

R.A. Akhmarov^{1}*

¹Kazakh medical university of continuin education

THEORETICAL AND APPLIED ASPECTS OF BACTERIOLOGY IN SURGERY (REVIEW)

SUMMARY

In this publication the review of theoretical and applied aspects of bacteriology is presented to surgeries. Frequency of incidence of a surgical infection reaches 35-45% in the general structure and is connected with material inputs: for continuous hospitalization, repeated surgical interventions for sanitation, providing with medicines. The problem of healthcare-associated infections(HAI) gains the increasing social importance: healthcare-associated pneumonia, peritonitis, sepsis and some other nosological forms, lead to a lethal outcome, despite application of highly effective antibiotics. Besides, economic damage for tens of millions of dollars is annually caused to health care. Thus, the expanded group of patients has to have a bacteriological diagnosis of not developed pathology, obligatory for definition, and prevention of a predisease, for studying of structure of microflora.

Key words: healthcare-associated infections, multiresistant hospital strains, opportunistic microorganisms, bacteriological diagnostics.

Today the medicine is presented by public institutions and private structures, but not providing broad access to society to the free qualified medical care. Wide circulation of high technologies in modern surgery doesn't reduce risk of a surgical infection [1,2,3,4]. Frequency of incidence reaches 35-45% in the general structure, with the accompanying material inputs connected with continuous hospitalization, repeated surgical interventions for sanitation, an arsenal of medicines. Spread of infections is promoted by an unsatisfactory condition of ecology, the low social and economic standard of living of a considerable part of the population, decrease in factors of non-specific antimicrobial resistance in the conditions of uncontrolled use of medicines [5,6,7].

At the present stage of development to of medicine, begin to understand value of the microbic communities organized in biofilms. It turned out that bacterial cages could unite in the specific differentiated three-dimensional structures with the harmonious behavior, which is considerably changing the dominating representations in medical microbiology. Process of creation of realistic models of natural microbic communities in vitro and ways of its regulation is at the initial stage [7,8,9].

In healthcare institutions increase in frequency of pyoinflammatory processes as a complica-

tion of a current of the postoperative period and a number of various somatic diseases takes place. Use of the new equipment, tool methods of diagnostics and treatment of patients in polyclinics and the treatment and prevention facilities (TPF) of RK is noted that increases probability of an exogenous way of distribution of the wide list of microorganisms by contact with the infected surfaces of the equipment, i.e. diseases of the nosocomial nature.

The problem of healthcare-associated infections(HAI) gains the increasing social importance: healthcare-associated pneumonia, peritonitis, sepsis and some other nosological forms, lead to a lethal outcome, despite application of highly effective antibiotics. Besides, economic damage for tens of millions of dollars is annually caused to health care. According to the American researchers, treatment of one patient from HAI caused by methicillin-resistant *Staphylococcus aureus* (MRSA) costs to a hospital 31400 dollars [10].

Today anti-epidemic actions [11-14] remain the main method of fight against healthcare-associated infections in the Russian Federation.

It is proved that the irrational antimicrobial pharmacotherapy promotes formation of tanks of multiresistant hospital strains with the increased virulent properties with which it becomes more

difficult to struggle in process of development of epidemic process.

The evidence-based principles of epidemiological surveillance including microbiological and epidemiological monitoring defined the main regularities of a course of epidemiological process, a way and factors of transfer of the healthcare-associated infections activator both in hospitals of the general profile, and in oncological clinics [15].

An integrated approach of various experts of health care to improvement and questions of prevention of emergence and spread of infectious diseases expands possibilities of paramedic service, for further drawing up the forecast of health of the person.

Development of the system of definition of future pathology or identification of possible pre-clinical display of a disease, in particular, of donozological diagnostics [16] is a priority of the practical doctor. Bacteriological diagnostics with its applied opportunities is the main link. She will allow solving at the same time several problems in the field of clinical diagnostics and prevention of emergence of complications in the field of surgery;

- to prevention of developing of diseases of the digestive tract (DT) in various age categories of patients (including children);

- prevention of emergence of infectious and inflammatory process of other localization at persons with not diagnosed disbiotic changes, as infection harbingers;

- to prevention of pre-natal and patrimonial infection of a fruit, and women have a developing of the ascending infection as result of change vagina autoflor

- early identification of artificial selection polyresistant clinical strains in an organism: a) dispensary patients at numerous aggravations and broad use of antibacterial medicines and chemotherapeutic agent; b) at the faces, potentially sore, the uncured, abusing independent reception antibacterial medicines.

For performance of these tasks experts of a narrow profile, surgeons need to use possibilities of bacteriological diagnostics, taking into account mechanisms of interaction between microbes-commensal and the owner's organism, and to consider from the point of view of evolutionary adaptation to each other. Respectively, the changes of a quantitative and qualitative ratio as a part of a biocenosis revealed when studying microflora of

various ecological niches is the indisputable preface to developing of an autogenic infection of endogenous origin.

Representatives of indigenous flora of the person are the opportunistic microorganisms capable to cause any opportunistic infection. For example: *E.coli*, possessing factors of adhesion and colonization (fibrin, proteins of an external membrane, a Col-plasmid, K99 plasmid, etc.), invasion factors (specific genes, a big plasmid of an invasion), a toxigenicity, cause diseases of urinary tract (cystitis, pyelitis, pyelonephritis, etc.), biliary tract (cholecystitis's, cholangitis), respiratory system (pneumonia, bronchitis, etc.), surgical wound infections, gastrointestinal diseases, bacteremia, a septicemia.

Other bright representative of opportunistic pathogen it is possible to call *S.aureus* inhabiting skin, a mouth, a commensal capable to cause about 100 nosological forms of diseases. It possesses wider list of factors of pathogenicity, which treat: protein A, enzymes (a hyaluronidase, DNK-aza, a plasmocoagulase, a lecithinase, fibrinolysin), antilysozyme, antiphagocyteactivity and various toxins (haemolysines, enterotoxin, toxin of a syndrome of toxic shock) which activity in a macro organism is capable to lead sometimes to a lethal outcome. Vegetation on mucous membranes, strains of commensal can gain multiple medicinal stability. By results of numerous researches of the Russian authors generalized in Chizhman's review of M [17] the major factors contributing to the development of resistance to antimicrobial medicines are established:

- general frequency of use of antimicrobial medicines;

- dispensing mode (application duration, dose, way of introduction, pharmacodynamics);

- frequency of development of the cross infection caused by resistant microorganisms (insufficient hygiene, houses boarding schools, kindergartens);

Public behavior and social conditions (the requirement of patients at any infection to appoint antibiotics, trips, overpopulation of schools, kindergartens). Say about bacteria that they as "refined biochemists" invent and improve ways of fight against antimicrobial agents [18], by means of mechanisms of transformation and conjugation. Thus, the bacteria which earlier don't have medicinal stability gain ability to resist to antibiotics, due to the chemical reactions reducing permeability of

a cellular wall of the bacteria for an antibiotic suppressing its transport to intracellular targets, changing structure of targets. The special part in the mechanism of stability is assigned to the enzymes inactivating an antibiotic; these are the strains of staphylococcus, enterobacteria developing 3-lactamase inactivating penicillin and cephalosporin. Respectively, it is possible to assume a possibility of artificial selection of antibiotic-resistant cultures in a live organism; increase in their virulence along with the acquired stability is result that promotes a heavy complication, including bacteremia and sepsis.

Considering existence of a polyresistant strain, further it's studying by bacteriologists of biology for the statement of the nosocomial nature. Interpretation of the conducted research will serve as the informative beginning for the aid to the doctor to the clinical physician at a stage of diagnosis of a pre-existing disease.

Thus, the expanded group of patients has to have a bacteriological diagnosis of not developed pathology, obligatory for definition, and prevention of a pre-existing disease, for studying of structure of microflora.

ЛИТЕРАТУРА

1. Бухарин, О.В. Теоретические и прикладные аспекты проблемы персистенции микроорганизмов // Журн. микробиология. – 2000. – № 4. – С. 4-7.
2. Бухарин О.В., Усвяцов Б.Я., Хуснутдинова Л.М. Фундаментальные и прикладные аспекты проблемы персистенции микроорганизмов // Журн. микробиология. – 2003. – № 4. – С. 3-8.
3. Габриэлян, Р.И., Горская Е.М., Снегова Н.Д. Функции микрофлоры желудочно-кишечного тракта и последствия её нарушения после хирургических вмешательств // Антибиотики и химиотерапия. – 2000. – № 45 (9). – С. 24-29.
4. Oosthuizen M.C. et al. Proteom analysis reveals differential protein expression by *Batlus cereus* during biofilm formation // Appl. Environ Microbiol. – 2002. – Vol. 68. – P. 2770-2780.
5. Коробов В.П. и др. Изменение антибиотикочувствительности стафилококков в условиях реализации эффекта пептидного антибактериального фактора // Антибиотики и химиотерапия. – 2002. – № 47 (2). – С. 11-15.
6. Мельников В.Г. Поверхностные структуры грампозитивных бактерий в межклеточном взаимодействии и плёнкообразовании // Журн. микробиология. – 2010. – № 2. – С. 119-123.
7. Сидоренко, С.В. Инфекционный процесс как "диалог" между хозяином и паразитом // Клин. микробиология и антимикроб. химия. – 2001. – № 4. – С. 301-315.
8. Miller M., Bassler B. Quorum sensing in bacteria // Annu Rev. Microbiol. – 2001. – Vol. 55. – P. 165-199.
9. Kato J., Suzuki A., Yamazaki H. Control by A-factor of a metal-endopeptidase gene involved in aerial mycelium formation in *Streptomyces griseus* // Ibid. – 2002. – Vol. 184, № 21. – P. 60166025.
10. Соломкин В.Н. Параназальные синуситы у больных в отделении реанимации // Журнал ушных, носовых, горловых болезней. – 2000. № 2. – С. 81-83.
11. Корнев-И.Н'. Стерилизация изделий медицинского назначения: Справочное руководство. – СПб. Человек, 2003. – 156 с.
12. Корнев И.Н. Актуальные проблемы стерилизационных мероприятий в лечебно-профилактических учреждениях и пути их решения // Стерилизация и госпитальные инфекции. 2006. – № 1. – С. 12-16.
13. Кузин Н.М., Ефимова Н.В., Сорокина М.И. Дадвани С.А. Антибиотикопрофилактика при плановых операциях в хирургии // Сборник "Актуальные проблемы химиотерапии бактериальных инфекций". 1991. – С. 341-343.
14. Фомина И.П., Смирнова Л.Б., Гельфанд Е.Б. Антибиотики в профилактике хирургической инфекции (микробиологические и клинические аспекты) // Антибиотики и химиотерапия. 1998. – Т. 43, № 9. – С. 35-38.
15. Полякова Т.С., Коршунов В.М., Гуров А.В., Гладких А.С. Исследование микробного

фона и антибиотикочувствительности выделенных штаммов в оториноларингологическом отделе-нии // Вестник оториноларингологии – 2002. – № 4. – С. 26-29.

16. *Аманов А.Т.* Донозологическая диагностика – приоритетное направление в стратегическом развитии здравоохранения / Стратегия развития здравоохранения Республики Казахстан: Матер, междуна. науч.-практ. конф. – Алматы. – 2003. – с. 235-236

17. *Чижман М.* Этиология внебольничной пневмонии и резистентность к антимикробным препаратам основных возбудителей инфекций дыхательных путей: европейский взгляд // Клинический микроб, и антимикроб, химиотер. 2003; 5(3): 3-7;

18. *Маянский А.Н.* Микробиология для врачей / Очерки патогенетич. микроб. – Нижн. Новг. – 1999. – 340 С.

ТҮЙІН

Осы мақалада хирургиядағы бактериологияның теориялық және қолданбалы аспектілеріне шолу жасалған. Хирургиялық инфекциялармен ауыру жиілігі жалпы құрылымда 35-45 % құрайды және ол материалдық шығындармен байланысты: ауруханада ұзақ жатқызу үшін, санация үшін қайта хирургиялық араласулар, дәрі-дәрмектермен қамтамасыз ету. Ауруханаішілік инфекциялар (АИИ) мәселесі аса үлкен әлеуметтік маңызға ие болып келеді: ауруханаішілік пневмония, перитонит, сепсис және бірқатар басқа да нозологиялық формалар тиімділігі жоғары антибиотиктерді қолданғанына қарамастан өлім-жітімге әкеп соғады. Бұдан басқа, денсаулық сақтауға жыл сайын ондаған миллион доллар экономикалық шығындар әкеледі. Сонымен, микрофлора құрамын зерделеу үшін, науқастардың кең тобында ауру алдындағы профилактиканы жасап, дамымаған патологияны анықтау үшін бактериологиялық диагностика жасау міндетті болуы тиіс.

Түйінді сөздер: ауруханаішілік инфекциялар, мультирезистентті госпиталдық штаммдар, шартты-патогенді микроорганизмдер, бактериологиялық диагностика.

АННОТАЦИЯ

В данной публикации представлен обзор теоретических и прикладных аспектов бактериологии в хирургии. Частота заболеваемости хирургической инфекции достигает 35-45 % в общей структуре и связана с материальными затратами: для длительной госпитализации, повторных хирургических вмешательств для санации, обеспечение медикаментами. Проблема внутрибольничных инфекций (ВБИ) приобретает всё большую социальную значимость: внутрибольничная пневмония, перитонит, сепсис и ряд других нозологических форм, приводят к летальному исходу, несмотря на применение высокоэффективных антибиотиков. Кроме этого, здравоохранению ежегодно наносится экономический ущерб на десятки миллионов долларов. Таким образом, бактериологическая диагностика должна быть обязательной для определения не развившейся патологии и профилактики предболезни у расширенной группы пациентов, для изучения состава микрофлоры.

Ключевые слова: внутрибольничные инфекции, мультирезистентные госпитальные штаммы, условно-патогенные микроорганизмы, бактериологическая диагностика.