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**ТИББИЁТДА ЯНГИ КУН
НОВЫЙ ДЕНЬ В МЕДИЦИНЕ
NEW DAY IN MEDICINE**

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TREATMENT OF MYCOPLASMA PNEUMONIAE INFECTION IN CHILDREN

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✓ Resume

Mycoplasma pneumoniae (MP) causes Mycoplasma pneumoniae pneumonia (MPP) in children and adolescents, with clinical symptoms characterized by intermittent irritating cough, accompanied by headache, fever, and muscle pain. This paper aims to investigate the current research status and key focus areas in MP infection, particularly the common laboratory diagnostic methods and clinical treatment of Mycoplasma pneumoniae. Laboratory diagnostic methods include molecular assays, serological antibody detection, rapid antigen detection, and isolation and culture. Polymerase chain reaction (PCR) is considered the gold standard due to its high sensitivity and specificity

Keywords: *Mycoplasma pneumoniae, laboratory diagnosis, treatment, children, antibody test*

ЛЕЧЕНИЕ ИНФЕКЦИИ MYCOPLASMA PNEUMONIAE У ДЕТЕЙ

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✓ Резюме

Mycoplasma pneumoniae (MP) является причиной Mycoplasma pneumoniae пневмонии (MPP) у детей и подростков, клинические проявления которой характеризуются периодическим раздражающим кашлем, сопровождающимся головной болью, лихорадкой и мышечными болями. В данной статье ставится цель изучить текущее состояние исследований и основные направления в изучении инфекции MP, особенно распространённые лабораторные методы диагностики и клинического лечения Mycoplasma pneumoniae. Лабораторные методы диагностики включают молекулярные анализы, серологическое обнаружение антител, быстрый тест на антигены, а также выделение и культивирование. Полимеразная цепная реакция (ПЦР) считается золотым стандартом благодаря высокой чувствительности и специфичности

Ключевые слова: *Mycoplasma pneumoniae, лаборатория, диагностика, лечение, дети*

BOLALARDA MIKOPLAZMA INFEKSIYASINING DAVOSI

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✓ Rezyume

Mycoplasma pneumoniae (MP) bolalar va o'smirlar orasida Mycoplasma pneumoniae pnevmoniyasiga (MPP) sabab bo'lib, klinik ko'rsatkichlari orasida takrorlanuvchi bezovta qiluvchi yo'tal, bosh og'rig'i, isitma va mushak og'rig'i mavjud. Ushbu maqola MP infektsiyasining tadqiqot holati va asosiy yo'nalishlarini, ayniqsa, Mycoplasma pneumoniae ning keng tarqalgan laboratoriya diagnostika usullari va klinik davolashini o'rganishga qaratilgan. Laboratoriya diagnostika usullari sifatida molekulyar tahlil, serologik antikor aniqlash, tezkor antigen aniqlash hamda izolyatsiya va ko'paytirish kiritilgan. Polimeraza zanjir reaksiyasi (PZR) yuqori sezgirlik va aniqlik bilan oltin standart hisoblanadi

Kalit so'zlar: *Mycoplasma pneumoniae, laboratoriya, diagnostikasi, davolash, bolalar*

Relevance

The genome size of *Mycoplasma pneumoniae* (MP) is very small, approximately 816 kilobase pairs [1-2]. Out of the 16 human mycoplasma species, six are capable of causing diseases, with MP being the most significant and predominant pathogen [3, 4]. The absence of a cell wall in mycoplasma renders them resistant to cell wall-targeting antibiotics such as beta-lactams, prevents them from being stained by Gram staining, makes survival difficult in dry conditions, and influences their microscopic appearance [5]. MP adheres to the ciliated cells of the respiratory epithelium through attachment organelles and produces an ADP-ribosyl transferase, known as community-acquired respiratory distress syndrome toxin (CARDS toxin), which facilitates entry into host cells via clathrin-mediated endocytosis [6, 7].

MP can cause infections in both the upper and lower respiratory tracts, leading to *Mycoplasma pneumoniae* pneumonia (MPP), tracheobronchitis, and other conditions. Symptoms such as headache, fever, muscle pain, sore throat, cough, dry cough, or sputum resembling mucus are common, with MPP representing a major cause of community-acquired pneumonia in children, posing a significant health risk to the pediatric population [8, 9]. Additionally, MP may result in a variety of extrapulmonary symptoms affecting nearly all organs, including the skin, nervous system, blood, cardiovascular system, genitourinary tract, and musculoskeletal system, and can cause conditions like pseudomembranous necrotizing laryngotracheobronchitis and myelin oligodendrocyte glycoprotein antibody-associated meningoencephalitis [10–13]. Infections typically occur in summer or early autumn but can happen at any time throughout the year. The primary mode of transmission is rapid, with an incubation period of 2–3 weeks, and the highest incidence is seen in children and adolescents. MP may cause reinfections over time, likely because it can evade antibodies and antibiotics by hiding within host cells, and also due to the lack of lasting immunity caused by factors such as variation and rearrangement of surface antigens. Research indicates that clinical signs, symptoms, and laboratory results alone are insufficient to distinguish pneumonia caused by MPP from other pathogens, making accurate and rapid laboratory diagnosis essential for correct etiological identification and appropriate drug treatment.

The purpose of this study is to review the current state of research and the main areas of study in the field of MP infection, particularly the common laboratory methods for diagnosing and treating *Mycoplasma pneumoniae*.

Materials and methods

PCR is considered the new "gold standard" with the higher sensitivity, most assays can detect <100 CFU/mL; The specificity is strong and there is no cross-reactivity when appropriate target selection and amplification conditions are validated. Nucleic acid amplification techniques used to detect MP DNA or RNA differ in the selection of target genes used (e.g. P1 gene, 16S rDNA, 16S rRNA, ATPase operon gene, etc.) (PCR versus isothermal amplification techniques) and the form of detection (conventional versus real-time, single versus multiple) [11]. The most problematic issue with PCR is colonization or asymptomatic carriage.

Results and discussions

Mild MPP is more common in school-age children over 5 years old, with a course of 7–10 days, most patients have a good prognosis. The main clinical manifestations are fever and cough, wheezing and dyspnea can be detected in a small number of infants and young children. Imaging findings are bronchitis and bronchopneumonia; only a few patients can develop into severe. Severe MPP refers to the severe condition of MPP, which conforms to any of the following manifestations: high fever ≥ 5 days or fever ≥ 7 days, or wheezing, shortness of breath, dyspnea, chest pain, hemoptysis and other symptoms. These manifestations are related to severe lesions, combined with plastic bronchitis, asthma attacks, pleural effusion and pulmonary embolism; extrapulmonary complications occurred, but did not meet the criteria for critical illness; finger pulse oxygen saturation $\leq 93\%$ when breathing air at rest. The imaging findings were one of the following: large area of pulmonary consolidation; single lung diffuse or double lung multi-leaf segmental bronchiolitis showed. Critically MPP refers to severe MPP with rapid progression, respiratory failure or life-threatening extrapulmonary complications that require life-support treatment.

Conclusion

Laboratory testing of *Mycoplasma pneumoniae* (MP) is essential for identifying the causative agents of *Mycoplasma pneumoniae* pneumonia (MPP), and the rational, safe use of antibiotics is crucial for effectively treating MPP in children. MP infections are often underreported due to the lack of distinct clinical and chest X-ray features, the limited availability of rapid and specific laboratory diagnostic methods, and the challenges associated with isolating and culturing MP. In many cases where the specific pathogen remains unidentified, physicians tend to prescribe empirical beta-lactam antibiotics, which are ineffective against atypical pathogens like MP. Timely and appropriate use of macrolide antibiotics can significantly reduce the duration of illness, making rapid and accurate laboratory diagnosis of MP vital. Common laboratory diagnostic methods for MP include PCR, serological antibody detection, rapid antigen detection, and isolation culture. PCR is considered the gold standard due to its high sensitivity, specificity, and lack of cross-reactivity. Serological antibody tests can qualitatively detect various immune antibodies in serum or quantitatively measure antibody titers, providing valuable guidance for diagnosis and monitoring disease progression. Rapid antigen detection offers the fastest results, requires no specialized equipment or environmental conditions, and is suitable for early diagnosis of MP infection. However, isolation culture has a long growth cycle and low sensitivity, so it is not recommended for routine diagnosis. For mild cases of MPP, macrolides are the first-line treatment. In cases of drug-resistant MPP, newer tetracyclines and symptomatic treatments can be used, typically resulting in improvement. For severe MPP, glucocorticoids and gamma globulin can be added alongside symptomatic treatment and appropriate antibiotics to achieve notable therapeutic effects. In critically ill MPP patients, bronchoalveolar lavage may also be considered.

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