

Comment

We are placing the issue of "Medical Science Advances" into the hands of readers, prepared by specialists of different fields of medical microbiology. The set of articles relates to many aspects of bacterial infections. When presenting these articles to you, we wanted to draw attention to advance made in the clinical microbiology due to adopting molecular methods in diagnosis of microorganisms.

Last 15 years of the achievements of the Polish medical microbiology have significantly accelerated and increased the sensitivity of detection methods and contributed to a possibility of monitoring the ways of transmission of pathogenic factors. Without their implementation, the knowledge of medical services in Poland would be much poorer, not only within the understanding of pathogenicity of microorganisms but also within the rational diagnosis and treatment of patients. However, it should be added with sadness that micro and macro bacterial epidemics only when causing deaths among people, are receiving the media publicity for some period of time which calms very quickly and does not result in further financing of thorough examinations in the field of transmission, diagnosis and treatment.

In our issue we present also the matter of cross infections which are not only the problem of mycological laboratories and general bacteriology but also of TB laboratories. A misleading microbiological diagnosis which can be caused by laboratory cross infections results in mistakes in diagnosing a disease and consequently in a wrong therapy. All microbiological laboratories are threatened with errors resulting from cross-contaminations which are very difficult to counter. In daily work it is particularly important to be aware of an easy spread of bacteria by means of bacterial aerosols between examined samples from different patients. It is important to be aware that a proper supervision though allows for minimising the risk of those contaminations but it will not eliminate them completely.

Incorrect diagnosis of tuberculosis which is a consequence of cross-contamination during diagnostic procedures in TB laboratories is a known and described phenomenon and its prevalence is estimated at approximately 0.1-4%. Rapid detection and confirmation of cross infection requires from the microbiologist a thorough analysis of positive test results for tuberculosis.

The authors of the article highlight the importance of running a detailed microbiological documentation which allows for a precise indication of a way which was taken by a clinical material from the moment of collecting the material and its delivery to laboratory to the ending stage of diagnosis and presenting the result.

The authors of the article, while discussing this issue, acquaint us with the works of foreign authors and on the basis of own experiences i.e. detection of strains of *Mycobacterium tuberculosis*, namely the "false" ones in TB laboratory, propose the algorithm of examinations verifying the correctness of performing the procedures of microbiological diagnosis and methods of preventing the contaminations.

Further articles refer to the problem of a drug-resistant tuberculosis. The presence of tubercular bacilli among the sick inhabiting 4 regions of Poland called the "Eastern Wall" was the subject of molecular examinations. It was discovered that about 80% of analysed patients excreted the strains of the tubercular bacilli belonging to molecular formula previously registered in Poland and at our neighbours – in Czech Republic, Latvia and in Russia.

Molecular mechanisms of the drug-resistance of tubercular bacilli to main medicaments such as: rifampicin, isoniazid and pyrazinamide are the subject of two further articles. They present the usability and credibility of tests in diagnosis of patients with tuberculosis. The advance in marking the resistance to pyrazinamide (PZA) was made altogether with learning about the genome of the bacilli and determination of molecular mechanisms of the resistance to a drug which are mutations in *pncA* gene. *PncA* gene is responsible for a proper synthesis of pyrazinamidase (PZase) transforming the drug into its active form. Mutations responsible for the resistance to PZA occur throughout the entire *pncA* gene and promoter area and have a diversified character. The authors found that discovering a mutation in this gene allows for obtaining a quick information regarding PZA-resistance and can be the base for developing credible and rapid molecular tests for this medicine.

The authors of the article concerning mechanisms of the resistance to two main antimicrobial drugs: rifampicin and isoniazid note that commercial molecular tests consider only these areas of genes responsible for the drug-resistance in which mutations occur to the largest extent. In this context, it should be borne in mind that drug-resistance related to mutations occurring in other places of genes, is not identified through these tests.

Therefore, further examinations on the improvement of molecular tests of the drug-resistance are necessary as well as including new mutations responsible for the resistance to anti-TB drugs. Development of genetic methods in diagnosis of tuberculosis allows for verification of diagnoses made by other specialists. The authors of the next article describe advanced, own research on the confirmation of the presence of bacilli in paraffin fixed tissue materials. In the material of the patient with suspected tuberculosis, stating in the histopathological examination of

granulomas, even with necrosis, is not tantamount to a diagnosis of the sickness and requires a microbiological diagnostics allowing to detect an acid-proof bacilli within the observed morphological changes. The specimen of a tissue of a sick person with suspected tuberculosis after immersing in the paraffin block may be examined by a microbiologist even long after taking a specimen and constitute an additional method in microbiological diagnostics of tuberculosis. The authors suggest including the examinations in the algorithm of methods of diagnosis of the sick with suspected tuberculosis.

The last article from the group of issues related to tuberculosis presents the perspectives of using IGRA tests in lung diagnosis and in extra pulmonary forms. Diagnosing of tuberculosis and a tuberculous pleuritis by means of standard methods of microbiological diagnostics is difficult and long lasting. At present, high hopes are placed on cells of lymphocytes T secreting interferon gamma as a response to *Mycobacterium tuberculosis* antigens and adopting this immune reaction in diagnostics of tuberculosis. A review of the latest publications has been presented in the work.

Klebsiella pneumoniae bacteria develops infections in humans of different intensity – from the asymptomatic intestinal colonisation, colonisation of urinary and respiratory tract to the fatal pneumonia and meningitis. *Klebsiella pneumoniae* infections are caused mainly by strains resistant to β -lactam antibiotics with the production of β -lactamases of a wide ESBL substrate spectrum. *Klebsiella pneumoniae* strains, because of their high prevalence in clinical materials and multi drug-resistance to antibiotics, constitute a threat to human's health and life. Examination of mechanisms of the resistance of *Kl. pneumoniae* isolated from the sick from the surgical wards and the intensive therapy units are the subject of two articles and present the carrying, colonisation and interlocation of strains among hospitalised patients and threats which are caused by a transmission of a bacteria in the hospital environment. Microbiological techniques are subjected to a dynamic development and each year the companies producing the laboratory equipment propose using new systems in microbiology leading to the receipt of fast and credible results of diagnostic tests.

Quick, species identification has a substantial meaning in life-threatening conditions, especially in case of bacteraemia and sepsis. Two further works deal in detail with the use of the MALDI-TOF Mass Spectrometry in identification of two groups of bacteria – gram negative Enterobacteriaceae bacilli and vancomycin-resistant enterococci.

The analysis of microbiome of respiratory tract among smokers, non-smokers, people suffering from the severe form of chronic obstructive pulmonary disease (COPD) and patients with cystic fibrosis showed the greatest number of bacteria in case of a cystic fibrosis with the lowest diversity of bacterial flora, at the same time.

Due to a long term co-existence of two or more species inhabiting the respiratory tract of patients suffered from cystic fibrosis, the phenotypic variation occurs. Microbiological diagnostics of patients suffered from cystic fibrosis is difficult and is based on a good cooperation of a doctor with a microbiologist. The knowledge on the bacterial species which infect the respiratory tract of adults with cystic fibrosis and requiring an intensive therapy allows for using a proper, target treatment. The authors of this article have demonstrated the advantage of two species: *Pseudomonas aeruginosa* and *Staphylococcus aureus* among patients suffering from the cystic fibrosis and treated at the Institute of Tuberculosis and Lung Diseases. The article presents in detail the prognoses regarding the patients dependently on the profile of bacteria that occur in secretions from the respiratory tract. The authors underline that conduction of microbiological diagnostics of cystic fibrosis is possible due to the knowledge of etiological factors of infections, mechanisms of the resistance to antibiotics and the interaction: microorganism-the host. Only a credible result of a microbiological examination allows for adaptation of the intensive antibiotic therapy, which is appropriate for a given infection.

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