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SPECIFIC DIFFERENTIATION AND
EPIDEMIOLOGICAL MARKING OF
STAPHYLOCOCCUS AUREUS STRAINS
DISTINGUISHED FROM THE CARRIERS OF
MEDICAL PERSONNEL AND OBJECTS OF
EXTERNAL ENVIRONMENT IN CURATIVE
INSTITUTIONS OF THE SOUTH RAILWAY

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Pathogen *Staphylococcus* is sanitary indicative microorganism, one of the most encountered and resistant to many external influences, and thus it remains in our environment (air, soil, our items) for a long time [1]. *Staphylococcus* vary often causes purulent diseases in humans, from this it comes the name – pyogenic, which causes complications in somatic and surgical pathologies [2]. The problem of pyoinflammatory diseases caused by conditional-pathogenic microorganisms in modern conditions, is one of actual problems in medical science and public health practice, it is connected with their wide spread in treatment-and-prophylactic establishments of any profile [3]. In different areas of the world intrahospital pyoinflammatory diseases are detected in 5-17% of hospitalized patients [4]. In our country they are most often observed in obstetric and surgical hospitals, where there localized forms appears to be a common cause of sepsis. For tens of years the leading role in the etiology of nosocomial pyoinflammatory diseases of infants, pregnant women and surgical patients, belongs to *Staphylococcus*. Important role in the development of nosocomial infections (sepsis, postoperative pyo-inflammatory complications, pneumonia, chronic abscesses) is played by *Staphylococcus* [4]. Being in structure of the normal microflora of the skin, *Staphylococcus* can be transmitted by droplet and contact-domestic routes, and also as a result of own microflora activation, against decrease of immunological resistance of the macroorganism. The most frequent and the most serious pathogens of nosocomial infections, from gram positive cocci are *Staphylococcus aureus* and *Staphylococcus epidermics* [3]. *Staphylococcus* are allocated from 30-50% of nasopharyngeal swabs from healthy donors, among the medical staff and doctors they are found in 60-70% cases [4]. There appeared the data on heterogeneity of species composition, as coagulopozitiv and coagulonegativ staphylococci the last decade. It is observed a considerable resistance of staphylococcus to a variety of antibiotics now[5]. Accumulation of multiresistant strains in hospitals indicates that it is the "hospital strains" are the main pathogens of nosocomial purulent-inflammatory diseases. In terms of epidemiological monitoring of nosocomial microflora, for forecasting the situation on hospital acquired complications, it is necessary to differentiate common "hospital strains" of staphylococci

and micrococci [2]. The genus *Staphylococcus* consists of three species: golden, epidermal, saprophytic. Each type is divided into independent biology-ecological types. Thus, golden *Staphylococcus* includes 6 ecotypes: the habitat of biotype A is man, and the rest of the biotypes' habitats are animals and birds. Important epidemiological significance has the division of golden *Staphylococcus* into phagotypes. International Committee for the phage typing proposed the set of 23 phages types for *Staphylococcus*, which is divided into 4 lytic groups:

I lytic group – 29, 52, 52A, 79, 80,

II lytic group – 3A, 3C, 55, 71,

III lytic group – 6, 42E, 47, 53, 54, 75, 77, 83A, 84, 85,

IV lytic group – 94,96, outside the group – 81 and 95.

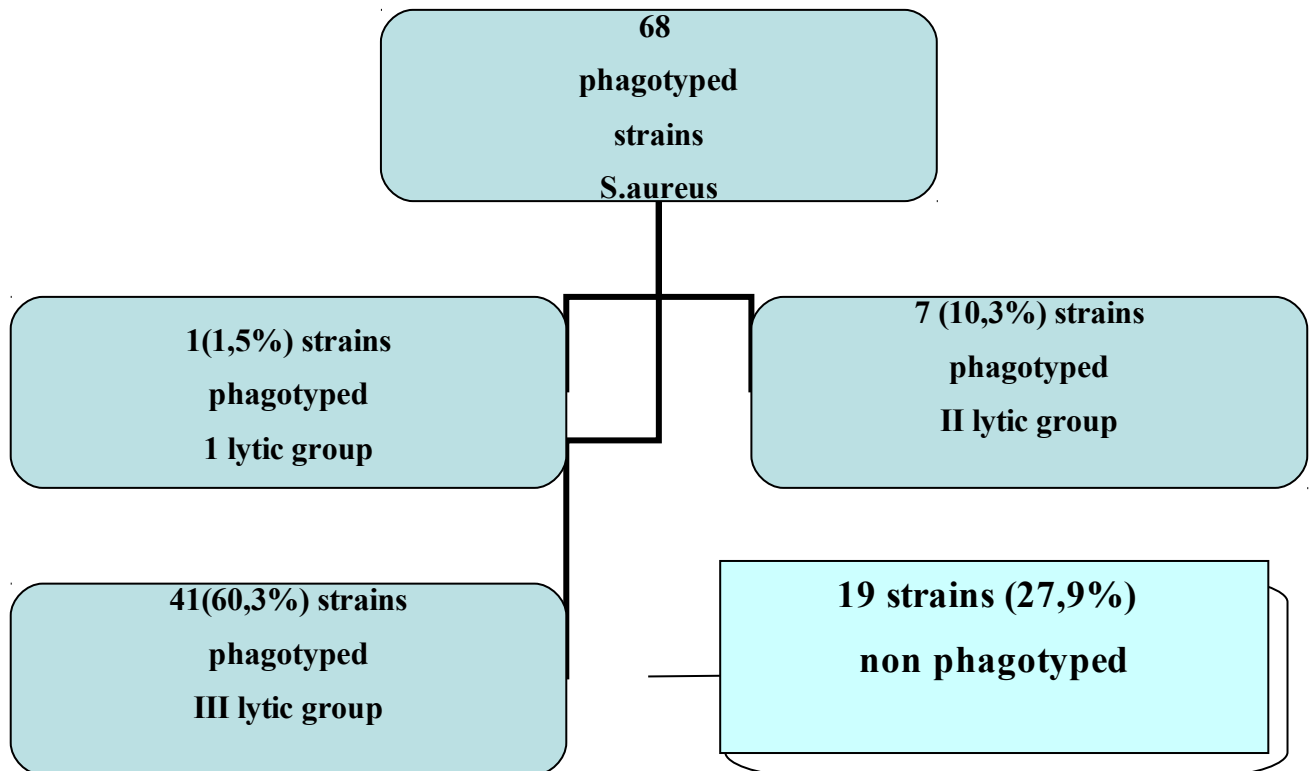
Phagotyping of *Staphylococcus* is constructed such a way, that cultures are lysed by some phages and divided into types by the set of phages, active with respect to these strains only [5]. Pathogenic properties of staphylococci are determined by their ability to produce toxins, enzymes and other biologically active substances in vital process. Toxins are of the greatest danger for the human organism. For a long time pathogenic properties ascribed solely to *Staphylococcus aureus*, but recently the point of view of "non-pathogenic" staphylococci coagulase has been reviewed. In particular, many details about their involvement in pyoderma, conjunctivitis, inflammation of the urinary tracts has been received. In addition, staphylococci coagulase have been allocated from the pus of surgical patients and from the blood of patients with suspected septicemia. Among the isolated strains, the leading position belonged to epidermal *Staphylococcus* [5]. *Staphylococcus* are considered to be the most epidemically significant, for hospital pyo-inflammatory pathology, and a leading role in the occurrence of nosological forms remains for them, that allows to consider them as pathogens of hospital-acquired staphylococcal infections. *Staphylococcus* possess a relatively high resistance to environmental factors, they can resist the heating under 80 C for 15-20 minutes. Pathogens persist for weeks in woolen fabrics, in the dust, including a room and ward; they are stored up to 6 months in the dressings, up to 3 years in pus [6]. Till now the problem of specific immunity to staphylococci hasn't solved yet. Especially easily and often children of early age affected staphylococci, owing to high vulnerability and a hyperpermeability of integuments, mucosas, and connecting tissue. The process of staphylococcus diffusion in an organism occurs as follows. Microbes with a perivascular lymph and with the assistance of Hyaluronidase, reach vascular capillaries, damage their wall, forming thus septic thrombus, with the development of an organic thrombophlebitis. Under the influence of a plasmin the septic thrombus breaks up to the fine parts containing a considerable quantity of staphylococcus which are transferred by blood flow to various organs, forming emboluses, and septic centers [6]. The incubation interval for local pyoinflammatory diseases lasts 4-16 days. Septic complications after operations in surgical hospitals develop in the range from 3 days till 4 weeks and more, at a sepsis they develop for 1 month [6]. Experienced disease causes anti-

toxic and antibacterial immunity, which is little busy and impermanent. Infection source usually appears patients with the expressed forms of illness and carriers of virulent strains of a staphylococcus. Epidemiologically significant sources of an infection are carriers whose clinical signs aren't expressed, but not the patients with the acute forms of staphylococcus infection who are usually isolated. The originator, as a rule, is found out in carriers on a mucosa of the top respiratory tracts, mainly in forward departments of nasal courses. The carriage in a fauces is rather rare. Exhalation of a staphylococcus from a carrier into environment depends on a place of localization and size of the microbe's seat. It was proved by special researches that contamination of the air was possible with a minimum number of staphylococcus equal to 1000 individuals per 1 ml of mucus. It is because of the passages of staphylococcus aureus via medical personnel, there mostly occurs survival and accumulation of hospital strains in treatment-and-prophylactic establishments, and in the future it happens cross- infection, with the ex-

change of pathogens among patients and staff. Lysotypy method of pathogenic staphylococcus is of a great importance in identifying sources and pathways of staphylococcal infection. We have studied by lysotypy method with the set of international specific phages, 68 cultures of pathogenic staphylococcus, which were allocated from slime from fauces and nose, washouts from environmental objects of departmental medical-preventive establishments of the Southern railway. All isolated cultures were previously identified and had gemotoksinom, letsitovitelaze, coagulated plasma, fermented lures and had golden pigment [6]. Cultures were tested for sensitivity to eight antibiotics, and only then it was done the lysotypy with the help of international set of staphylococcus phages, according to the instructions. Results of phagotyping presented in Table. 1.

The results of lysotypy of strains of *S. aureus* isolated from medical staff and of the external environment objects in treatment-and-prophylactic establishments of medical service of the Southern railway.

19 strains (28 %) cannot have been typed with available set of phags.



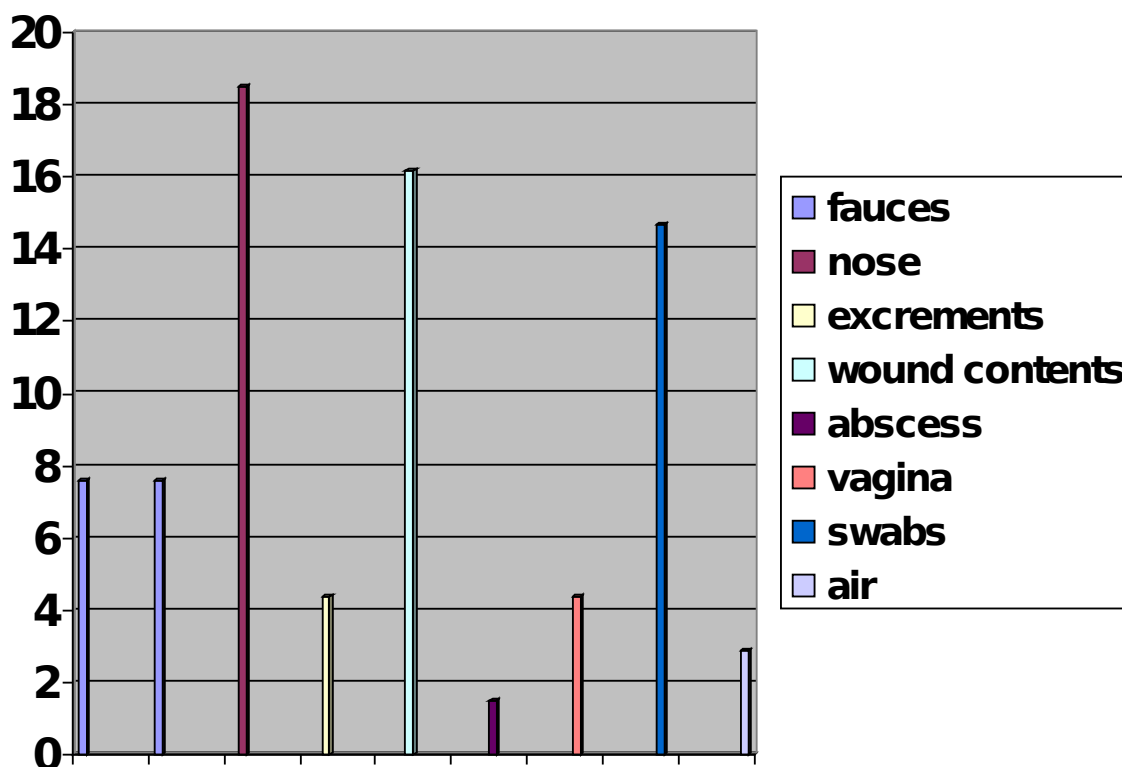
Pic. 1 shows the frequency of staphylococcus detection to different lytic groups, depending on infectious material from which there were allocated strains studied by fagotyping.

Table 1. - The detection rate of staphylococci phage types from infectious material

№	lytic groups' name	determination frequency	Name of clinical material
1	I lytic group	0,5%	slime from fauces
2	II lytic group	4,3%	slime from nose
		14,3%	excrements
3	III lytic group	37%	slime from nose
		10,5%	excrements
		31,6%	wound content
4	Non-typic group	26%	discharge from the wounds of the lower extremities
		21%	swabs from the external environment
		10,5%	air samples
		4,4%	swabs from the vagina
		1,5%	contents of an abscess
		2%	slime from nose
		12,9%	slime from fauces

Diagram 2 shows the frequency of isolation and identification of pathogenic staphylococcus from clinical mate-

rial, delivered from treatment-and-prophylactic establishments of the Southern railway.



There Y - frequency of release of staphylococci (%), X - clinical material

Pic. 2.- The frequency of release of staphylococci from clinical material

On the basis of the received data of staphylococcus phagotyping, isolated from clinical material it follows that the greatest number of identified strains refers to the third lytic group.

Of the staphylococcus cultures which failed to have been phagotyped with international set, the greatest number of strains have been allocated from the wound content, washouts of the external environment objects.

Our studies have important epidemiological value, because at the annual monitoring of the phagotypes of allocated nosocomial strains of staphylococcus would help to identify the epidemiological chain, including the identification of carriers and routes of transmission in hospitals.

The phagotyping of staphylococcus in the practical work of bacteriological laboratories would help to prevent intra hospital infections effectively, take epidemiological and disinfection measures in advance.

Taking into account the leading role of Staphylococcus aureus in case of purulent-inflammatory diseases and using phagotyping of allocated in a medical institution pathogenic staphylococcus, it is possible to prove the involvement of the microorganism in the spread of nosocomial diseases, to take antiepidemic precautions in time.

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ВИДОВАЯ ДИФФЕРЕНЦИАЦИЯ И ЭПИДЕМИОЛОГИЧЕСКОЕ МАРКИРОВАНИЕ ШТАММОВ STAPHYLOCOCCUS AUREUS, ВЫДЕЛЕННЫХ ОТ НОСИТЕЛЕЙ МЕДИЦИНСКОГО ПЕРСОНАЛА И ОБЪЕКТОВ ВНЕШНЕЙ СРЕДЫ В ЛЕЧЕБНЫХ УЧРЕЖДЕНИЯХ ЮЖНОЙ ЖЕЛЕЗНОЙ ДОРОГИ.

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Проведена видовая дифференциация штаммов патогенного стафилококка, которые были изолированы из различных объектов внешней среды хирургического стационара, биоматериалов от больных. Результаты исследований позволили объединить штаммы патогенных стафилококков в 4 литические группы и показать частоту обнаружения каждой литической группы в определенном материале. Получены обоснования необходимости внедрения метода фаготипирования в практическую работу бактериологических лабораторий, контролируемых эпидемиологическим обеспечением в стационаре по бактериологическим показателям для эффективной борьбы с внутрибольничными инфекциями.

Ключевые слова: S.aureus (патогенный стафилококк), внутрибольничная инфекция, хирургический стационар, послеоперационные осложнения, фаготипирование (определение типа микроорганизма с использованием набора специфических фагов) .

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Carried out specific differentiation of pathogenic strains of Staphylococcus aureus, which were isolated from various environmental objects surgical hospital, biomaterials from patients. The results of the research brought together strains of pathogenic staphylococci in the lytic group and 4 show the frequency of detection of each analytic group in the particular material. Received the rationale for the introduction of phage-typing method in the practical work of bacteriological laboratories, epidemiological control software in the hospital for bacteriological indicators to effectively combat nosocomial infections.

Key words: S.aureus (golden Staphylococcus), nosocomial diseases, treatment-and-prophylactic establishments of medical service of the Southern railway, surgical hospitals, postoperative pyo-inflammatory complications, phagotyping (identified strains microorganism with the set of international specific phages) .

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**ВИДОВА ДИФЕРЕНЦІАЦІЯ ТА ЕПІДЕМІОЛО-
ГІЧНЕ МАРКУВАННЯ ШТАМІВ
STAPHYLOCOCCUS AUREUS, ВИДІЛЕНИХ
ВІД НОСІЇВ, МЕДИЧНОГО ПЕРСОНАЛУ ТА З
ОБ'ЄКТІВ НАВКОЛИШНЬОГО
СЕРЕДОВИЩА ЛІКУВАЛЬНИХ ЗАКЛАДІВ
ПІВДЕННОЇ ЗАЛІЗНИЦІ»**

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Півненко Т.В., Гречишкіна Ю.О., Канівець О.О.

Проведна видова диференціація штамів патогенно-
го стафілокока, що були ізольовані із різних об'

єктів зовнішнього середовища хірургічного ста-
ціонару, біоматеріалів від хворих. Результати дослі-
джень дозволили об'єднати штами патогенних ста-
філококів в 4 літичні групи та виявити частоту кож-
ної літичної групи в окремих біоматеріалах. Об-
ґрунтована необхідність застосування методу фаго-
типування в роботі бактеріологічних лабораторій лі-
кувально-профілактичних закладів України.
Ключові слова: S.aureus (патогенний стафілокок),
внутрішньо-лікарняна інфекція, хірургічний ста-
ціонар, після операційні ускладнення, фаготипуван-
ня (визначення типу мікроорганізму з використан-
ням набору специфічних фагів) .