



## CASE REPORT

# What is New with Bordetella?

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## Abstract

A 27-year-old HIV-1 positive male was admitted in September 2018 for sudden onset of vomiting and diarrhea and was conservatively managed for positive *Norovirus* on a Gastrointestinal PCR panel. It was anticipated to start him on ibalizumab intravenous infusions and enfuvirtide upon discharge and a PICC line was placed in the right internal jugular vein.

On the third day of line placement, he developed a fever with mild respiratory symptoms. His respiratory PCR panel for *Rhino/Enterovirus* was positive and blood cultures grew *Enterobacter*. Blood cultures from PICC line confirmed the diagnosis of central line-associated infection and the line was discontinued. He was started on meropenem, given sensitivities of the cultures. However, despite initial improvement, patient spiked fever again two days later. The second blood cultures turned out to be positive for *Bordetella bronchiseptica*, prompting to continue the patient on meropenem for further 2 weeks and thereafter the infection resolved uneventfully.

## Introduction

*Bordetella bronchiseptica* is a known respiratory tract pathogen in mammals. We report a case of bacteremia in an immunocompromised patient successfully treated with meropenem.

## Case Description

A 27-year-old male with a past medical history of multiple drug resistant *HIV-1 (subtype B)* acquired from vertical transmission was admitted in September 2018 for sudden onset of non-bloody and non-bilious vomiting accompanied by diarrhea. The patient denied any recent sick contacts and reported to be adherent to his medications.

The patient's medical history included recurrent esophageal candidiasis, cryptococcal meningitis, AIDS wasting syndrome, and anemia of chronic disease. His home medications for AIDS included darunavir 600 mg twice daily, ritonavir 100 mg twice daily, emtricitabine tenofovir 200/300 mg once daily, dolutegravir 50 mg twice daily, despite known pan-genotype resistance. Prophylactically, he was on fluconazole 200 mg twice daily, bactrim 400/80 mg once daily, and azithromycin 1200 mg once weekly. During his hospital stay, he reported odynophagia and was started on intravenous micafungin for presumed candida esophagitis.

On physical examination, he was cachectic with vital signs within normal limits. Chest examination revealed clear breath sounds bilaterally, no rhonchi or wheezes, normal heart sounds, his abdomen was soft and non-tender. Laboratory studies revealed a total peripheral leucocyte count on admission of 2.77 K/uL with Neutrophil count of 1.95 K/uL and Lymphocyte count of 0.32 K/uL. CD4 count was 1 with a CD4% of 0, and HIV viral load 1,041,768/ml. The hemoglobin and platelet counts were 10.6 g/dl and 223 K/uL respectively. His liver enzymes were within normal limits.

He was found to be positive for *Norovirus* on a gastrointestinal PCR panel. He was hemodynamically stable and managed conservatively for diarrhea. During his hospital stay, it was anticipated to start him on ibalizumab intravenous infusions and enfuvirtide, thus a PICC line was placed in the right internal jugular vein. On day three after PICC line placement, he developed a fever with mild respiratory symptoms including rhinorrhea and sore throat. He was found to be positive for *Rhinovirus/Enterovirus* on a respiratory PCR Panel. His

blood cultures grew *Enterobacter* which was thought to be secondary to a central line-associated blood stream infection later confirmed by cultures from the PICC line growing *Enterobacter*, *Enterococcus faecalis*, and *Pseudomonas*. The line was discontinued, and he was started and continued on meropenem. The patient initially improved, however then developed fevers again inspite of being on antibiotic. CT imaging of the chest, abdomen and pelvis were obtained to rule out lymphoma or other opportunistic pocket infection. On repeat assessment, patient reported of a new complain of headache, and a diagnostic lumbar puncture was also performed. However all these studies were unremarkable. Meanwhile, repeat blood cultures came back to be positive for *Bordetella bronchiseptica*, sensitive to amikacin, cefepime, meropenem and piperacillin-tazobactam. It was decided to continue the patient on meropenem for two more weeks and he subsequently improved and was afebrile.

A new PICC line in right internal jugular was placed and the patient was discharged on Ibalizumab infusion every 2 weeks, subcutaneous enfuvirtide, and continued prophylaxis with an outpatient follow up.

## Discussion

*Bordetella bronchiseptica*, an aerobic Gram-negative rod bacteria often associated with mammals, is an infrequent pathogen in immunocompromised subjects causing a variety of respiratory manifestations ranging from sinusitis tracheobronchitis, pneumonia, and septicemia. Of note, our patient did not have any history of close contact with animals [1-8].

Common radiologic findings for this infection include consolidation, multifocal cavitory nodules, ground-glass opacities, and bronchiectasis. Although our patient had mild respiratory symptoms (cough, rhinorrhea), the chest X-ray and CT Chest being negative for pertinent findings, did not yield much information. Given the central line already discontinued, it was unlikely to be the source of infection [9-11].

From the fore-mentioned clinical scenario it is hypothesized that even though *Bordetella bronchiseptica* is a common respiratory tract pathogen in mammals, humans may also be a frequent host of this pathogen. Various mechanisms have been implicated to enable this organism to easily invade mucosal linings including proteins like hemagglutinin (filaments), pertactin and fimbriae. In addition, *Bordetella bronchiseptica* has a built in mechanism to produce adenylate cyclase toxin arming it to penetrate into the polymorphonuclear cells and macrophages. These invasive properties may potentially play an important role in causing infection in immunocompromised human hosts necessitating further studies.

Management of *Bordetella bronchiseptica* infections is often based on antibiotic susceptibility pattern. Some of the common successful treatment regimens have in-

corporated erythromycin, ciprofloxacin and rifampin, and carbapenems in various combinations, however, proper guidelines for duration of treatment and prevention strategies have not been established [12-19].

## Conclusion

*Bordetella bronchiseptica* is an infectious agent in immunocompromised patients that may present with a spectrum of illnesses. The duration and choice of antibiotic are tailored according to the presentation and it is advisable to use an antibiotic that has good intracellular penetration. Further investigation is needed to determine if this pathogen is a human commensal and evaluate its role as an opportunistic or primary cause of disease.

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