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## ANALYSIS OF THE MICROFLORA ON DATES OF THE BACTERIOLOGICAL LABORATORY

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### Abstract

**Introduction.** Bacteriological laboratories play a key role in the diagnosis of infectious diseases, the study of pathogenic microorganisms and the development of prevention methods. Close collaboration between clinical microbiologists and attending physicians is necessary to optimize microbiological research. This article discusses the main areas of work of the bacteriological laboratory, diagnostic methods and the role of laboratories in the fight against infectious diseases.

**The purpose of the study.** To analyze the structure and properties of pathogens isolated from the patients' material and the choice of drugs for initial empirical antimicrobial therapy.

**Research materials and methods.** A retrospective continuous copying of research results from the journals of the bacteriological laboratory of the Center for Phthisiopulmonology and Infectious Diseases in Semey for 2024. Identification of pathogens obtained from various patient materials was carried out in accordance with the regulatory documents governing the work of bacteriological laboratories. Sensitivity to antimicrobial drugs was determined by the disco diffusion method. Statistical processing was carried out in the Excel program.

**The results of the study.** In total, 37790 analyzes from 31689 individuals were performed in the bacteriological laboratory of Semey in 2024. The main areas of the laboratory's work were the isolation of salmonella, shigella, opportunistic pathogenic flora, pathogenic staphylococcus, feces for dysbiosis, pathogens of droplet infections (meningococcal infection, diphtheria, pertussis), blood tests, biomaterial studies for pathogenic flora, serological studies. In intestinal infections, pathogenic flora, conditionally pathogenic flora, pathogenic staphylococcus and stool examination for dysbiosis were determined. Of airborne infections, studies were conducted on meningococcal infection, whooping cough and diphtheria. Blood tests for hemoculture and striality were carried out in the laboratory. The laboratory also conducted studies of various biomaterials for pathogenic flora: eyes, ENT organs, wounds, breast milk, genitals, urine, sputum, cadaverous material. The analysis of the microbial landscape revealed that bacteria from the family of Streptococcus, Staphylococcus, Candida, Escherichia coli, etc. were most often isolated. The bacteriological laboratory performs serological studies.

**Conclusions.** The work of specialists in microbiological laboratories plays a crucial role in the effective prevention and control of infections, since the identification of the pathogen allows doctors to prescribe treatment in a timely and effective manner and thereby prevent the spread of infections.

**Keywords:** bacteriological laboratory, pathogens, infectious diseases.

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### Резюме

## АНАЛИЗ МИКРОФЛОРЫ ПО ДАННЫМ БАКТЕРИОЛОГИЧЕСКОЙ ЛАБОРАТОРИИ

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**Введение.** Бактериологические лаборатории играют ключевую роль в диагностике инфекционных заболеваний, исследовании патогенных микроорганизмов и разработке методов профилактики. Для оптимизации микробиологических исследований необходимо тесное взаимодействие между клиническими микробиологами и лечащими врачами. В этой статье рассматриваются основные направления работы бактериологической лаборатории, методы диагностики и роль лабораторий в борьбе с инфекционными болезнями.

**Цель исследования.** Провести анализ структуры и свойств возбудителей, выделяемых из материала больных и выбор препаратов для стартовой эмпирической антимикробной терапии.

**Материал и методы исследования.** Проведена ретроспективная сплошная выкопировка результатов исследований из журналов бактериологической лаборатории Центра фтизиопульмонологии и инфекционных болезней г. Семей за 2024 год. Идентификацию возбудителей, полученных из различного материала больных, проводили согласно нормативным документам, регламентирующим работу бактериологических лабораторий. Определение чувствительности к антимикробным препаратам осуществлялось диско-диффузионным методом. Статистическая обработка проводилась в программе Excel.

**Результаты исследования.** Всего за 2024 год по бактериологической лаборатории г. Семей было выполнено 37790 анализов от 31689 лиц. Основными направлениями работы лаборатории были выделение сальмонеллы, шигеллы, условно-патогенной флоры, патогенного стафилококка, кал на дисбактериоз, возбудителей каплевых инфекций (менингококковая инфекция, дифтерия, коклюш), исследования крови, исследования биоматериала на патогенную флору, серологические исследования. При кишечных инфекциях определяли патогенную флору, условно патогенную флору, патогенный стафилококк и исследование кала на дисбактериоз. Из воздушно-капельных инфекций исследования проводили на менингококковую инфекцию, коклюш и дифтерию. В лаборатории были проведены исследования крови на гемокультуру и стерильность. Также в лаборатории провели исследования различного биоматериала на патогенную флору: глаза, ЛОР органы, раны, грудное молоко, половые органы, моча, мокрота, трупный материал. При анализе микробного пейзажа выявлено, что чаще всего выделяли бактерии из семейства *Streptococcus*, *Staphylococcus*, *Candida*, *Escherichia coli* и др. Бактериологическая лаборатория также выполняет серологические исследования.

**Выводы.** Работа специалистов в микробиологических лабораториях играет решающую роль в эффективной профилактике инфекций и борьбе с ними, так как определение возбудителя позволяет врачам своевременно и эффективно назначить лечение и тем самым предотвратить распространение инфекций.

**Ключевые слова:** бактериологическая лаборатория, возбудители, инфекционные болезни.

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Түйіндеме

## БАКТЕРИОЛОГИЯЛЫҚ ЗЕРТХАНАНЫҢ МӘЛІМЕТТЕРІ БОЙЫНША МИКРОФЛОРАНЫ ТАЛДАУ

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**Кіріспе.** Бактериологиялық зертханалар жұқпалы ауруларды диагностикалауда, патогендік микроорганизмдерді зерттеуде және алдын алу әдістерін әзірлеуде шешуші рөл атқарады. Микробиологиялық зерттеулерді оңтайландыру үшін клиникалық микробиологтар мен емдеуші дәрігерлер арасында тығыз өзара әрекеттесу қажет. Бұл мақалада бактериологиялық зертхана жұмысының негізгі бағыттары, диагностика әдістері және жұқпалы аурулармен күресудегі зертханалардың рөлі қарастырылады.

**Зерттеудің мақсаты.** Науқастардың материалынан бөлінетін қоздырғыштардың құрылымы мен қасиеттеріне талдау жүргізу және таңдау бастапқы эмпирикалық микробқа қарсы терапияға арналған препараттар.

**Зерттеу материалы мен әдістері.** 2024 жылы Семей қ. фтизиопульмонология және жұқпалы аурулар Орталығының бактериологиялық зертханасының журналдарынан зерттеу нәтижелерін ретроспективті үздіксіз көшірме жасалды. Науқастарының әртүрлі материалдарынан алынған қоздырғыштарды сәйкестендіру бактериологиялық зертханалардың жұмысын реттейтін нормативтік құжаттарға сәйкес жүргізілді. Микробқа қарсы препараттарға сезімталдықты анықтау диско-диффузия әдісімен жүзеге асырылды. Статистикалық өңдеу Excel бағдарламасында жүргізілді.

**Зерттеу нәтижелері.** 2024 жылы Семей қаласының бактериологиялық зертханасында 31689 адамнан 37790 талдау жасалды. Зертхана жұмысының негізгі бағыттары – сальмонелла, шигелла, шартты-патогенді флора, патогенді стафилококк бөлінуі, дисбактериозға нәжіс, тамшы инфекцияларының қоздырғыштары (менингококк инфекциясы, дифтерия, көкжөтел), қан анализі, патогендік флораға биоматериалды зерттеу, серологиялық зерттеу. Ішек инфекцияларында патогендік флора, шартты патогендік флора, патогендік стафилококк және дисбактериозға нәжісті зерттеу анықталды. Ауа-тамшы инфекцияларына зерттеулер менингококк инфекциясына, көкжөтелге және дифтерияға жүргізілді. Зертханада гемокультура мен стерильділікке қан анализі жүргізілді. Сондай-ақ, зертханада патогендік флораға арналған әртүрлі биоматериалдарға зерттеулер жүргізілді: көз, ЛОР мүшелері, жаралар, емшек сүті, жыныс мүшелері, зәр, қақырық, мәйіт материалы. Микробтық пейзажды талдау кезінде *Streptococcus*, *Staphylococcus*, *Candida*, *Escherichia coli* және т.б. тұқымдасынан бактериялар жиі бөлінді. Бактериологиялық зертханада сонымен қатар серологиялық зерттеулер жүргізеді.

**Қорытындылар.** Микробиологиялық зертханалардағы мамандардың жұмысы инфекциялардың тиімді алдын алуда және олармен күресуде шешуші рөл атқарады, өйткені қоздырғышты анықтау дәрігерлерге емдеуді уақтылы және тиімді тағайындауға және осылайша инфекциялардың таралуын болдырмауға мүмкіндік береді.

**Түйінді сөздер:** бактериологиялық зертхана, қоздырғыштар, жұқпалы аурулар.

**Дәйексөз үшін:** Маукаева С.Б., Кудайбергенова Н.К., Меримғалиева А.К., Ағыбаева А.М., Абзалханова Г.Т., Оразалина А.С., Юрковская О.А., Горемыкина М.В., Зейнолла К.А., Ахметова А.К. Бактериологиялық зертхананың мәліметтері бойынша микрофлораны талдау // Ғылым және Денсаулық сақтау. 2025. Vol.27 (1), Б. 89-99. doi 10.34689/SH.2025.27.1.011

## Introduction

Bacteriological laboratories are an integral part of the healthcare system and scientific research. They play a key role in the diagnosis of infectious diseases, the study of pathogenic microorganisms, and the development of prevention methods [1,3,4,6,14].

A bacteriological laboratory is a type of microbiological laboratory in which bacteriological research is carried out. Bacteriological laboratories can be scientific, industrial, medical, veterinary, etc. Medical bacteriological laboratories as independent structural units are organized at sanitary and epidemiological stations (SES) (sanitary and bacteriological laboratories), in infectious diseases hospitals, general type hospitals, some specialized hospitals (for example, in tuberculosis, rheumatology, skin and venereology) and in polyclinics (clinical bacteriological laboratories). Bacteriological laboratories at the SES examine environmental objects for general bacterial contamination, as well as infection with conditionally pathogenic and pathogenic microflora: air, water, soil, food; they examine organized groups and individuals for carriers of pathogenic bacteria of the intestinal group, corynebacteria diphtheria, whooping cough, paracoccus, meningococcus.

The work of the microbiological laboratory in conjunction with other departments of the SES has a

specific task - improving the environment and reducing the incidence of diseases in the population. Bacteriological laboratories at medical and preventive institutions perform the tests necessary to establish and clarify the diagnosis of an infectious disease, contributing to the correct choice of specific treatment and determining the time of discharge of the patient from the infectious diseases hospital. The subject of research in bacteriological laboratories are: secretions from the human body: urine, feces, sputum, pus, as well as blood, cerebrospinal fluid and cadaveric material; environmental objects: water, air, soil, food, flushing from inventory items, hands, etc. [2,13,16].

The bacteriological laboratory conducts research on isolation, identification and determination of antibiotic sensitivity of pathogenic and conditionally pathogenic microorganisms isolated from various biomaterials. The most common resistant bacteria are *Escherichia coli*, *Klebsiella pneumoniae*, *Staphylococcus aureus* and *Streptococcus pneumoniae*, followed by *Salmonella* spp. The only way out today is the rational use of antibiotics already available in our arsenal, which will not only keep the growth of resistance of microorganisms to them, but also increase the effectiveness of the treatment of infectious diseases [8,18].

To optimize microbiological research, it is necessary close interaction between clinical microbiologists and attending physicians

This article discusses the main areas of work of the bacteriological laboratory, diagnostic methods and the role of laboratories in the fight against infectious diseases.

**Aim.** To analyze the structure and properties of pathogens isolated from the patients' material and the choice of drugs for initial empirical antimicrobial therapy.

**Research materials and methods.** A retrospective continuous copying of research results from the journals of the bacteriological laboratory of the Center for Phthisiopulmonology and Infectious Diseases in Semey for 2024 was carried out to identify pathogens obtained from various patient materials (feces, wound discharge, pharynx and nose, sputum, urine, vagina, etc.) in Semey. The study used an AutoMic-i600 microbiological analyzer. The management of this clinic is familiar with the progress of the research. There are no objections to the further publication of the research results in the open press. The identification of bacteria was carried out in accordance with the regulatory documents governing the work of bacteriological laboratories. Sensitivity to antimicrobial drugs was determined by the disco diffusion method. Descriptive statistics were used for the analysis in this article. Statistical processing was carried out in the Excel program.

The research topic was approved at the meeting of the Ethics Committee of the NCJSC «Semey Medical University» (Protocol No. 3 dated 02/25/2024).

Informed consent of patients to participate in the study is not required, since data obtained as part of regular laboratory diagnostics were used.

#### Research results

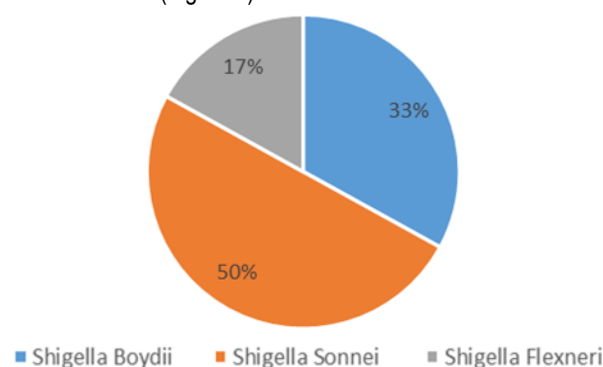
In total, 37790 analyzes from 31689 individuals were performed in the bacteriological laboratory of Semey in 2024. The main areas of the laboratory's work were the isolation of salmonella, shigella, opportunistic pathogenic flora, pathogenic staphylococcus, feces for dysbiosis, pathogens of droplet infections (meningococcal infection, diphtheria, pertussis), blood tests, biomaterial studies for pathogenic flora, serological studies. The sensitivity of microbes to antibiotics is also being determined in the laboratory.

In intestinal infections, pathogenic flora, conditionally pathogenic flora, pathogenic staphylococcus and stool

examination for dysbiosis were determined. 18,012 analyses (48%) on pathogenic flora were performed.

4,310 (11%) Salmonella tests were performed from 3,937 individuals, of which 70 (1.6%) from 47 patients were positive. Salmonella enteritidis was detected in all patients from the landscape of isolated cultures. This culture is usually detected in feces [11,17].

13,702 (36%) analyses from 12,976 individuals were conducted for Shigella, of which 12 (0.09%) from 10 patients were positive. In the landscape of the isolated cultures, Shigella Boydii was isolated – 4 (33%) from 3 individuals, Shigella Sonnei - 6 analyzes (50%) from 5 individuals, Shigella Flexneri 2A – 2 analyzes (17%) from two individuals (Figure 1).



As can be seen from Figure 1, Shigella Sonnei prevails, followed by Shigella Boydii and Shigella Flexneri 2A closes. This distribution is usually seen in patients with dysentery [5].

2,148 (6%) tests were performed on conditionally pathogenic microflora (CPF) from 296 individuals, of which pathogens were isolated from feces in 1,691 (79%) analyses from 193 individuals, and 457 (21%) from 103 patients from gastric lavage. 140 analyses were confirmed, of which Proteus Vulgaris – 5 (4%), Proteus Mirabilis – 5 (4%), Enterobakter – 9 (6%), Citrobakter – 10 (7%), Staphylococcus Aureus – 33 (24%), Klebsiella – 76 (54%), Pseudomonas Aeruginosa – 2 (1%) (Figure 2).

As can be seen from Figure 2, more than half were Klebsiella, one third were Staphylococcus Aureus, and to a lesser extent the remaining pathogens. The same picture is observed in other study [12].

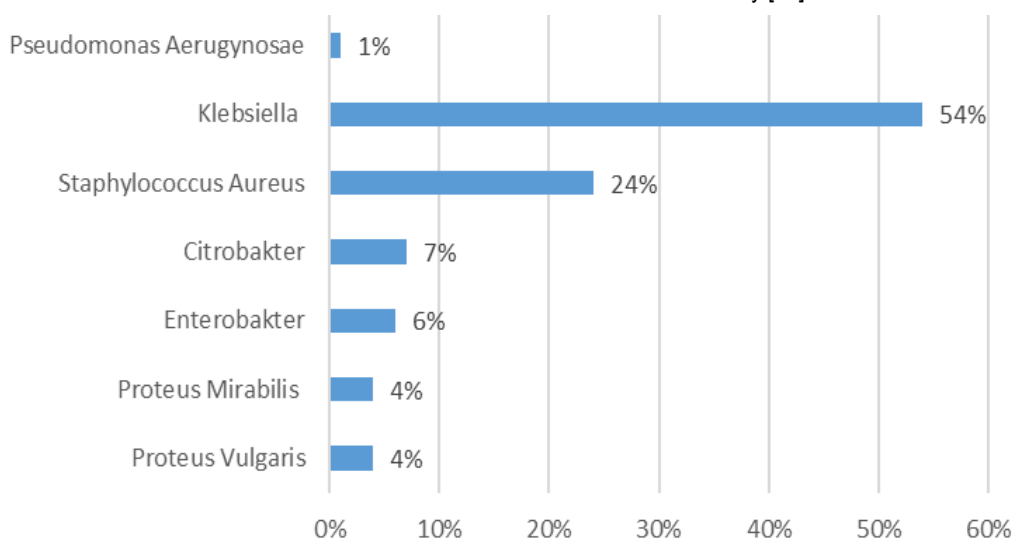


Figure 2. Microbial landscape of CPF.

3 stool tests from 2 individuals for pathogenic staphylococcus were performed, of which 2 tests from 2 individuals came out positive.

244 tests were performed on dysbiosis from 243 individuals, dysbiosis was detected in 208 cases from 203 individuals [2].

Of airborne infections, studies were conducted on meningococcal infection, whooping cough and diphtheria. A total of 5,309 (14%) were conducted analyses from 2,769 individuals. 513 (10%) tests from 391 people were conducted for meningococcal infection, 428 (8%) tests from 194

people for whooping cough, and 4,368 (82%) tests from 2,184 people for diphtheria. All the tests were negative.

The laboratory conducted 443 (1%) blood tests from 443 people, including 141 blood culture tests and 303 sterility tests [7]. 4 sterility tests were positive: Stapyilococcus epidermidis, Klebsiella pneumonia, Stapyilococcus hominis, Abiotrophia defectiva.

The laboratory also conducted studies of various biomaterials for pathogenic flora: eyes, ENT organs, wounds, breast milk, genitals, urine, sputum, cadaveric material (Table 1).

Table 1. Landscape of isolated cultures from biomaterial.

|                              | Eyes    | ENT       | Wounds  | Breast milk | Genitals | Urine     | Sputum    | Cadaveric material | Total       |
|------------------------------|---------|-----------|---------|-------------|----------|-----------|-----------|--------------------|-------------|
| 1                            | 2       | 3         | 4       | 5           | 6        | 7         | 8         | 9                  | 10          |
| Number of tests              | 585/295 | 2024/1946 | 165/156 | 11/6        | 587/587  | 1596/1596 | 6277/6277 | 162/30             | 11407/10893 |
| Number of positive tests     | 153/91  | 1358/1233 | 54/50   | 3/2         | 281/261  | 375/374   | 5307/4592 | 105/17             | 7647/6629   |
| Staphylococcus aureus        | 37/22   | 322/296   | 6/3     | 3/2         | 15/15    | 4/4       | 346/247   | 13/1               | 476/591     |
| Staphylococcus epidermidis   | 90/51   | 4/4       | 3/3     |             | 23/23    |           |           |                    | 120/81      |
| Staphylococcus gallinarum    |         |           |         |             |          |           | 1/1       |                    | 1/1         |
| Staphylococcus haemolyticus  | 4/2     |           |         |             | 2/2      | 1/1       |           |                    | 7/5         |
| Staphylococcus lugdunensis   | 2/1     |           |         |             |          |           |           |                    | 2/1         |
| Staphylococcus hominis       | 2/1     |           |         |             |          |           |           |                    | 2/1         |
| Staphylococcus sciuri        |         |           |         |             | 1/1      |           |           |                    | 1/1         |
| Staphylococcus lentus        |         | 2/2       |         |             |          |           |           |                    | 2/2         |
| Staphylococcus simulans      |         |           |         |             |          |           | 2/2       |                    | 2/2         |
| Streptococcus pneumoniae     |         | 37/37     |         |             |          |           | 1293/1286 |                    | 1330/1323   |
| Staphylococcus haemolyticus  |         | 119/118   | 2/2     |             | 6/6      | 3/3       | 847/845   | 2/2                | 973/975     |
| Streptococcus pyogenes       | 4/2     | 297/291   | 4/4     |             | 14/14    | 1/1       | 909/907   | 8/2                | 1237/1221   |
| Streptococcus sanguinis      |         | 68/67     | 1/1     |             | 1/1      |           | 241/236   |                    | 311/305     |
| Streptococcus suis           |         | 4/4       |         |             | 1/1      |           | 14/14     |                    | 19/19       |
| Streptococcus mitis          |         | 7/7       | 1/0     |             |          |           | 65/65     |                    | 73/72       |
| Streptococcus uberis         | 1/1     | 107/107   | 1/1     |             | 8/8      | 3/3       | 347/344   |                    | 467/467     |
| Streptococcus mutans         |         | 15/14     |         |             |          |           | 29/27     |                    | 44/41       |
| Streptococcus thoraltentis   |         | 8/8       |         |             |          |           | 14/14     |                    | 22/22       |
| Streptococcus anginosus      |         |           |         |             |          | 1/1       | 3/3       |                    | 4/4         |
| Streptococcus gordonii       |         |           |         |             |          |           | 2/2       |                    | 2/2         |
| Streptococcus hyantestinalis |         | 14/13     |         |             |          |           | 41/38     |                    | 55/51       |

Continuation of the Table 1

| 1                           | 2   | 3     | 4     | 5 | 6     | 7       | 8     | 9    | 10      |
|-----------------------------|-----|-------|-------|---|-------|---------|-------|------|---------|
| Streptococcus salivarius    |     | 1/1   |       |   |       |         | 16/16 |      | 17/17   |
| Streptococcus ovalis        |     | 1/1   |       |   |       |         | 16/16 |      | 17/17   |
| Streptococcus parasanguines |     |       |       |   |       |         | 1/1   |      | 1/1     |
| Streptococcus hominis       | 3/2 |       |       |   |       |         |       |      | 3/2     |
| Streptococcus caprae        | 1/1 |       |       |   | 1/1   |         |       |      | 2/2     |
| Streptococcus pluranimalibm |     |       |       |   |       | 1/1     |       |      | 1/1     |
| Streptococcus disgalactia   |     |       |       |   |       |         | 1/1   |      | 1/1     |
| Streptococcus vestibularis  |     |       |       |   |       |         | 1/1   |      | 1/1     |
| Streptococcus perosus       |     |       |       |   |       |         | 1/1   |      | 1/1     |
| Streptococcus galatycticus  |     |       |       |   |       |         | 1/1   |      | 1/1     |
| Streptococcus intermedius   |     | 1/1   |       |   |       |         |       |      | 1/1     |
| Enterococcus faecalis       | 4/4 |       | 2/2   |   | 29/28 | 11/11   |       |      | 46/45   |
| Enterococcus faecium        |     |       | 2/1   |   | 2/2   | 6/6     |       |      | 10/9    |
| Enterococcus cassiellarum   |     |       |       |   | 1/1   |         |       |      | 1/1     |
| Enterococcus galinarum      | 2/1 |       |       |   |       |         |       |      | 2/1     |
| Escherichia coli            | 2/2 |       | 22/22 |   | 84/84 | 198/198 |       | 9/1  | 315/307 |
| Escherichia hermannii       |     |       | 2/2   |   | 2/2   | 8/2     |       |      | 12/12   |
| Enterobakter                |     |       |       |   | 2/2   | 4/4     |       |      | 6/6     |
| Enterobakter cloacae        |     |       | 2/2   |   | 5/5   | 7/7     | 1/1   |      | 15/15   |
| Enterobakter aminigensis    |     | 1/1   |       |   |       | 2/2     |       |      | 3/3     |
| Enterobakter Brevis         |     |       |       |   |       | 1/1     |       |      | 1/1     |
| Citrobakter                 |     |       |       |   |       | 1/1     |       |      | 1/1     |
| Citrobakter broakii         |     |       | 1/1   |   |       | 2/2     |       |      | 3/3     |
| Citrobakter freuindii       |     |       |       |   | 1/1   |         |       |      | 1/1     |
| Citrobakter malonaticus     |     |       |       |   |       | 1/1     |       |      | 1/1     |
| Klebsiella                  |     | 1/1   |       |   |       | 1/1     |       |      | 2/2     |
| Klebsiella pneumoniae       |     | 45/43 | 5/5   |   | 9/9   | 45/44   | 65/56 | 37/8 | 206/165 |
| Klebsiella oxitocae         |     | 1/1   |       |   |       |         | 1/1   |      | 2/2     |
| Klebsiella aerogenes        |     | 6/6   | 1/1   |   | 5/5   | 3/3     | 4/2   | 4/1  | 23/18   |
| Pseudomonas aeruginosa      |     | 5/5   | 3/3   |   | 1/1   | 17/17   | 54/47 | 1/0  | 81/73   |

Continuation of the Table 1

| 1                           | 2   | 3      | 4   | 5 | 6     | 7     | 8       | 9   | 10      |
|-----------------------------|-----|--------|-----|---|-------|-------|---------|-----|---------|
| Pseudomonas luteola         |     |        |     |   |       |       | 1/1     |     | 1/1     |
| Pseudomonas putida          |     |        |     |   |       | 1/1   |         |     | 1/1     |
| Pseudomonas mendocina       |     |        |     |   |       |       | 1/1     |     | 1/1     |
| Proteus vulgaris            |     |        |     |   |       | 7/7   |         | 5/1 | 12/8    |
| Proteus mirabilis           | 1/1 |        | 1/1 |   | 4/4   | 17/17 | 2/2     |     | 25/25   |
| Proteus penneri             |     |        |     |   |       | 1/1   |         |     | 1/1     |
| Proteusmorganii             |     |        |     |   |       | 1/1   |         |     | 1/1     |
| Salmonella enteritidis      |     |        | 1/1 |   |       |       |         |     | 1/1     |
| Shigella Sonnei             |     |        |     |   |       | 1/1   |         |     | 1/1     |
| Prevotella intermedia       |     | 1/1    | 1/1 |   | 1/1   | 2/2   |         |     | 5/5     |
| Candida                     |     | 117/79 |     |   | 25/17 |       | 390/133 | 4/0 | 536/229 |
| Candida albicans            |     | 99/66  | 1/0 |   | 14/9  |       | 313/115 | 7/0 | 434/190 |
| Candida lusitanae           |     | 4/3    |     |   |       |       | 10/2    |     | 14/5    |
| Candida krusei              |     | 17/13  |     |   | 8/2   |       | 68/30   |     | 93/45   |
| Candida thopicalis          |     | 3/3    |     |   |       |       | 13/4    |     | 16/7    |
| Candida dublinensis         |     | 25/18  |     |   |       |       | 47/11   | 7/1 | 79/30   |
| Candida guillemontii        |     | 1/1    |     |   |       |       | 6/2     |     | 7/3     |
| Candida parapsilosis        |     | 5/4    |     |   |       |       | 11/8    |     | 16/12   |
| Candida glabrata            |     | 2/2    |     |   | 3/3   |       | 14/8    |     | 19/13   |
| Candida kefyr               |     | 3/0    |     |   |       |       | 4/1     |     | 7/1     |
| Candida auris               |     | 3/3    |     |   |       |       | 12/6    |     | 15/9    |
| Candida pseudothopicalis    |     |        |     |   |       |       | 4/3     |     | 4/3     |
| Candida norvegensis         |     |        |     |   |       |       | 1/0     |     | 1/0     |
| Candida pelliculosa         |     |        |     |   |       |       | 1/0     |     | 1/0     |
| Плесень                     |     |        |     |   |       |       | 2/0     | 4/0 | 6/0     |
| Abiothofiae detectiva       |     | 10/10  |     |   |       |       | 74/74   |     | 84/84   |
| Actinomyces naeslundii      |     | 2/2    |     |   |       |       | 5/5     |     | 7/7     |
| Actinomyces lucii           |     |        |     |   |       |       | 2/2     |     | 2/2     |
| Acinetobacter colcaoceticus |     |        | 1/1 |   | 9/9   | 10/10 | 1/0     | 4/1 | 25/21   |
| Acinetobacter Baumanii      |     |        | 1/1 |   | 1/1   | 6/6   | 2/2     |     | 10/10   |
| Burkholderia ceracia        |     |        |     |   | 2/2   | 3/3   | 1/1     |     | 6/6     |
| Helicoccus kunsii           |     |        |     |   |       |       | 3/3     |     | 3/3     |
| Lecteria adecurbroxylata    |     |        |     |   |       | 1/1   | 1/1     |     | 2/2     |

Continuation of the Table 1

|                             |  |  |  |  |     |     |     |  |     |
|-----------------------------|--|--|--|--|-----|-----|-----|--|-----|
| Cronobacter malonaticus     |  |  |  |  | 1/1 | 1/1 |     |  | 2/2 |
| Stenotrophomonas maltophini |  |  |  |  |     | 2/2 |     |  | 2/2 |
| Serratia plymutica          |  |  |  |  |     |     | 1/1 |  | 1/1 |
| Gemella sanguinis           |  |  |  |  |     |     | 1/1 |  | 1/1 |
| Providencia rettgerii       |  |  |  |  |     | 1/1 |     |  | 1/1 |

As can be seen from Table 1, a total of 11,407 (30%) of 10,893 individuals were executed. 7,647 (67%) tests from 6,629 individuals turned out to be positive. The analysis of microflora, depending on the material, showed the following picture. The number of eye tests was 585, positive – 153 (26%), the flora was mainly represented by Staphylococcus epidermidis and Staphylococcus aureus. The number of tests with ENT organs was 2,024, positive – 1,358 (67%). The most common were Staphylococcus aureus, Streptococcus pyogenes, Staphylococcus haemolyticus, Streptococcus uberis, and Candida. These dates confirmed by study of other authors [15]. There were 165 tests from wound, 54 of them were positive (33%). Escherichia coli appeared among the pathogens [9,10]. Breast milk was studied from 11 people, positive 3 (27%) assays (Staphylococcus aureus). Genital seeding was 587 people, which is 281 (48%) - a positive result. The microbes Candida and Escherichia coli evolved. The urine of 1,596 individuals was studied, with 375 (23%) positive tests. Escherichia coli dominated the analyses. Sputum culture was performed by 6,277 people, and a positive result was obtained in 5,307 (85%) cases. Among the microbes were Streptococcus pneumoniae, Streptococcus pyogenes, Staphylococcus haemolyticus, Streptococcus uberis and Staphylococcus aureus. 162 tests of sheets of cadaveric material were studied, and positive result was in 105 (65%). Klebsiella pneumoniae prevailed.

The analysis of the microbial landscape revealed Streptococcus pneumoniae (1330), Streptococcus pyogenes (1237), Staphylococcus haemolyticus (973), Candida (536), Staphylococcus aureus (476), Streptococcus uberis (467), Candida albicans (434), Escherichia coli (315) and others.

The bacteriological laboratory performs serological studies (passive hemagglutination reaction (PHAR), agglutination reaction (AR)). A total of 205 (0.5%) tests were conducted from 129 individuals, including PHAR with Salmonella diagnosticum (101), PHAR with Vi antigen (2), PHAR with Shigella diagnosticum (52), PHAR with Tularemia antigen (2), AR with pertussis/paracoccussis (48) antigen from 24 individuals. No positive titers were found.

The sensitivity of various pathogens to antibiotics was determined in the laboratory. The sensitivity of Streptococcus pneumoniae to antibiotics Gentamycin, Vancomycin, Linezolid, Penicillin, Moxifloxacin, Ceftoroline, Erythromycin, Clindamycin, Daptomycin was determined. Resistance of the pathogen was observed to Ampicillin, Tetracycline, Ciprofloxacin, Trimethoprim, Rifampin. Sensitivity and resistance to antibiotics were determined in Staphylococcus aureus. The pathogen was sensitive to the following antibiotics: Gentamycin, Ciprofloxacin,

Nitrofurantoin, Teicoplanin, Vancomycin. Resistance to the microbe was revealed to Ampicillin, Penicillin, Oxacillin. Klebsiella pneumoniae was sensitive to Imipenem, Minocycline, Amikacin, Piperacillin and resistant to Nitrofurantoin, Trimethoprim, Cefazolin, Tobramycin.

### Discussion

Data about the structure of the microflora are varied in different hospitals. In dynamic in Saratov multidisciplinary hospital structure of pathogens may change, but some microorganisms remain dominant. This are Staphylococcus aureus in the nose and pharynx, Escherichia coli and Staphylococcus aureus in the wound materials, Streptococcus pneumoniae and Candida in the sputum, Escherichia coli in the cervical canal.

Analyze of the resistance of Staphylococcus aureus to antibacterial drugs (ABD) revealed the increase in resistance to Ceftriaxone, Oxacillin. Regarding resistance of Proteus has increased to Ampicillin. At the same time, the resistance of Staphylococcus haemolyticus to macrolides and aminoglycosides decreased. The isolated Enterobacter strains proved to be resistant to Ampicillin (and Amoxicillin/clavulanate, respectively) in 100% of cases. No Vancomycin-resistant strains have been identified. Regarding Staphylococcus epidermidis resistance to antibacterial drugs has significantly decreased. Analyze of the resistance of Escherichia coli to antibacterial drugs detected that 100% of the strains are not sensitive to unprotected Aminopenicillins (due to the production of b-lactamases). The resistance of Escherichia coli to Cephalosporins has increased, which causes the ineffectiveness of therapy. The isolated strains of Pseudomonas aeruginosa are resistant to anti-pseudomonas preparations (Ciprofloxacin, Ceftazidime). The resistance of enterococci to antimicrobial drugs is growing. Regarding the resistance of fungi of the genus Candida to Nystatin revealed [19].

The structure of the microflora isolated from biomaterial of patients in different departments of Hanoi National Hospital of pediatrics revealed the following data. 140 biomaterials from 74 patients hospitalized in anesthesiology and intensive care unit, infectious diseases department, gastroenterology were tested. In biomaterial of patients treated in anesthesiology and intensive care unit Enterobacteriaceae (38,5%) prevailed, in infectious hospital Gram-negative non-fermenting bacteria (46,5%) presented, in gastroenterology department Gram-positive microbes (39,3%) presented.

The structure of the microflora of the hospital, according to the selected hospital environment, gram-positive flora prevailed (60.2% in anesthesiology and intensive care unit

and 50,7% - in infectious diseases department). A wide range of Enterobacteriaceae and Gram-negative non-fermenting microbes with wide spectrum of resistance were found in National Hospital of pediatrics [20].

Bacteriological laboratory of the Center for Phthisiopulmonology and Infectious Diseases in Semey revealed a predominance of *Streptococcus pneumoniae*, *Streptococcus pyogenes*, *Staphylococcus haemolyticus*, *Candida*, *Staphylococcus aureus*, *Streptococcus uberis*, *Candida albicans*, *Escherichia coli*.

The sensitivity of *Streptococcus pneumoniae* to antibiotics Gentamycin, Vancomycin, Linezolid, Penicillin, Moxifloxacin, Ceftoroline, Erythromycin, Clindamycin, Daptomycin was determined. Resistance of the pathogen was observed to Ampicillin, Tetracycline, Ciprofloxacin, Trimethoprim, Rifampin. *Staphylococcus aureus* was sensitive to Gentamycin, Ciprofloxacin, resistant to Ampicillin, Penicillin. *Klebsiella pneumoniae* was susceptible to Imipenem, Minocycline and resistant to Nitrofurantoin, Trimethoprim. The sensitivity of *Candida* to Fluconazole, Micafungin and resistance to Voriconazole was determined.

The dates of bacteriological laboratory of the Center for Phthisiopulmonology and Infectious Diseases in Semey reflect the general situation with microflora and resistance to antibacterial drugs in the world. The Atomic-i600 microbiological analyzer allows accurate and fast testing of various biological samples, which significantly increases the reliability and speed of obtaining results.

### Conclusions

Thus, the work of specialists in microbiological laboratories plays a crucial role in the effective prevention and control of infections, since the identification of the pathogen allows doctors to prescribe treatment in a timely and effective manner and thereby prevent the spread of infections.

Despite the successes, bacteriological laboratories face a number of challenges. One of the main ones is the growth of antibiotic-resistant strains. This is due to the frequent and improper use of antibiotics, as well as the lack of awareness among patients about the importance of following doctors' prescriptions. Another important problem is the shortage of qualified personnel in the laboratories. In this regard, it is necessary to raise the level of training of specialists, introduce new educational programs and provide laboratories with modern equipment. In our study, AutoMic-i600 was used to analyze microbial strains, which ensured high data accuracy and increased the efficiency of sample processing.

The work of a bacteriological laboratory is a complex, multifaceted process that includes diagnosis, monitoring, scientific research and prevention of infectious diseases. With the development of new technologies and diagnostic methods, the role of the bacteriological laboratory in healthcare continues to grow. It is important to continue investing in the education of specialists and the development of laboratory facilities in order to improve the quality of diagnosis and treatment of infectious diseases.

The systematic introduction of new technologies and research methods into the work of bacteriological laboratories contributes to improving infection control and improving public health.

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