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CASE REPORT

Empyema caused by *Kingella denitrificans* and *Peptostreptococcus spp.* in a patient with bronchogenic carcinoma

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ABSTRACT: Empyema caused by *Kingella denitrificans* and *Peptostreptococcus* spp. was diagnosed in a patient with bronchogenic carcinoma. This appears to be the third report providing evidence of a pathogenic role for *K. denitrificans*, and the first concerning infection in the pleural space and in a patient with underlying immunosuppressive disease. *K. denitrificans* should be added to the list of fastidious gram-negative bacteria associated with opportunistic infections in the compromised host.

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Patients with malignancy have a high morbidity and mortality due to infection [1]. Local obstruction plays a prominent role in infection occurring in such patients. They are particularly susceptible to infection by organisms of the upper respiratory commensal flora [2]. *Kingella denitrificans* is a gram-negative aerobic rod of recent identification [3] and taxonomic classification [4] isolated from throat swabs in asymptomatic carriers, with unknown pathogenicity.

We report a patient with bronchogenic carcinoma who developed an empyema caused by *Kingella denitrificans* and *Peptostreptococcus* spp. This appears to be the third report providing evidence of a pathogenic role for *Kingella denitrificans*, and the first concerning infection in the pleural space of a compromised host.

Case report

A 42 year old man was admitted to the hospital with a two month history of progressive deterioration of his general condition. He was a heavy cigarette smoker. There was a history of tuberculous meningitis, uncomplicated duodenal ulcer, and amputation of the right lower extremity for obliterans vascular disease.

Examination revealed cachexia, signs of dehydration, paleness of the skin and mucosa, acropachy, amputation of the right lower extremity, reduction of distal pulses in the left leg, systolic ejection murmur, and signs of left pleural effusion. The erythrocyte sedimentation rate (ESR) was 102 per hour; haematocrit 27%, haemoglobin 93 $g \cdot l^{-1}$; white blood cell count 13,700 mm^{-3} with 74% segmented neutrophils, 14% lymphocytes and 7% monocytes. The total serum proteins were 60 $g \cdot l^{-1}$. Results of urinalysis and liver and renal function tests were normal. Arterial pH was 7.44, Po_2 6.1 kPa (46 mmHg) and Pco_2 6.3 kPa (48 mmHg ; the oxygen saturation was 83.7%, and the standard bicarbonate 31 $mmol \cdot l^{-1}$. Chest X-ray showed a right apical cavitation, obliteration of the costophrenic angle and massive pleural effusion in the left hemithorax. Two blood cultures were negative and Ziehl-Neelsen stain failed to demonstrate acid-fast bacilli in six sputum smears.

Thoracocentesis revealed a purulent exudate with neutrophils too numerous to count. Culture of the pleural fluid was positive; the organisms were identified as *Peptostreptococcus* spp. and *Kingella denitrificans* sensitive to ampicillin, tetracycline, gentamicin and penicillin.

An intercostal catheter was inserted for continuous drainage. Treatment was started with penicillin and gentamicin, oxygen therapy and respiratory physiotherapy; however, the patient required intubation and mechanical ventilation in the Intensive Care Unit because of retained bronchial secretions and acute respiratory failure. *K. denitrificans* was identified in three new cultures of the pleural aspirate over a period of three days from first to last culture.

Fibreoptic bronchoscopy through the orotracheal tube showed bronchial obstruction due to a mass in the left main bronchus. Histological examination demonstrated an epidermoid carcinoma and cytological examination of the pleural fluid disclosed malignant cells compatible with squamous cell carcinoma. The patient died three days after regaining spontaneous breathing.

The four smears from pleural exudate were cultured on blood agar under aerobic and anaerobic conditions, and chocolate agar in a microaerophilic atmosphere, and

in tioglycolate broth. Numerous small, circular, low, convex colonies appeared after 24 h of incubation at 37 °C. Haemolysis was not produced under the colonies. Gram stained smears showed gram-negative coccobacilli in pairs and short chains. Table 1 refers to the results of the biochemical tests performed on the strain.

Table 1. – Identification of *Kingella denitrificans*

Test	Result
ß-haemolysis	-
Oxidase production	+
Catalase production	-
Acid from glucose	+
Acid from sucrose	-
Acid from maltose	-
Acid from fructose	-
Motility	-
Urease production	-
Growth on Mac Conkey agar	-
Growth in anaerobic conditions	+ (weak)
Citrate utilization	-
ß-galactosidase production (ONPG-test)	-
Sensitivity to penicillin	+
Growth on Thayer-Martin agar	+

Discussion

K. denitrificans (previously called TM-1 because of its ability to grow on Thayer-Martin agar) [4, 5] is a new species of upper respiratory tract commensal with pathogenic potential under exceptional circumstances. Of the strains referred to the Centre for Disease Control, Atlanta, USA, more than 80% were isolated from the respiratory tract with five isolates from rectal and genitourinary sources and two from blood [6]; however, only two strains could be considered as causes of disease. There are only two reports of *K. denitrificans* acting as a pathogen in cases of endocarditis [7, 8]. GOLDMAN *et al.* [7] described a 31 year old patient with aortic stenosis who had undergone open commissurotomy at the age of twelve, and gave a history of dental cleaning without prophylaxis two months before admission. The patient reported by SWANN and HOLMES [8], had an infection complicated by a large vegetation with embolisation necessitating valve replacement, with no history of previous cardiological abnormalities or recent dental manipulations. In both patients, treatment with ampicillin and ampicillin and gentamicin, respectively, produced an uncomplicated recovery. The strain of *K. denitrificans* isolated in the case of SWANN and HOLMES [8] was moderately sensitive to penicillin, whereas in the case of GOLDMAN *et al.* [7] sensitivity to penicillin was not mentioned. Bergey's Manual of Systematic Bacteriology states the consistent sensitivity to penicillin of *K. denitrificans*, as found in our case.

In the present case, obstruction of the main left bronchus from the squamous cell carcinoma played a prominent role in pleuropulmonary infection. Organisms of the upper respiratory tract commensal flora are encountered as pathogens causing mixed infections in the compromised host [1, 2, 9]. Although the presence of *Peptostreptococcus* spp. and *K. denitrificans* in the oropharynx was not documented in our patient, repeated identification of *K. denitrificans* from the theoretically sterile pleural space strongly supports the pathogenicity of this organism. Aerobic and anaerobic bacteria are frequently implicated in the aetiology of empyema [10] as occurred in our case with the association of *K. denitrificans* and *Peptostreptococcus* spp.

The pathogenic potential of *K. denitrificans* should be considered in patients with underlying respiratory disease in whom this organism may cause pneumonia and/or empyema.

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RÉSUMÉ: Un empyème causé par *Kingella denitrificans* et *Peptostreptococcus spp.* a été diagnostiqué chez un patient atteint de cancer bronchique. Ceci semble être le troisième cas démontrant un rôle pathogène pour *Kingella denitrificans*, et le premier concernant une infection pleurale chez un patient atteint d'une maladie sous-jacente à caractère imuno-suppresseur. *Kingella denitrificans* devrait être ajouté à la liste des bactéries à Gram (-) à croissance lente associées à des infections opportunistes chez les sujets en imuno-dépression.