cyst as a result of the inflammatory effect of the host, and this is evident in this study. The density of this tissue depends on the location and size of the tissue, as well as the period of growth and the ability of this organism to form alveolar-epithelial injury and apoptosis [8].

Our current findings have shed light on the presence of fibrous tissue surrounding the hydatid cyst. This fibrous tissue develops as a result of the host's contact with the parasite's inflammatory effect, which initiates early in the cyst's growth. The severity of the reaction plays a role in influencing the extent of the fibrous tissue formation. In addition to this, our examination of lung tissue samples has revealed significant tissue response and infiltration of inflammatory cells surrounding bronchiole and alveolar walls. Notably, there was an absence of magenta color, atelectasis, or emphysema. Furthermore, we observed the proliferation of fibrous tissue capsule surrounding the lung, as well as degeneration of the lung tissue accompanied by the spread of necrotic areas of the interstitial tissue with severe broncho-pneumonia. It is worth mentioning that these findings have been previously confirmed by similar studies that focused on investigating pathological cases of hydatid cysts [9-15].

In addition to damaging the infected host tissues, the parasite infection causes the production of signals that trigger the recruitment of many cells, including mast cells, eosinophils, basophils, and dendritic cells. When these parasites are present, the cells have the capacity to secrete immunological components that control the immune response processes [16].

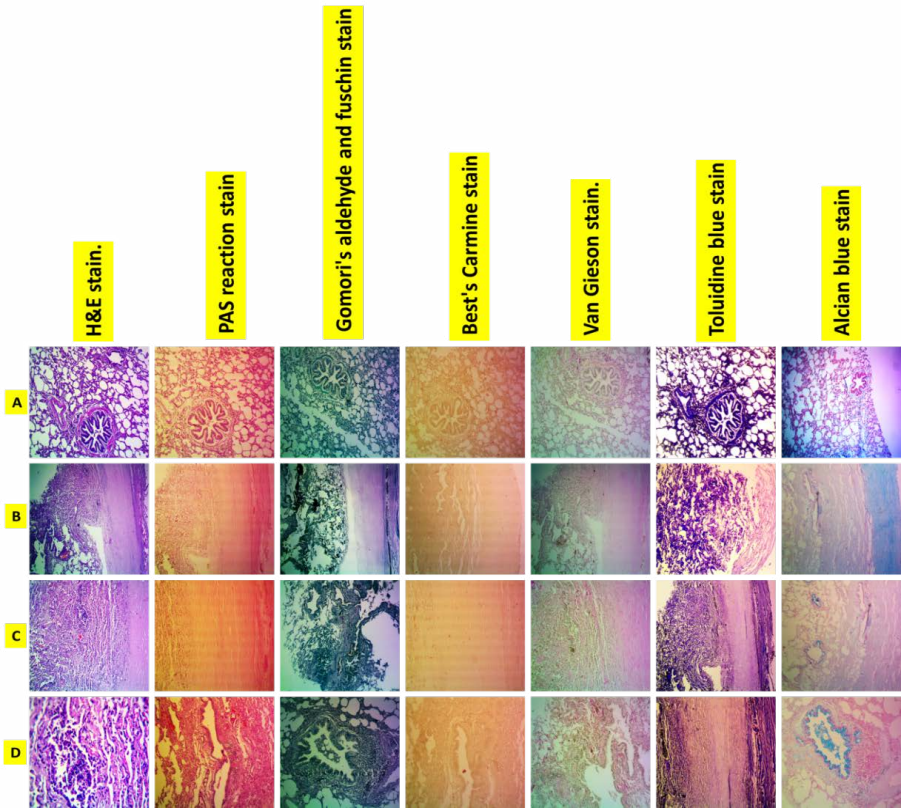

Figure 1. *Sections of sheep lungs. (A): control group showing normal architecture represented by alveoli, bronchiole, and respiratory bronchiole. (B) and (C): infestation groups showing the presence of laminated membrane of hydatid cyst, proliferated fibrous tissue capsule surrounding the lung and severe pneumonia with infiltration of inflammatory cells. (D): infestation group showing atelectasis of alveoli, necrosis of epithelial cells of the bronchiole with infiltration of inflammatory cells. 100X.*

Table 1. The reaction of the intensity of lung tissue infected with hydatid cysts using specific stains.

		PAS stain	**Gomori 's aldehyde fuschin stain**	**Best's Carmine stain**	**Van Gieson stain**	**Toluidine blue stain**	**Alcian blue stain**
	Alveoli	++++	+++	-	-	-	-
A	Bronchiole	++	++	++	+++	+++	-
	Blood vessel	--	+	±	+	++	±
	Laminated membrane	++++	---	-	-	+++	++++
B	Fibrous tissue capsule	--	--	-	-	+	±
	Inflammatory cells	±	+++	-	+++	++++	-
	Laminated membrane	++++	++++	-	-	+++	++++
C	Fibrous tissue capsule	--	+++	-	-	+	±
	Inflammatory cells	±	---	-	+++	++++	-
	Bronch- pneumonia	++++	+++	±	±	+++	+++
D	Inflammatory cells	++++	+	++	++++	-	-
	Emphysema	+++		-	--	++	++++
Very strong reaction: +++, ++++; Moderate reaction: ++; Positive reaction:+ Faintly reaction: ±; Negative reaction: -							

Recent investigation has found evidence supporting the notion that inflammatory cells, specifically eosinophils and mononuclear cells, quickly enter the cyst layer in hydatid cysts found in the lungs. Additionally, these cells often spread into the nearby alveoli and bronchioles, which is consistent with previous observations made by Beigh et al. in 2017 [10]. This finding suggests that the immune response is important in the development of hydatid cysts in the lungs. Eosinophils, a type of white blood cell involved in allergies and parasitic infections, tend to gather in tissues affected by helminthic infections like hydatid cysts.

Atelectasis, a condition characterized by the collapse or incomplete expansion of the lung, has been observed to occur due to various factors. These factors include pressure on the lung or obstruction of the airways, specifically the bronchioles or bronchi. One of the main causes of atelectasis is the presence of foreign bodies or mucus that block the airways, preventing proper airflow. In a recent study conducted by Al-Malki and Ahmed [15]. In a study analyzed pathological lesions in infected sheep to determine the prevalence of various conditions such as bronchiectases, alveoli atelectasis, areolar emphysema, bronchiolar epithelial hyperplasia, thickening of interalveolar septa, collagen fiber amount, and pulmonary vessel congestion. The results showed a significant increase in these parameters in infected sheep compared to uninfected ones, indicating the impact of infection on the development of atelectasis. This research emphasizes the importance of understanding the mechanisms and pathophysiology of atelectasis and its potential implications for animal and human health.

In several histological studies, PAs, and Masson's trichrome are excellent prognostic markers. As in our current study, the cyst wall was made up of three layers: an exterior fibrous layer, a laminated layer and the innermost germinal layer. The lung tissue appeared as a very dark purple shade using PAS, with a large amount of glycogen and acidic mucopolysaccharides around the alveolar macrophages and around the lesion. It is caused by an inflammatory reaction, and this is consistent with what found [17,10].

In the study conducted by Solcan et al., an interesting discovery was made regarding the existence of a space between the pericyst and the ectocyst. This space was found to serve as a pathway for tissue fluid and nutritive medium to pass through. Further examination of the pericystic area revealed the presence of a linear area consisting of acid mucopolysaccharides. Notably, in the case of sheep, the region between the pericyst and the ectocyst exhibited the precipitation of both neutral and acidic polysaccharides. These findings align with the observations made in the current study. The identification of these components and their distribution within the pericystic area further contributes to our understanding of the intricate biological processes occurring in this specific context. Such discoveries shed light on the complex nature of these interactions and provide valuable insights for future research in this field [18].

The content of myosin blue, a specific marker, was found to exhibit distinguishable patterns in certain cells of lung tissue that were affected by hydatid cysts. This distinction was observed through the utilization of Alcian blue staining, which allowed for the visualization and differentiation of these cells from the control group. This finding aligns with the results reported by Arabi et al. in their study conducted in 2013 [19]. The use of Alcian blue staining as a diagnostic tool in the examination of lung tissue affected by hydatid cysts has proven to be consistent with their findings, further supporting the relevance and accuracy of this staining technique in identifying and characterizing pathological changes in cellular composition. This discovery contributes to our understanding of the cellular alterations occurring in lung tissue affected by hydatid cysts and emphasizes the importance of utilizing staining techniques such as Alcian blue to aid in the accurate diagnosis and characterization of such conditions [19].

In this study, Toluidine blue-stained sections of lung tissue revealed the presence of mast cells in the fibro-cellular reaction near the cyst wall. These mast cells contained granules that were labeled both inside and outside of them. Additionally, the alveolar parenchyma of the lungs affected by hydatid cysts showed a significant mast cell response, which is supported by a previous study conducted by Beigh et al. [10].

This study found that lung tissue sections stained with toluidine blue showed a fibro-cellular reaction near the cyst wall. This reactive area contained a significant number of mast cells. What made our observation even more interesting was the presence of

granules within and outside the cells neighboring the mast cells, which exhibited metachromatic labeling. This metachromatic labeling suggests the presence of substances or molecules within these granules that have the ability to change the color of the stain, providing valuable insights into the cellular and molecular environment surrounding the hydatid cyst. Furthermore, our investigation extended to the alveolar parenchyma of the lungs affected by the hydatid cyst, and we discovered a robust mast cell response. This finding aligns with the research conducted by Beigh et al. [10], further supporting the significance of mast cells in the context of cystic lung diseases. By utilizing toluidine blue staining and carefully examining the lung tissue sections, we were able to shed light on the significant presence of mast cells and the associated fibro-cellular reaction near the cyst wall. These findings contribute to our understanding of the cellular and molecular dynamics involved in hydatid cysts in the lungs. Further research in this area could explore the mechanisms underlying mast cell activation and their potential as therapeutic targets for managing cystic lung diseases [10].

Tissue hypoxia, a condition characterized by inadequate oxygen supply to the cells, is a crucial factor that triggers mast cell activation [20]. Mast cells, a type of immune cell found in connective tissues, play a pivotal role in the immune response and are known for their ability to release various bioactive substances [21]. Mast cells, when activated, release various substances including proteolytic enzymes, angiogenic factors, and growth factors. These substances can lead to tissue deterioration and remodeling in both normal and pathological conditions. The release of proteolytic enzymes by mast cells, such as tryptase, chymase, and matrix metalloproteinases, can degrade components of the extracellular matrix, causing tissue damage. Mast cells also release angiogenic factors, promoting the formation of new blood vessels, which is important for wound healing but can contribute to diseases like cancer and chronic inflammation when excessive. Additionally, mast cell activation results in the secretion of growth factors that play a role in cell proliferation, migration, and tissue remodeling. This can lead to changes in tissue structure and function, and excessive remodeling can contribute to the development of fibrosis [22]. The study discovered color changes and an abundance of mast cells in certain areas. These mast cells release various mediators that have proteolytic, proliferative, and angiogenetic effects. These findings were observed in and around the fibroblastic regions [23].

Pulmonary fibroplasia is a condition characterized by excessive connective tissue formation in the lungs. Mast cells, immune cells found in the respiratory system, play a crucial role in tissue remodeling, and are closely associated with fibroblast foci and alveolar type II cells. The interaction between mast cells and fibroblasts is important in the development and progression of lung fibrosis and inflammation caused by hydatidosis, a parasitic infection. Mast cells release mediators such as cytokines, growth factors, and chemokines, which stimulate fibroblast activation and proliferation, leading to the excessive production of collagen and other components of the extracellular matrix. These changes disrupt lung function, resulting in respiratory symptoms and complications. Understanding the role of mast cells and their mediators is important for developing targeted therapies to alleviate symptoms and improve the quality of life for individuals with pulmonary fibroplasia [22,24,25].

Masson's trichrome stain is a commonly used technique in pathology and histology to differentiate between collagen and muscle tissues. It helps evaluate collagen in various diseases and is particularly useful in distinguishing collagen fibers from muscle fibers. A recent study using Masson's trichrome stain identified collagen fibers in the cyst wall of lung tissue, providing insights into the structure affected by certain conditions or diseases. This stain aids researchers and pathologists in understanding the underlying pathology, assessing fibrosis, or scarring in lung tissue. Masson's trichrome stain has also been used to demonstrate fibrous tissue associated with hydatidosis in sheep, contributing to a better understanding of the disease's pathogenesis and potential treatments [17,26,27]. Collagen is a sign of inflammation in response to chronic stimulation, which could be a result of the regular, sluggish exosmosis that takes place in hydatid cysts. This is essentially the fundamental defensive reaction used to contain the parasite that leads to the development of the cyst wall.

Several trichrome techniques can show fibrin, which is useful for histologists to provide important information on the pathology. In tissue sections, fibrin is a byproduct of coagulation, and its location and structure provide important information on the pathological state of the tissue. For example, fibrin spots will appear on the lung with lobar pneumonia. Lung tissue shows fibrinogen and haemorrhage in specific areas where fibrin usually appears in pink colour, and this is what saw in our current study.

The use of a modified Verhoeff's elastin stain to stain the thin elastic fibers of pulmonary blood vessels. This staining technique enables histomorphometric imaging analysis of vessel wall thickness in small arteries and intra-acinar vessels. [28].

Conclusion.

Through this study, it has been concluded that hydatidosis, a parasitic infection caused by the larvae of Echinococcus granulosus, has a significant impact on lung tissue. This conclusion is based on the findings obtained by using several stains that revealed clear histochemical changes in the infected lung tissue. These changes indicate a disruption in the normal structure and function of the lungs, which are vital organs responsible for respiration and oxygen exchange in the body. The presence of hydatid cysts in the lung tissue can lead to various complications, including compression of adjacent structures, impaired lung function, and even potentially life-threatening situations such as rupture or secondary infection. The histochemical changes observed in this study highlight the destructive nature of hydatidosis and emphasize the need for early diagnosis and appropriate treatment to mitigate the detrimental effects on lung tissue and overall respiratory health. Understanding the impact of hydatidosis on the lung is crucial for healthcare professionals to provide effective management strategies and improve patient outcomes.

REFERENCES

1. Higuita NIA, Brunetti E, McCloskeyet C. Cystic Echinococcosis. J. Clin. Microbiol. 2016;4:518-523.

2. Degefu H, Damet T. Hydatidosis of cattle and sheep, its economic importance and Echinococcus granulosus among stray dogs in South Wollo, Ethiopia Ethiop. Vet. J. 2013;17:101-119.
3. Regassa B. Review on Hydatidosis in Small Ruminant and its Economic and Public Health Significance. Dairy and Vet Sci J. 2019;11:555808.
4. Abed ND, Al-Bayati N Y. Effect of Pulmonary Metacestodes Of Echinococcus Granulosus (Hydatid Cyst) Infection On Lung Tissue Of Sheep And Cow. Biochem Cell Arch. 2019;19:3463-3467.
5. Rawat S, Kumar R, Raja J, et al. Pulmonary hydatid cyst: Review of literature. J Family Med Prim Care. 2019;8:2774-8.
6. Luna G. Manual of histologic staining methods of the Armed forces, Institute of Pathology. 3. New York: Mc Graw Hill Book Company. 1968.
7. Sarkar M, Pathania R, Jhobta A, et al. Cystic pulmonary hydatidosis. Lung India. 2016;33:179-191.
8. Barnes TS, Hinds LA, Jenkins DJ, et al. Comparative pathology of pulmonary hydatid cysts in macropods and sheep. J Comparative Pathology. 2011;144:113-122.
9. Singh BB, Sharma R, Sharma JK, et al. Histopathological changes associated with E. granulosus echinococcosis in food producing animals in Punjab (India). J Parasit Dis. 2014;40:997-1000.
10. Beigh AB, Darzi MM, Samina Bashir S, et al. Pathological and histochemical studies of the effects of cystic echinococcosis in sheep. Comp Clin Pathol. 2017;27:407-412.
11. Abed ND, Al-Bayati NY. Effect of pulmonary of Echinococcus granulosus granulosus (hydatid cyst) infected on lung of sheep and cow. Biochem. Cell. Arch. 2020;19:3463-3467.
12. Al-Aubaidi1 IK, Yaseen AN, Gathwan MA. Histopathological study of hepatic and pulmonary sheep's hydatidosis. Annals of Tropical Medicine & Public Health. SPe155. 2019;22.
13. Hanash WJ. The study of histopathological changes in some of intermediate hosts infected with cystic echinococcosis. University of Thi-Qar Journal of Science. 2019;7:47-56.
14. Mnati IM, Mutlak BH, Abed ND. Histological Changes in Liver Tissue Resulting from Hydatid Cyst Infection: Comparison between Sheep and Cattle in Iraq. Medico-legal Update. 2020;20:1205-1210.
15. Al Malki, Ahmed N. Epidemiological and histomorphic studies in sheep infected with hydatid cyst in Taif area. Sudi J Bio Sci. 2022;29:886-893.
16. Motran CC, Silvane L, Chiapello LS, et al. Helminthic Infections: Recognition and Modulation of the Immune Response by Innate Immune Cells. Frontier in Immunology. 2018;9:664-676.
17. Ibrahim SEA, Gameel AA. Pathological, histochemical and immunohistochemical studies of lungs and livers of cattle and sheep infected with hydatid disease. U. of K. Graduate College and Scientific Research. The 5th Annual Conference - Agricultural and Veterinary Research. Khartoum, Sudan, Conference Proceedings. 2014;2:328-344.
18. Solcan C, Solcan G, Ioniţă M, et al. Histological aspects of cystic echinococcosis in goats. Sci Parasitol. 2010;11:165-172.
19. Arabi M, Ibrahim M, Camelo Piragua S, et al. Supratentorial neurenteric cyst mimicking hydatid cyst: A case report and literature review. Avicenna Journal of Medicine. 2013;3:73-80.
20. Shephard MT, Merkhan MM, Forsyth NR. Human Mesenchymal Stem Cell Secretome Driven T Cell Immunomodulation Is IL-10 Dependent. International Journal of Molecular Sciences. 2022;23:13596.
21. Merkhan MM, Shephard MT, Forsyth NR. Physoxia alters human mesenchymal stem cell secretome. Journal of Tissue Engineering. 2021;12:20417314211056132.
22. Pejler G, Ronnberg E, Waern I, et al. Mast cell proteases: multifaceted regulators of inflammatory disease. Blood. 2010;115:4981-4990.
23. Jakubowski MS, Barnard DE. Anaphylactic shock during operation for hydatid disease. Anesthesiol. 1971;34:197-199.
24. Wygrecka M, Dahal BK, Kosanovic D, et al. Mast cells and fibroblasts work in concert to aggravate pulmonary fibrosis's role of transmembrane SCF and the PAR-2/PKC-a/Raf-1/p44/42 signalling pathway. Am J Pathol. 2013;182:2094-108.
25. Molyneaux PL, Maher TM. The role of infection in the pathogenesis of idiopathic pulmonary fibrosis. European Respiratory Review. 2013;22:376-381.
26. Rashed AA, Omer HM, Fouad MAH, et al. The effect of severe cystic hydatidosis on the liver of a Najdi sheep with special reference to the cyst histology and histochemistry. J Egypt Soc Parasitol. 2004;34:297-304.
27. Alsulami M. Prevalence and histopathological study on cystic hydatidosis in heart and spleen of goat slaughtered at Makkah, Saudi Arabi. Ann Parasitol. 2019;65:225-36.
28. Reddy V, David O, Spits D, et al. Gaituso's Differential Diagnosis in Surgical Pathology (4th edition). 2022.