Case report

A fatal case associated with *Catabacter hongkongensis* bacteremia in lung cancer patient: A case report

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A R T I C L E  I N F O

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A B S T R A C T

*Catabacter hongkongensis* is a bacterium first isolated in 2007 and has since been detected in the blood of about fifteen patients with disease such as gastrointestinal malignancy, intestinal obstruction, or acute intestinal infection. We describe herein the case of a patient newly diagnosed with metastatic lung cancer, who died from a fatal infection possibly related to *Catabacter hongkongensis* bacteremia. By reviewing all cases reported in the literature, our case report supports that this infection is associated with a very high mortality in cancer patients.

Introduction

*Catabacter hongkongensis* is a rare Gram-positive anaerobic coccobacillus, first isolated in 2007 in blood cultures from four patients living in Hong-Kong and Canada [1]. Since then, this bacterium has been only reported few times in literature, mostly from Asia (seven cases from Hong-Kong, one from South Korea and one from New-Zealand) [1,4]. Other reports were from North America (two cases from Canada) [1] and Europe (four cases, from Italy, Sweden and France) [5,8]. We describe herein the case of a patient newly diagnosed with metastatic lung cancer, who died from a fatal infection possibly related to *Catabacter hongkongensis* bacteremia.

Case description

A 62-year-old caucasian man was admitted to our Pneumology Unit the 29th of December 2020 for dyspnea, cough, and body condition loss. He was recently diagnosed with non-small cell lung cancer (right: 139 × 98 mm; left: 66 × 42 mm). There was no other metastatic lesion. The other antecedents were hypertension, chronic obstructive pulmonary disease and peripheral arterial disease. Importantly, his general health status was preserved, with no organ failure, and a survival estimated well beyond 3 months. The therapeutic project was a combination of both chemotherapy and immunotherapy (immune checkpoint inhibitors, anti-PD1).

At patient’s arrival, exertional dyspnea (mMRC scale 3) and productive cough with difficulty in expectoration were described. There wasn’t any need for oxygen support. Clinical examination found decrease in right apical vesicular lung sound, a painless palpable mass in the right hypochondrium, without any sign of peripheral hypoperfusion. He underwent a bronchial fibroscopy in order to relieve bronchial obstruction because thoracic CT showed complete upper right lobe atelectasis. After identifying a wild-type *Streptococcus pneumoniae* from bronchoscopypiration (total bacteria count > 5 UFC (log10)/mL), we started amoxicillin-clavulanic acid from the 31st/12 to the 7th/01. On January the 4th, the patient had fever (up to 39.3°C) and chills. He underwent a new fibroscopy and two blood culture samples collected between the 2nd/01 and the 7th/01. On January the 4th, the patient had fever (up to 39.3°C) and chills. He underwent a new fibroscopy and two blood culture samples collected between the 2nd/01 and the 7th/01.

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**Table 1**

Summary of all *Catabacter hongkongensis* infections reported from the literature.

| Ref. | Age/ Gender | State | Case year | Clinical context | Blood culture/ Days or hours to positive | Identification method | Strain | Suspected source of the bacterium | Surgical or medical treatment used | Outcome |
|------|-------------|-------|-----------|------------------|-----------------------------------------|-----------------------|--------|----------------------------------|----------------------------------|----------|
| 2007, Lau et al. [1] | 48/M | Hong-Kong | 1999 | Small bowel obstruction with secondary sepsis | Anaerobic, 3 days | 16S RNA sequencing | HKU16 | Intestinal | Cefoxime + Metronidazole | Recovered after 19 days of hospitalization |
| 2007, Lau et al. [1] | 39/M | Hong-Kong | 2003 | Acute appendicitis with perforation | Anaerobic, 3 days | 16S RNA sequencing | HKU17 | Intestinal | Emergency laparoscopic appendectomy/Cefoxime + Metronidazole | Recovered after 2 days |
| 2007, Lau et al. [1] | 74/M | Canada | 2004 | Exchange of biliary stent | Anaerobic, unknown | 16S RNA sequencing | CA1 | Intestinal | Ciprofloxacin | Recovered |
| 2007, Lau et al. [1] | 66/F | Canada | NA | Sepsis/Metastatic lung cancer | Anaerobic, 5 days | 16S RNA sequencing | CA2 | NA | Cefoxime + Ciprofloxacin | Died 2 weeks after admission |
| 2007, Lau et al. [1] | 2007 | Canada | NA | Sepsis with liver abscess and suspected carcinoma of the colon | Anaerobic, 3 days | 16S RNA sequencing | HKU16 | Intestinal | Ticarcillin-clavulanic acid + gentamicin | Died a month after admission from nosocomial pneumonia |
| 2007, Lau et al. [1] | 21/M | Hong-Kong | 2009 | Acute gangrenous perforated appendicitis | Anaerobic, 3 days | 16S RNA sequencing | HKU16 | Intestinal | Emergency laparoscopy with appendectomy/Cefoxime + Metronidazole | Recovered a month after admission |
| 2007, Lau et al. [1] | 2009 | Hong-Kong | 2009 | Sepsis/metastatic colorectal cancer | Anaerobic, 3 days | 16S RNA sequencing | HKU16 | Intestinal | Amoxicillin-clavulanic acid then Piperacillin-Tazobactam | Died 9 days after admission |
| 2007, Lau et al. [1] | 2009 | Hong-Kong | 2009 | Acute appendicitis with perforation | Anaerobic, 3 days | 16S RNA sequencing | HKU16 | Intestinal | Cefoxime + Metronidazole | Recovered after 3 weeks |
| 2007, Lau et al. [1] | 2010 | Hong-Kong | 2010 | Infected tumor/colon adenocarcinoma with liver metastasis | Anaerobic, 3 days | 16S RNA sequencing | HKU16 | Intestinal | Cefoxime + Metronidazole | Died 2 months after admission |
| 2007, Lau et al. [1] | 2009 | Hong-Kong | 2009 | Acute gangrenous perforated appendicitis | Anaerobic, 3 days | 16S RNA sequencing | HKU16 | Intestinal | Emergency laparoscopy with appendectomy/Cefoxime + Metronidazole | Recovered a month after admission |
| 2012, Choi et al. [3] | 77/M | South Korea | NA | Acute cholecystitis | Anaerobic, 3 days | 16S RNA sequencing | NA | Intestinal | Endoscopic retrograde biliary drainage/Cefodizime + Metronidazole | Recovered |
| 2012, Smith et al. [4] | 47/M | New-Zealand | NA | Acute appendicitis with perforation/ Perianal abscess | Anaerobic, 4 days | 16S RNA sequencing | HKU16 | Intestinal | Laparoscopy and pelvis wash out/ Cefoxime + Metronidazole, Amoxicillin-clavulanic acid | Recovered |
| 2015, Torri et al. [5] | 55/M | Italia | NA | Septic shock/Road accident with multiple pelvic fractures and splenic hematoma | Anaerobic, 82 h | 16S RNA sequencing | HKU16 | NA | Ceftazidime + Gentamicin then vancomycin + meropenem | Recovered |
| 2016, Kaden et al. [6] | 83/M | Sweden | NA | Fever and chills without any focal infection symptoms: viral infection suspected | Anaerobic, 80 h | 16S RNA sequencing | ABBA15k | NA | No antibiotic treatment | Recovered |
| 2011, Elsendoorn et al. [7] | 52/M | France | NA | Intestinal perforation peritonitis with pneumoperitonitis | Anaerobic, 3 days | 16S RNA sequencing | NA | Intestinal | Amoxicillin-clavulanic acid + gentamicin/Laparotomy, complete colectomy with rectum closure end and ileostomy | Recovered |
| 2021, Cabrol et al. [8] | 80/W | France | NA | Abdominal abscess fistulized to a sigmoid tumor | Anaerobic, 67 and 74 h | 16S RNA sequencing | NA | Intestinal | Piperacillin-Tazobactam and Vancomycin | Died after 1 month |
| 2021, Mandin et al. | 62/M | France | 2021 | Abdominal abscess fistulized to a sigmoid tumor | Anaerobic, 65 h | 16S RNA sequencing | NA | Pulmonary or Intestinal | Amoxicillin-clavulanic acid then Piperacillin-Tazobactam + Amikacin | Died 23 days after admission |

NA = Not available, F = female, M = male.
11th/01, only one anaerobic blood bottle culture collected the 04th/01 (during amoxicillin-clavulanic acid treatment) was positive after 65 h, revealing Gram-positive coccobacilli from direct microscopic analysis. We decided to continue amoxicillin-clavulanic acid because the patient was stable, with no new fever episode. In the meanwhile, a central venous catheter was placed on December the 31st and he underwent his first chemo-immunotherapy cycle (Carboplatin-Pemetrexed-Pembrolizumab) on January the 5th with granulocyte colony-stimulating factor for 5 days. Despite different assays, no identification could be performed using MALDI-TOF MS (VITEK® MS, bioMérieux) using the V3.2 database, thereby justifying molecular and sequencing methods. *Catabacter hongkongensis* was then identified using the 16S RNA partial sequencing method as previously described (with no subculture available for antibiotic susceptibility testing) [9]. On the 11th/01, that is seven days after Gram-positive coccobacilli observed on the anaerobic blood sample, **respiratory status declined with oxygen flow rate of 1 L/min needed and he became hypotensive (blood pressure 89/59 mmHg) with oliguria, poor peripheral perfusion (pale and mottled skin) and hyperlactatemia (4.1 mmol/l) despite vascular filling (500 ml of saline solution (NaCl 0.9 %) administered in twenty minutes).** Intravenous antibiotic therapy, associating piperacillin-tazobactam and amikacin, was initiated and he was therefore transferred to the Intensive Care Unit to get vasopressive support. Piperacillin-tazobactam was continued until the 21st/01. His clinical condition was stable thanks to these therapies but he underwent a septic shock 23 days after, with no other bacteria isolated in any other sample (6 blood cultures samples pairs between the 12th/01 and 27th/01, urine cultures the 11th/01 and 21st/01, BAL the 25th/01). To note, only one blood sample was positive for *Staphylococcus haemolyticus* but was considered as a contaminant. On the 21st/01, considering this new clinical impairment, the intravenous antibiotic treatment was switched for imipenem/cilastatin association, maintained until his death on the 27th/01.

**Discussion**

According to literature, little is known about *Catabacter hongkongensis* epidemiology. *Catabacter hongkongensis* is a motile, catalase-positive, strictly anaerobic, nonsporulating, Gram-positive coccobacillus. It was first described by Lau et al., 14 years ago as a new family of bacteria named *Catabacteriaceae*, based on its unique phenotypic and genotypic characteristics [1]. *Catabacter hongkongensis* is the only species of *Catabacter* genus.

We review the characteristics of other patients described in literature with *Catabacter hongkongensis* bacteremia in Table 1. *Catabacter hongkongensis*’ growth is slow and tedious with a median detection time in blood culture of 72 h [8]. This long period time to positivity (given the fact that blood bottle samples usually are incubated 5 days excepted in case of endocarditis suspicion) added to this bacteria’s growth difficulty might explain the fact that it is mis- or underdiagnosed. To date, half of case reports were from Hong Kong patients [1,2,10]. This is the only fifth case described in Europe, and the third in France, since its first description in 2007 [6–8]. Several reports also described the detection of *Catabacter* spp in environmental sources, such as urban aerosols in the United States [11], mangrove sediment in Japan [13]. *Catabacter hongkongensis* has also been described as a commensal intestinal bacteria of an aquatic herbivorous mammal in Japan [14].

Our case supports that *Catabacter hongkongensis* bacteremia is associated with a very high mortality rate in patients suffering from advanced malignancies. Including this case, all patients with malignancies died from this infection (six cases reported worldwide up to now). It is important to highlight that our patient was just diagnosed for a metastatic malignancy and previously had a good condition. Importantly, most cases occurred in patients with gastrointestinal malignancies (primary tumor or metastasis), intestinal obstructions or infections. Thus, the main hypothesis sustained being a gastrointestinal translocation. In our situation, the patient’s symptoms were mostly respiratory due to bronchial obstruction. However, he also had huge bilateral adrenal metastases. These necrotic lesions (both in the thorax and in the abdomen) may be the source of the bacterium. Given the very few number of cases described worldwide, further epidemiological and metagenomical studies are required to better understand the reservoir, phylogeny, virulence factors, pathogenicity, and eventually contamination way(s). Previous case reports described that some strains could be resistant to penicillin and cephalosporin [1,3,7], two antibiotics commonly used in primary intention. Importantly, *Catabacter hongkongensis* was mostly sensitive to metronidazole and vancomycin treatment [1,6,8].

**Conclusion**

This new observation of fatal septic shock associated with a *Catabacter hongkongensis* bacteremia highlights that this infection is associated with a poor prognosis in neoplasic patients, with a 100 % mortality among reported cases. Obviously, publication bias could explain this high mortality rate. However, identification of Gram-positive coccobacilli in anaerobic blood samples should not be considered as a contamination especially in neoplasic patients, with necrotic tumors. The rarity of this infection and the long delay of culture may defer the introduction of adapted antibiotics.

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**Ethical approval**

Ethical Approval in accordance with local regulations.

**Consent**

No consent needed for this paper.

**Declaration of Competing Interest**

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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