**Mycoplasma hominis** necrotising pneumonia in an immunocompetent adult male

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**SUMMARY**

*Mycoplasma hominis*, a common coloniser of the urogenital tract, is a rare cause of respiratory infections in an immunocompetent patient. *M. hominis* lacks a cell wall and can be difficult to identify with standard culture methods posing difficulties in diagnosis and treatment. We describe a case of *M. hominis* pneumonia in an immunocompetent man in his early 40s without any risk factors presenting with a cavitory lesion who developed empyema and necrotising pneumonia requiring surgical debridement. Identification of *M. hominis* and subsequent modification of antibiotic therapy led to favourable outcome. *M. hominis* should be considered in the differential diagnosis of patients with treatment resistant pneumonia especially in patients with trauma, intracranial injury, lung transplant or if immunocompromised. While *M. hominis* is naturally resistant to all antibiotics that target cell wall synthesis, we recommend levofloxacin or other fluoroquinolone to most effectively treat with doxycycline as a potential alternative.

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**BACKGROUND**

*Mycoplasma hominis* is a rare cause of pneumonia and cavitary lesion, especially in an immunocompetent patient. Among cited infections of the respiratory tract, many of the reports are in patients with manipulation of the urogenital tract, concurrent trauma, intracranial injury, transplant patients or otherwise immunocompromised patients.1-6 Outside of the respiratory tract, *M. hominis* has been implicated in cases of mediastinitis, meningitis, joint infection and endocarditis.7-11

*M. hominis* is a common coloniser of the urogenital tract where it was originally discovered along with other genital mycoplasmas such as *Ureaplasma urealyticum*.12 *M. hominis* can be found in the urogenital tract of up to 53% of sexually active asymptomatic women, with slightly less incidence in men.13 While these organisms are thought to be commensal colonisers, they have been implicated in infections of the urogenital tract, pregnancy complications, neonatal infections and infertility.14-17

*M. hominis* may often go under recognised as a cause of infection due to its fastidious growth requirements, difficulty growing and being recognised using standard blood culture methods, or the difficulty to see the colonies it forms on standard cell culture.2 3 12 18 While culture remains the gold standard for identification and is important for susceptibility testing, PCR methods have also been used to identify cases.

As mycoplasma species do not have a cell wall, they are inherently resistant to antibiotics that target cell wall synthesis such as beta-lactams, cephalosporins and glycopeptides. *M. hominis* also demonstrates resistance to commonly used macrolides such as erythromycin but is generally susceptible to fluoroquinolones and tetracyclines, although some resistance to different agents has been noted.19-21

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**CASE PRESENTATION**

A man in his early 40s presented with 5 days of worsening fever, body aches, sore throat, shortness of breath and productive cough with accompanying pleuritic pain. He was hypotensive and tachycardic. He had increased work of breathing with diminished lung sounds in the right lung field. He had leucocytosis of 13.6/mm³ (normal range 4–11/mm³) and neutrophil count of 12.7/mm³, and procalcitonin was elevated to 9.46 ng/mL (normal range <0.05 ng/mL). Chest radiograph (CXR) and CT imaging of the chest revealed a mass-like 5.2 cm cavitary lesion in right upper lobe, left lower lobe consolidation and small left pleural effusion (figure 1). SARS CoV-2 testing was negative via nasopharyngeal PCR swab, and there were no sick contacts. He had a history of well-controlled asthma on combination long-acting beta-agonist and inhaled corticosteroid, biliopancreatic diversion with duodenal switch for weight loss 14 years prior, and was on emtricitabine-tenofovir for pre-exposure prophylaxis.

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**INVESTIGATIONS**

Initial infectious work up included strep swab and throat culture, HIV testing, blood cultures, *Legionella* urine antigen and *Streptococcus pneumoniae* urine antigen which were all negative. Infectious disease was consulted and recommended further investigation with *cryptococcus* blood antigen, * bistoplasma* urine antigen, sputum culture and PCR testing for respiratory viruses and bacteria, (1,3)-β-D-Glucan and *Aspergillus Galactomannan* antigen which were all subsequently negative. Over the subsequent days, the patient had clinical improvement with decreased oxygen needs, symptomatic improvement and decreased procalcitonin to 2.18 ng/mL. While bronchoscopy was considered, this was not pursued at initial presentation due to his improving clinical course. Ammonia level, zinc or selenium were not checked throughout the evaluation.

Nine days following his initial presentation, he was found to be hypotensive with diminished left lung sounds despite lack of symptoms while...
receiving his daily antibiotic infusion at an outpatient infusion centre. On evaluation in the emergency department with this second presentation, there was a new leucocytosis of 19.5/mm³, and CXR was notable for large left hydropneumothorax with signs of tension (figure 2).

DIFFERENTIAL DIAGNOSIS
Two cultures from pleural fluid were collected at the time of his second presentation. One noted growth of *M. hominis* in the thioglycolate broth only and was reported out by the lab 5 days after chest tube placement. Blood cultures remained negative. Fungal cultures, silver stain and cytology performed on pleural fluid also remained negative. Sputum cultures with acid-fast bacilli with *Mycobacterium tuberculosis* DNA direct probe PCR were all negative. Serum IgG, IgA and IgM were all within normal limits.

TREATMENT
He was initially treated empirically with intravenous vancomycin and cefepime. Following improvement during initial presentation, antibiotics were transitioned to intravenous ceftriaxone and oral metronidazole with a plan to complete 4 weeks of this therapy outpatient and repeat imaging towards the end of this course. At initial discharge, he was noted to have cavitary lesions without empyema and did not have any indication for surgical treatment.

Following chest tube placement at second presentation, 2 L of purulent material were drained. CT imaging at this time again demonstrated mass-like cavitary lesion in right lung in addition to an interval increase in opacities of the left upper and lower lobe, significant bilateral chest wall subcutaneous emphysema likely secondary to chest tube placement and mediastinal gas on the right. Antibiotic therapy was broadened to vancomycin and piperacillin/tazobactam at this point. Following clinical improvement, he was transitioned to vancomycin and cefepime and later restarted on intravenous ceftriaxone and oral metronidazole. Identification of *M. hominis* from pleural fluid prompted addition of oral doxycycline 100 mg two times per day to the antibiotic regimen.

Repeat CT imaging 1 week into this hospitalisation showed some improvements in pneumomediastinum, noted stable cavitary areas and raised new concerns for bronchopleural fistula due to subcutaneous gas with possible signs of infection. Thoracic surgery was consulted with consideration of video-assisted thoracoscopic decortication.

Initial findings in the operating room included a large chest wall abscess under serratus anterior muscle, necrosis of serratus and intercostal muscles as well as the overlying fascia, loculated pleural effusions, dense adhesions with thick pleural rind and other purulent material. This was debrided and irrigated extensively before the wound was packed. No clear sign of bronchopleural fistula was noted during initial decortication. The patient would require two more trips to the operating room for irrigation, debridement, and finally wound vac placement.

OUTCOME AND FOLLOW-UP
Due to concern for possible tetracycline resistance and with *M. hominis* susceptibility testing still pending at an outside lab, the patient was discharged on a 6-week course of oral levofloxacin to cover *M. hominis* and oral metronidazole for empiric anaerobic coverage. Susceptibility testing at an outside laboratory did demonstrate susceptibility to clindamycin, tetracycline and levofloxacin. Follow-up imaging demonstrated resolution of the hydropneumothorax.

DISCUSSION
We have described a case of *M. hominis* pneumonia presenting with a cavitary lesion and progressing to empyema and...
necrotising pneumonia in an immunocompetent adult without clear risk factors. While *M. hominis* has been noted to cause severe disease with progression to necrotising pneumonia, it has not been associated with cavitary lesions previously. Our case also reinforces challenges noted in similar cases in that empiric antibiotics commonly used to treat pneumonia are ineffective against *M. hominis*, identification can be difficult as it is a fastidious and slow-growing organism, and recovery can depend on transition to appropriate antibiotic therapy. We feel that the unique aspects of this case add to previously reported cases of *M. hominis* pneumonia in immunocompetent patients.

Identification of the organism is a crucial step in the clinical course of patients with *M. hominis* so that appropriate modifications to therapy can be made. *M. hominis* can be lysed or killed by saline, the wooden shaft of collection swabs or sodium polyanethol sulfonate found in blood culture bottles.2 12 *M. hominis* has also been noted to not cause visible change in blood culture bottles or turbidity due to its small size.12 22 and may require subculture for detection as was done in two of the cases reviewed.2 6 The colonies that grow on agar are also small with a classically described ‘fried-egg’ appearance due to the clear pinpoint centre and translucent surrounding which can be difficult to identify with the naked eye.2 23 Despite this, culture remains the gold standard for identification of *M. hominis* as it can help guide therapy with susceptibilities, with increasing resistance to antibiotics typically used to treat. Similar to other cases, *M. hominis* was not identified in our case until 14 days after his initial presentation and 5 days after chest tube placement and drainage of a pulmonary empyema.

PCR methods, usually targeting 16S rRNA, can also be used to identify *M. hominis*.13 In one of the cases reviewed, eubacterial PCR was used to identify the organism, and culture was later used to yield susceptibilities.5 Identification with PCR may be less useful to demonstrate clinically significant disease in the urogenital tract as it is a commensal organism commonly found there but could be more useful in extragenital locations.

The biology of *M. hominis* informs antibiotic treatment and its inherent resistance to numerous classes of antibiotics. As *Mycoplasma* species lack a cell wall, they are naturally resistant to therapies that target peptidoglycan synthesis such as cephalosporins, beta-lactams and glycopeptides as well as demonstrating resistance to other classes of antibiotics such as aminoglycosides, sulfonamides and trimethoprim.22 Unlike *M. pneumoniae*, *M. hominis* exhibits resistance to commonly used macrolides such as azithromycin, clarithromycin and erythromycin.6 20 21 The most commonly recommended antibiotics for treatment of *M. hominis* include tetracyclines, fluoroquinolones and clindamycin.

Early case reports have expressed concern about increasing resistance to tetracycline in association with the tetracycline-resistant element (tetM).3 9 26 Resistance to tetracycline seems widely variable based on geography with some areas of the USA having tetracycline resistance as high as 50%, and there is susceptibility to doxycycline even in stains resistant to tetracycline.12 24 Fluoroquinolones have been cited as being more effective options with lower resistance rates, except in China. Resistance to fluoroquinolones is due to changes in quinolone resistance-determining regions which are coding regions for DNA gyrase or topoisomerase IV, the drug targets.25 Two studies demonstrating the high rates of fluoroquinolone resistance in China reported 52/57 and 11/13 of *M. hominis* samples were resistant, with comparisons showing higher resistance to ciprofloxacin over levofloxacin.25 26

In Samra et al, looking at rates of resistance in *M. hominis* samples in Israel found 9/110 resistant to doxycycline with higher resistance to tetracycline, while noting none of the samples had resistance to levofloxacin.21 In Krausse et al, 290 *M. hominis* and *Ureasplasma* samples collected over a 20-year period in Germany found doxycycline to be most effective against both but noted 10% of *M. hominis* samples were resistant to doxycycline. Of these samples, 7.9% were resistant to ciprofloxacin, and less than 2% were resistant to ofloxacin.27 Finally, in Morris et al, when using international set thresholds by Clinical Laboratory Science Institute, only 1/100 of collected samples from Wales demonstrated resistance to tetracycline, while 0/100 demonstrated levofloxacin resistance.21 24 Clindamycin is also commonly used and effective, which may present great option for neonatal or perinatal infections.19

Our review of previous case series and case reports of *M. hominis* pneumonia in immunocompetent patients yielded 14 patients spanning three decades.1 4 22 29 30 Among the four patients who died, none of them had modification of therapy, although one patient from Garcia et al withdrew due to worsening of illness and significant comorbidity.7 4 30 Two of the earlier cases recovered despite no change in therapy or the inadequate change to erythromycin.6 22 Other patients were noted to have significant improvement after identification of *M. hominis* and transition to a fluoroquinolone and/or tetracycline antibiotic. Common associations or risk factors identified in some of these patients included two patients with pneumonia in the peripartum period12 22 and five patients who suffered trauma or closed head injury.1 4 30 Four cases also identified co-infection with another bacterial source.14 22 30

Many of the other various extragenital infections had found a large proportion of cases involve immunocompromised patients or transplant patients emphasising lower cell-mediated immunity and hypogammaglobulinaemia.31 *M. hominis* and *U. urealyticum* have been implicated as possible aetiology of non-hepatic hyperammonemia which should prompt antibiotic coverage of these organisms in such cases to prevent further complications.32 Our patient did not have any immunoglobulin deficiencies identified.

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**Patient’s perspective**

Our patient added with his consent form, ‘Thanks so much again for all you did to help me get better!’

**Learning points**

- This case demonstrates that *Mycoplasma hominis* can cause severe respiratory infection and cavitary lesion in an immunocompetent adult despite lack of previously identified risk factors.
- *M. hominis* should be considered on the differential of patients with treatment resistant pneumonia or other infection especially in patients with trauma, intracranial injury, lung transplant or if immunocompromised.
- Institutions should consider availability of PCR testing for *M. hominis* or broader eubacterial PCR testing to help identify offending organisms quickly.
- Cultures should be collected for further use in monitoring susceptibility patterns with increase in resistance to tetracyclines and fluoroquinolones.
- We recommend levofloxacin or other fluoroquinolone to most effectively treat, while doxycycline would be a potential alternative.


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M. hominis can also progress to very severe illness such as other reviewed cases in which patients developed empyema requiring drainage with chest tube, but other cases did not describe the extent of surgical intervention required in this case.

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Case reports provide a valuable learning resource for the scientific community and can indicate areas of interest for future research. They should not be used in isolation to guide treatment choices or public health policy.

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