Collaboration of the Medical academy, healthcare settings and industry as model for innovations promotion

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Nizhny Novgorod – 2011
one of the great State Educational Establishment of Higher Professional Medical Training in Russia
was founded in 1910
4500 students (from 25 countries), 760 teachers (565 PhD)
8 faculties
75 departments
2 Scientific-Research Institutes (SRI)
   SRI of Applied and Fundamental Medicine
   SRI of Preventive Medicine

Nizhny Novgorod State Medical Academy
Types of activities

Education

Medical services

NizhSMA

Scientific researching

Innovation promotion
Healthcare associated infections (HAIs)

PROBLEM URGENCY

- Healthcare associated infections – 2-10% of all patients
- 2 million cases annually (RF, USA), 5 million - Europe
- 2.7 – 15% of cases with lethal outcome
- Component of the system of quality and biosafety of medical services
Ways for overcome the conservation of healthcare workers and motivation them for application of new technologies in routine practice

- To inform
- To teach
- To conduct the training
- To control
- Others
1. Sphere of medicine requires innovation

Evidence of efficacy, safety (evidence-based medicine)

Strong requirements for investigation before registration of preparations, methods, equipments (clinical trials, field trials)

Post registration estimation

Standardization of medical services

2. Sphere of medicine is very conservative

Sphere of medicine has a lot of limits in application of new technologies
Education Center – EC (constantly operating School of hospital epidemiologists and others healthcare workers) as a platform for introduction of innovations
Education Center
as a platform for introduction of innovations

- Medical academy
- Federal service on supervision
- Public health services department
- Industry
- Firms
- Research Institute
- Other Establishments
- Healthcare settings
THE TECHNOLOGY OF ESTIMATION OF MICROORGANISMS RESISTANCE TO DISINFECTANTS

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The technology of estimation of microorganisms resistance to disinfectants allows

• to reveal the resistance of microorganisms to disinfectants with high accuracy and efficiency,
• to carry on the monitoring of disinfectant resistance in healthcare setting and in community,
• to raise effectiveness of disinfection

The technology is referred to medicine and biotechnology, in particular to epidemiology and microbiology and is intended for prevention the healthcare associated infections (HAIs) and community-acquired infections (CAIs)

General description of “The technology of estimation of microorganisms resistance to disinfectants”.
• Infectious diseases are the cause of each 3rd death in the world
• High adaptable potential of microorganisms, development of the resistance of microbes to disinfectants
• Expansion of spectrum of applied disinfectants in healthcare settings and in community
• Absence of uniform strategy of disinfectant application in practical public health services and monitoring of resistance of microbes to disinfectants
Key results and achievements

The Nizhniy Novgorod scientific epidemiological school, involving the authors of the Technology, receives the following scientific results representing the high scientific novelty and the practical importance, being innovative for Russia and worldwide:

- estimation of prevalence of the resistance to disinfectants and its characteristic by results of large-scale, long-term researches at regional level is conducted (fig.1-3);
- factors and conditions of formation of resistance to disinfectants are revealed resistance to disinfectants in the conditions of laboratory experiment is generated (fig.4,5);
- the way of modeling of formation of resistance of a microorganism to disinfectant is developed;
the method of detection of sensitivity of microorganisms to disinfectants (variants) is created;
- creation of a scientific substantiation, methodical and organizational maintenance of monitoring of resistance of microorganisms to disinfectants that is innovative for Russia and world practice
Key results and achievements

- The resistance of microorganisms to disinfectants is extended in healthcare settings

1. hospital for adults 1
2. hospital for adults 2
3. surgical hospital
4. hospital for children
5. maternity hospital 1
6. maternity hospital 2
7. maternity hospital 3
8. outpatient department (polyclinic)

Figure 1. Share of resistant to disinfectants strains of microorganisms in different hospitals

on the average – 26.1%
The resistance of microorganisms to disinfectants
• presents among microbes, caused enteric infections in community (salmonellosis, dysentery)
• presents to disinfectants of different groups of chemical compounds (figure 2)
• presents at various species of bacteria (figure 3)
• is one of the reasons of an inefficiency of disinfection
• leads to occurrence of outbreaks of healthcare associated infections and community-acquired infections

Figure 2. The resistance to disinfectants of various groups of chemical compounds

Figure 3. The resistance to disinfectants of different species of microorganisms
Strain *E.coli* sensitive to disinfectant (A)  

Strain *E.coli* resistant to disinfectant (B)

Figure 4. Electronic microscopy of *E.coli* strain sensitive to disinfectant (A) and *E.coli* strain resistant to disinfectant (B)

Figure 5. Thickness of a cellular wall (micron) of *E.coli* strain sensitive to disinfectant (A) and *E.coli* strain resistant to disinfectant
Main components of the Technology

“The method of detection of sensitivity of microorganisms to disinfectants (variants)”

The system of monitoring of the resistance to disinfectants
- In general
- For different types of healthcare settings

“The organizational-functional model of monitoring at region level”
The method of detection of sensitivity of microorganisms to disinfectants (variants) is used for epidemiological surveillance of healthcare associated infections for revealing resistance strains and microbial associations.

**Figure 6. Estimations of results**

**Growth less 300 CFU/ml – sensitive strain:**

- **Full sensitivity (A):** growth of microorganisms absent at all

- **Incomplete sensitivity (B):**
  - Growth 1 - 99 CFU/ml – incomplete bactericidal action
  - Growth 100 – 299 CFU/ml – subbactericidal action

**Resistant strain (C):** growth 300 CFU/ml and more
Advantages of “The method of detection of sensitivity of microorganisms to disinfectants (variants)”:

- high sensitivity (98.7 %);
- high specificity (99.2 %),
- reproducibility (95.4 %),
- quantitative estimation (growth 300 CFU/ml and more is considered as the resistance of the strain to disinfectants),
- simplicity of performance,
- speed,
- profitability,
- availability to routine practice.
The project on monitoring of resistance to disinfectants of microorganisms in healthcare settings at regional level

For the first time in the Russian Federation and world practice in territory of the Nizhniy Novgorod region since 2009 the project on monitoring of resistance to disinfectants of microorganisms in healthcare settings at regional level is carried out.
The center of monitoring of resistance:
- carrying out of researches
- database creation
- creation of a museum of cultures
- analyzing of results
- giving the recommendations
- organizational-methodical maintenance
- scientific workings out
- testing of disinfectants

Public health services department:
- monitoring control
- the analysis of results
- organizational-methodical maintenance

Healthcare settings:
- monitoring introduction
- the transmission of microorganisms
- disinfection control and correction
- the analysis of results

Manufacturers and sellers of disinfectants:
- postregistration testing of disinfectants
- working out and perfection of disinfectants
- promoting the choice and rotation of disinfectants

Regional Management of Federal service on supervision in the sphere of protection of consumers rights and well-being of the person:
- monitoring control
- disinfection control
- organizational-methodical maintenance
Organizational-functional model of monitoring of resistance of microbes to disinfectants:

• applies at the level of healthcare settings and at regional level
• allows to reveal the resistance to disinfectant and to correct disinfection
• has high epidemical and economic effectiveness
Bases of success of the project:

• A problem Urgency
• Deficiency of the information
• The Unique scientific and practical data
• The Priority of a group of authors on many questions of the given problem
• The Statement and theoretical questions, organizational-methodical workings out, practical recommendations
Key components of success of an administrative team work:

- multidisciplinary approach;

- collaboration of science (Medical academy), industry (manufactures of disinfectants, antiseptics, medical equipments, items and etc) and consumers (healthcare settings);

- involving in project different establishments from different departments and servicers: Public health services department, Regional Management of Federal service on supervision in the sphere of protection of consumer’s rights and well-being of the person;
Key components of success of an administrative team work:

- participation in the project of young specialists and authoritative experts with a wide experience;

- training of participants of the project to technologies of advancement of innovations;

- application of educational technologies for project promotion (EC);

- feedback;

- dynamic estimation of quality and effectiveness of monitoring
The technology of estimation of microorganisms resistance to disinfectants has no analogues worldwide.

All rights are reserved in 2 patents of the Russian Federation.

“The method of detection of sensitivity of microorganisms to disinfectants (variants)” was recommended in 2010 by the Regional Ministry of Health and Regional Management of Federal service on supervision in the sphere of protection of consumers rights and well-being of the person for monitoring of microbial resistance to disinfectants in healthcare settings of Nizhny Novgorod region.

We are awarded by 3 gold and 2 silver medals at international exhibitions:

- VIII Moscow International Exhibition of Innovations and Investments: Silver medal and Diploma (Moscow, 2008г.)
- XI International Exhibition of Industrial Property “Archimedes-2008”: Gold medal and Diploma (Moscow, 2008 г.)
- International Salon of Technological Innovations «Eureka!»: Silver medal and Diploma (Belgium, Brussels, 2009)
- Salon International Des Inventious, Geneve: Gold medal and Diploma (Geneva, 2009), Gold medal and Diploma (Geneva, 2011)
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Thank you for attention!