Mycoplasma: What, Where, When, & Why Now?

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Project ECHO
Disclosures

• Received travel and lodging support to attend the International Scientific Association of Probiotics and Prebiotics international conference, Sitges, June 2022

• Voting member of the FDA VRBAC

• Receive a stipend for my role as Deputy Editor of *The Journal of the Pediatric Infectious Diseases Society (JPIDS)*
Objective:

To describe the epidemiology, diagnostics, clinical manifestations, and management of *Mycoplasma pneumoniae* infections
History of *Mycoplasma*

- 1930s, noted people with respiratory symptoms that lasted for a longer duration, with less severity, and non-response to antibiotics
- 1944, scientists discovered an agent that causes “atypical” pneumonia and later named it *Mycoplasma pneumoniae*.
- “mycoplasma,” = Greek for “fungus-formed.”
- now known to be a bacterium that can survive and replicate external to cells, without a definite cell wall (implications for therapy)
Mycoplasma pneumoniae Epidemiology (1)

- Infections occur sporadically, both endemic and epidemic, affecting all ages, with variable attack rates
- Epidemics in late summer and fall; endemic - variation by year and geographical areas
- *M. pneumoniae* associated with outbreaks in schools and congregate settings
- Transmission occurs through inhalation of droplets or by direct contact; secondary cases among contacts being common
- Incubation period 6 - 32 days and transmissibility can be extended up to 20 days; duration of immunity is unknown
Mycoplasma pneumoniae Epidemiology (2)

- Cyclical increases in *M. pneumoniae* every 3 – 5 years due to changes in circulating strains
- Mitigation measures of COVID-19 pandemic = decline in *M. pneumoniae* detections
- Autumn 2023, increase in *M. pneumoniae* infections in China and other countries
- Data from CDC’s National Syndromic Surveillance Program and the New Vaccine Surveillance Network showed an increase in *M. pneumoniae* in the United States beginning in fall 2023, though below pre-pandemic levels
Mycoplasma pneumoniae – Autumn 2023, Asia

- November 2023, China’s respiratory disease surveillance system indicated an increase in outpatient consultations and pediatric hospital admissions for pneumonia due to *Mycoplasma pneumoniae* since May 2023 and for RSV, adenovirus, and influenza since October 2023
- Attributed increase to elimination of COVID-19 restrictions and the start of the winter season.
- Increase in respiratory disease activity occurred earlier than expected, no new or unusual pathogens
- The Korea Disease Control and Prevention Agency (KDCA) reported in November 2023 an increase in infections in children due to *M. pneumoniae*
Mycoplasma pneumoniae – Autumn 2023, Europe

- ECDC reported increases in *M. pneumoniae* detections in Denmark, France, Ireland, the Netherlands, Norway and Sweden in all age groups; predominantly among children and adolescents.
- French Public Health Agency reported unusual increases in respiratory infections from *M. pneumoniae* were detected in schools and intensive care units in several regions.
- The Statens Serum Institut of Denmark reported an epidemic increase in respiratory infections attributed to *M. pneumoniae*, with 541 new cases in late November 2023; national epidemics occurring every four years, mainly affecting children aged 6 to 12 years in autumn and winter.
Figure 1. Detection of *M. pneumoniae*, April 2022 to November 2023. Study Group for Mycoplasma and Chlamydia Infections – ESGMAC

![Graph showing detection rates of *M. pneumoniae* from April 2022 to November 2023 for various countries.]

**Update:** December 8, 2023. Please see previous publications for data after the implementation of non-pharmaceutical interventions against COVID-19 in March 2020, as well as detailed information on sites and reporting characteristics.

- **1st year (Apr 1, 2022–Mar 31, 2023):** [Link to 2022 data](https://example.com/2022data)
- **2nd year (Apr 1, 2022–Mar 31, 2023):** [Link to 2023 data](https://example.com/2023data)
- **3rd year (Apr 1, 2022–Mar 31, 2023):** [Link to 2024 data](https://example.com/2024data)
- **4th year (Apr 1, 2022–Sep 30, 2023):** [Link to 2023 data](https://example.com/2023data)

Mycoplasma pneumoniae Surveillance U.S.

FIGURE. Monthly number of Mycoplasma pneumoniae tests performed and percentage of positive test results among children and adolescents with acute respiratory illness — four sites, New Vaccine Surveillance Network, 2018–2023

US Department of Health and Human Services | Centers for Disease Control and Prevention | MMWR | February 22, 2024 | Vol. 73 | No. 7
Mycoplasma pneumoniae Pathophysiology

- *M. pneumoniae* prevents mucociliary clearance mechanisms from removal
- *M. pneumoniae* damage the respiratory epithelial cells at the base of cilia → local cytotoxic effects
- *M. pneumoniae* produce Community Acquired Respiratory Distress Syndrome (CARDS) toxin → colonization → inflammation and airway dysfunction
- Residence on surface of the respiratory epithelial cells with ability to invade tissues and replicate intracellularly
- Could lead to post-infectious or chronic complications
M. pneumoniae Diagnostics

- **Culture**: performed by reference laboratories; not valuable for clinical decision-making
- **Serological testing**: lacks specificity; acute and convalescent specimens
- **Molecular testing**: improved sensitivity and specificity over culture; results applicable in real time; most detect multiple respiratory organisms
- **Public health laboratories**: can type strains and perform antibiotic susceptibility.

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Mycoplasma pneumoniae Clinical Presentations (1)

- Symptom onset often gradual progressing to more severe symptoms of fever and cough, dyspnea, dry cough → productive non-bloody sputum
- Symptoms: headache, malaise, paroxysmal cough, sore throat
- In addition, chest auscultation may show scattered or localized rhonchi and expiratory wheezes.
- Duration of symptoms: days to months
- Concurrent bacterial infection and rare post-infectious complications (CNS manifestations and Stevens Johnson syndrome); fatalities rare
Mycoplasma pneumoniae Clinical Presentations and Complications (2)

- Children < 5 years of age: subclinical symptoms
  - coryza, wheezing, without fever, diarrhea, and vomiting
- Exacerbation of asthma and severe pneumonia
- Non-pulmonary manifestations
  - Encephalitis
  - Hemolytic anemia
  - Renal dysfunction
  - Myalgias, arthralgias, or polyarthropathies
  - Septic arthritis
  - Skin disorders can include erythema multiforme, Stevens-Johnson syndrome, and toxic epidermal necrolysis
Dermatologic Manifestations of *M. pneumoniae*

https://dermnetnz.org/topics/mycoplasma-pneumoniae-infection
Mycoplasma-Induced Rash with Mucositis (MIRM)

- Mucosal eruption often with minimal skin changes, differs from Stevens-Johnson and erythema multiforme
- Average 12 years of age
- Oral, ocular, urogenital lesions
- Skin lesions vesiculobullous or target-like, and usually situated acrally, less frequent
- Classification of MIRM:
  1. Classic MIRM - atypical pneumonia with mucositis, plus a non-mucosal rash
  2. MIRM sine rash - atypical pneumonia with mucositis
  3. Severe MIRM - atypical pneumonia with mucositis (greater than 2 sites have been reported), - the cutaneous rash is extensive with widespread non-mucosal blisters or flat atypical target lesions.

https://dermnetnz.org/topics/mycoplasma-pneumoniae-infection
Mycoplasma pneumoniae – Antimicrobials

- Adequate antimicrobial treatment may decrease the duration of symptoms and may result in radiological and clinical improvement
- Absence cell wall → resistance to beta lactam antimicrobials
- Macrolides (azithromycin, clarithromycin) are recommended in children and adults
- Alternatives include tetracyclines (doxycycline) for those over 8 years of age and quinolones (levofloxacin, moxifloxacin) in adults
M. pneumoniae – Antimicrobial Resistance

• Resistance to macrolides has been emerging in M. pneumoniae
  • Canada: About 12%
  • China: About 80%
  • Europe: 5- 20%
  • Japan: > 50%
  • United States: 10%

• Clinical correlations of longer duration of symptoms fever and cough with infections attributed to macrolide-resistant strains.
• Consider alternatives (e.g., doxycycline, levofloxacin, moxifloxacin) if concern for macrolide resistance

https://www.cdc.gov/pneumonia/atypical/mycoplasma/surv-reporting.html
Infection Prevention

1. Spread through contact with droplets
2. Hand hygiene
3. Separation of symptomatic and asymptomatic
4. Reduction in gathering, crowding
5. Prophylaxis may be considered in group settings
Take Aways

1. Consider *Mycoplasma pneumoniae* as an etiology of respiratory symptoms, especially during outbreaks.

2. Consider extra-pulmonary post-infectious complications of *M. pneumoniae*.

3. Consider the addition of a macrolide for management and an alternative if non-response and/or concern for resistance.

4. Hand hygiene is the mainstay of prevention along with separation of ill and well.
References

3. https://www.who.int/emergencies/disease-outbreak-news/item/2023-DON494#:~:text=Mycoplasma%20pneumonia%20and%20RSV%20are%20known%20to,WHO%20identified%20media%20and%20ProMED%20reports%20about
5. https://dermnetnz.org/topics/mycoplasma-pneumoniae-infection