

Contribution of diagnostic syndromic panels to emergency management Pediatric infectious: regarding an outbreak of *Mycoplasma pneumoniae*.

INTRODUCTION

Pneumonia represents a frequent cause of infection respiratory in the population pediatric, being *Mycoplasma pneumoniae* (MP) one of the main agents etiological. This pathogen intracellular lacks wall cell phone, which makes it intrinsically resistant to β -lactam antibiotics and requires treatment with macrolides, tetracyclines or fluoroquinolones depending on the age group. Although *M. pneumoniae* it usually causes symptoms respiratory mild or moderate, in some cases it can cause manifestations extrapulmonary, such as complications neurological, cardiac or hematological, especially in children immunosuppressed.

Mycoplasma pneumoniae in Europe during 2024 has been characterized by an increase significant number of cases, affecting especially to the population pediatric and causing Presentations clinics more serious. Reports from different regions have documented a notable increase in infections, with significant implications for public health and clinical management.

In northwestern Italy, the positivity rate of *Mycoplasma pneumoniae* infections increased to 5% in 2024, compared to 0.7% in 2023 (Novazzi et al., 2024).

On the other hand, in another study carried out in Marseille, France, 218 cases were recorded, representing 0.8% of the 26,449 patients. Analyzed, with predominance in children under 15 years of age (Edouard et al., 2024).

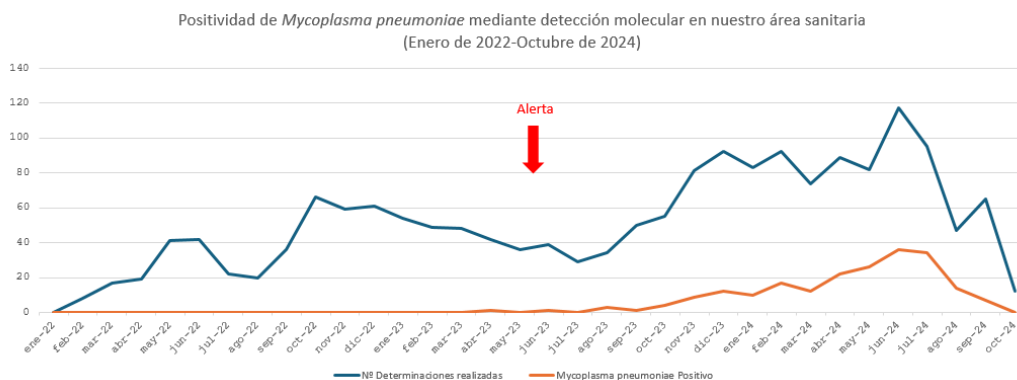
In this same period, also in our scope health an increase in detections was detected molecular requested during this period. At Catlab, during 2024 a total of 1928 determinations were carried out, of which **1756 were in population pediatric**.

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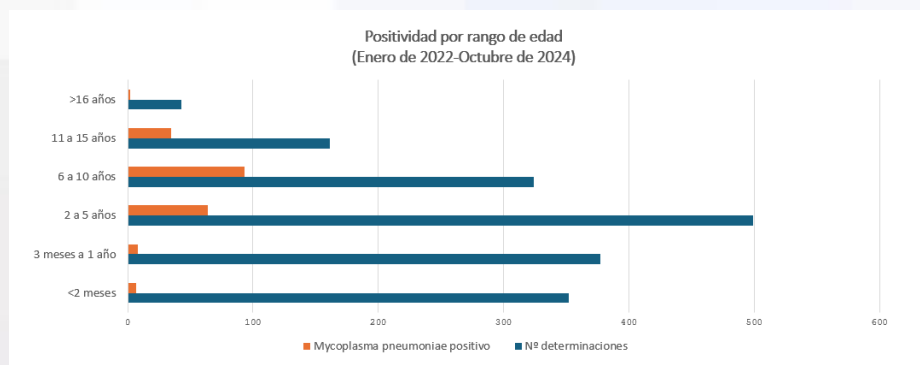
Evolution of the incidence of *M. pneumoniae* in our center (January 2022-October 2024)

In June 2023, a health alert was issued throughout Western Europe due to a considerable increase in MP cases. As can be seen in graph 1, there is an upward trend in positive cases toward late 2023, with a peak incidence in July 2024.

In the year 2024 (until October) they had already A total of 756 determinations were made with a total of 178 positive results (Positivity rate : 17.51 %), observing up to 31.71% positive in May 2024.



When the data are analyzed by age groups, it is observed that most of the determinations were carried out in children aged 2 to 5 years, although the positivity in this group is low. In contrast, the groups from 6 to 15 years present a greater proportion of positive cases, which coincides with the epidemiology of the disease, which mainly affects schoolchildren and adolescents. In infants and children under 1 year of age and in adults (>16 years), detections are minimal. These data reflect a possible epidemic pattern and suggest the need to optimize test request criteria to improve diagnostic efficiency.



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Molecular diagnosis at Catlab

Rapid and accurate detection of *M. pneumoniae* is essential to guide treatment antibiotic, especially in the context of epidemic outbreaks, where the diagnosis clinical may be nonspecific. The techniques Molecular methods have improved the detection of this microorganism compared to conventional methods . serological traditional , but conventional RT-PCR They usually require personnel and devices specialized that many times only are available in Molecular Microbiology laboratories . This This often causes the patient to have problems when the analysis results are obtained already is been discharged and started treatment antibiotic empirical .

In this sense , the introduction of multiplex syndromic panels in the emergency Microbiology laboratory allows for early detection Rapid and simultaneous detection of multiple pathogens respiratory . This can significantly impact antimicrobial prescribing , reducing unnecessary use of broad- spectrum antibiotics and promoting a more focused approach therapeutic directed , since the result is available in approximately 2 hours .

diagnosis of MP in the laboratory this intended for emergency or admission patients hospital . We have two tests diagnostic with this MP target:

- Elite Ingenius (routine diagnosis):
 - Molecular Biology Routine Test
 - DNA extraction using magnetic particles (MagCore)
 - DNA amplification and detection using Elite Ingenius
 - Response time: 3 to 20 hours (up to 3 days on weekends or holidays).
- Filmarray Respiratory Panel (urgent diagnosis):
 - Test performed in the Hospital Microbiology Service as an urgent test. 365 days a year during Microbiology technician hours.
 - DNA Extraction: Chemical and mechanical lysis in closed cartridge
 - Response time: Maximum 2 hours

In the field of care primary , serology go on being the method diagnosis used .

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Impact of the implementation of the syndromic panel on antibiotic treatment

Given the exponential increase in cases during the summer months of 2024, and the appearance of more serious cases requiring hospitalization. It was decided in consensus with the HUMT pediatric service , to establish the Filmarray Respiratory Panel as of July 1, 2024 . BioFire ® Respiratory Panel 2.1 as a test urgent in the Microbiology service for greater speed in patient management . This panel includes the following targets :

Viruse	Bacterias	
Adenovirus	Influenza A/H1	<i>Bordetella pertussis</i>
Coronavirus 229E	Influenza A/H1-2009	<i>Chlamydomphila pneumoniae</i>
Coronavirus HKU1	Influenza A/H3	<i>Mycoplasma pneumoniae</i>
Coronavirus OC43	Influenza B	
Coronavirus NL63	Parainfluenza 1	
Metapneumovirus humano	Parainfluenza 2	
Rinovirus/Enterovirus humano	Parainfluenza 3	
Influenza A	Parainfluenza 4	
	VRS	

To your time, the impact of the implementation of this syndromic panel on the adequacy of treatment was monitored antibiotic during an outbreak of *M. pneumoniae* in the emergency department pediatric , analyzing his effect on the optimization of antimicrobial therapy and clinical management of patients.

For this purpose, a retrospective study was carried out pre -post which included patients minors under 18 years of age with clinical suspicion of atypical pneumonia and a sample nasopharyngeal.

During the period Prior to the intervention (May-June 2024), the diagnosis of MP was made by real -time PCR using the ELITe platform Ingenius ® (Respiratory Infections Bacterial Panel) as part of the workflow usual diagnosis.

In the post- intervention period (July -August 2024), the BioFire ® Respiratory Panel 2.1 was used in the emergency laboratory for the same purpose.

Patients were excluded treated by others pathogens causing atypical pneumonia, such as *Bordetella pertussis* . In addition , the prescriptions were reviewed antimicrobials on discharge.

As a result, during the period Prior to the intervention, 83 samples were analyze, with response times ranging from 3 to 20 hours on weekdays and up to 3 days on weekends. MP was detected in 50.6% (42/83) of cases, and treatment was prescribed correct in 55.43% of patients.

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Notably, 18 patients MP positive did not receive treatment suitable with macrolides (3 of them were discharged with beta-lactams), while 19 patients MP negatives were treated unnecessarily with azithromycin.

Once implanted from the syndromic panel, 55 samples were processed, with results available in less than 2 hours. The positivity rate for MP was 43.63% (24/55), and the adequacy improved to 94.55 % of **prescriptions correct**.

Prescribing antibiotics unsuitable for atypical pneumonia caused by MP decreased from 44.57% to 5.45%, reducing prescriptions unnecessary beta-lactams and increasing pathogen-directed therapy at discharge.

Conclusions

Implementation of the BioFire[®] Respiratory Panel 2.1 in the diagnosis of PM in the emergency department Pediatrics has shown a positive impact on optimizing antibiotic management. The reduction in response times from up to 3 days to less than 2 hours allowed for better adequacy of treatment antimicrobial, with an increase from 55.43% to 94.55% in the correct prescription of antibiotics.

In addition, the inappropriate use of antibiotics decreased significantly, reducing administration unnecessary use of beta-lactams and avoiding the indiscriminate use of macrolides in patients who did not require them. This change not only improves individual clinical management, but also contributes to a global strategy for the rational use of antibiotics, helping to mitigate the problem of antimicrobial resistance.

The results of this study are in line with research previous ones, such as the one carried out in Japan, where the implementation of tests fast improved significantly the adequacy of treatment in patients with MP pneumonia. These findings reinforce the importance of incorporating diagnostic techniques rapid in the context of epidemic outbreaks, especially in pediatrics, where an identification early pathogen can reduce hospitalizations, improve patient prognosis and optimize the use of healthcare resources.

In conclusion, the adoption of multiplex syndromic panels in the diagnosis of respiratory infections in emergencies pediatric represents a step forward key in precision medicine,

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facilitating treatment targeted and timely . It is recommended its systematic use in high incidence scenarios of MP to maximize its impact on clinical practice .

References:

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