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Case report

# MALDI-TOF vs. VITEK 2 for identification of *Aggregatibacter actinomycetemcomitans* chest wall abscess

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ABSTRACT

*Aggregatibacter actinomycetemcomitans* (*A. actinomycetemcomitans*) is a facultative anaerobic Gram-negative coccobacillus that is associated with a variety of diseases in humans. In the present study, the isolate finally identified as *A. actinomycetemcomitans* by MALDI-TOF was misidentified as *Pasturella canis* or *Pasturella multocida* by the automated VITEK 2 system. The findings re-enforce the importance of an accurate and rapid diagnosis to assist patient management.



## 1 Introduction

*Aggregatibacter actinomycetemcomitans* (*A. actinomycetemcomitans*) was first isolated from patients with cervicofacial actinomycosis in 1912. It is part of the oral microbiota and can be recovered on culture of oral secretions in up to 20% of healthy people [1]. *A. actinomycetemcomitans* and other members of the AACEK (formerly HACEK) group are primarily associated with bacterial endocarditis [2]. *A. actinomycetemcomitans* is most commonly associated with aggressive periodontitis, and its infection can result in tooth loss and systemic complications [3]. Extra-oral infections due to *A. actinomycetemcomitans* include pneumonia, osteomyelitis, septic arthritis, cervical lymphadenitis, and urinary tract infection [4–8]. *A. actinomycetemcomitans* also causes soft-tissue abscesses, particularly of the chest wall, mandibular area or brain [9–11]. Here, we report the misidentification of A. *actinomycetemcomitans* using the automated VITEK 2 system.

## 2 Case presentation

A 56-year-old male with a medical history remarkable for hypertension, and gastroesophageal reflux disease presented to an urgent care center for an enlarging painful, erythematous mass on the left side of the chest, which was first noticed 2 months prior to admission. The patient was prescribed a 10-day course of doxycycline 100 mg. Upon worsening of symptoms, the patient came to the hospital for further evaluation. He reported having a pet cat but denied recent scratches or bites. The patient was afebrile, and vitally stable (blood pressure 112/75-mmHg, heart rate of 86 bpm, respiratory rate 15/min, and blood oxygen saturation level of 100%). Laboratory studies conducted at the time of admission revealed a normocytic anemia with a normal white cell count. A chest CT scan with contrast showed a lower left chest and abdominal wall ill-defined approximately 15 cm in diameter mass with intercostal muscle involvement with no rib destruction. An abscess was suspected clinically and radiographically. The patient underwent incision and drainage of large volume of purulent material both superficial and deep in the soft tissues. The patient underwent two additional surgeries, and was subsequently placed on six weeks of antibiotics (ceftriaxone and metronidazole), with excellent improvement.

A tissue specimen through incision and drainage was submitted to our laboratory for bacterial and fungal cultures. After 48 hours of incubation at 35°C in 5% $CO_2$, round-shaped and translucent colonies grew poorly on chocolate agar, but not sheep blood agar (tryptic soy agar containing 5% defibrinated sheep blood). No growth was also noted on MacConkey and Columbia CNA agars. Microscopic examination of a Gram-stained smear revealed small Gram-negative coccobacilli (Fig. 1a). The isolate was subcultured to solid media, including sheep blood and chocolate agars. The X- and V-Factor disks impregnated with X (hemin) and V (nicotinamide adenine dinucleotide - NAD) growth factors were also set up. After 24hours of incubation at 35°C in 5% $CO_2$, the isolate grew poorly on sheep blood and chocolate agars, but better on chocolate agar (Fig. 1b, c). The colonies on sheep blood agar are non-hemolytic. Since the isolate did not require X and V growth factors, *Haemophilus* spp. was ruled out. The isolate tested positive for

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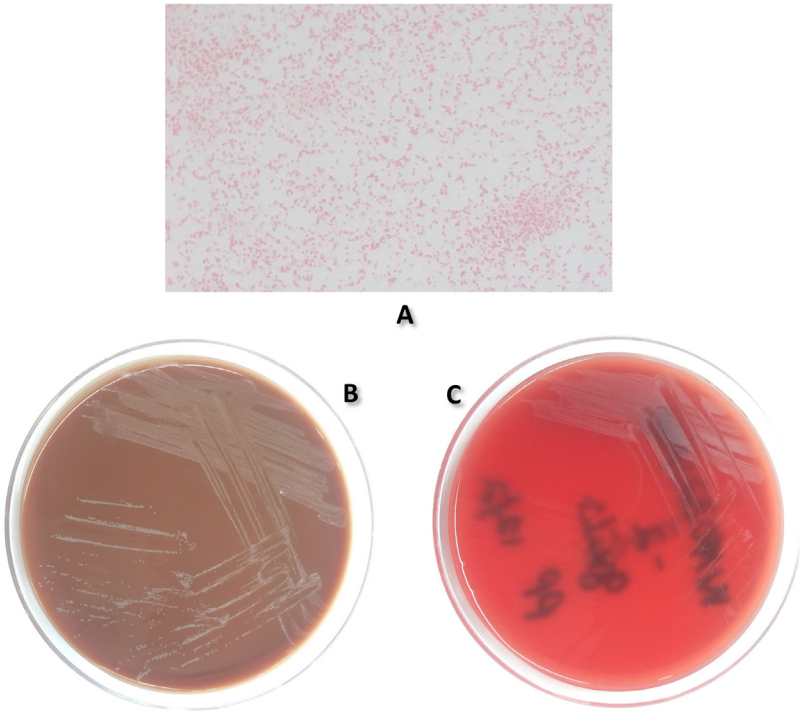


**Fig. 1. A.** Microscopic examination of a Gram-stained smear revealed small Gram-negative coccobacilli. **B.** Colonies of the isolate on chocolate. **C.** Sheep blood agars. Round-shaped and translucent colonies were observed.

cytochrome oxidase and catalase but tested negative for urease production by a urea agar slant. Together, these observations ruled out possible select agents, including Francisella tularensis and Brucella spp., so enhanced biosafety precautions were not implemented. Following primary isolation, the isolate was subjected to automated phenotyping using the VITEK 2 Gram-Negative Identification card (BioMerieux, Durham, NC, USA) following the manufacturer's instructions for use. Primary phenotypic testing identified the isolate as *Pasteurella canis* with a good confidence score of 95%. *Pasteurella canis* often grows well on sheep blood and chocolate agars after 24 hours of incubation. Therefore, the growth characteristics of the isolate were not consistent with *Pasteurella canis.* The identification was repeated by the VITEK 2 system, and the isolate was identified as *Pasteurella multocida* with a good confidence score of 94%. Due the discrepancy between the VITEK 2 system results, the identification of the isolates by MALDI-TOF MS (matrix-assisted laser desorption/ionization time-of-flight mass spectrometry) was performed. The isolate was finally identified as *Aggregatibacter actinomycetemcomitans* by Bruker MALDI-TOF MS with an excellent confidence score of 2.3.

## 3 Discussion

Rapid and accurate identification of microorganism is an important task in clinical microbiology laboratories. Conventional phenotypic and genotypic techniques have been primarily used for microbial identification; however, it is difficult and time-consuming to define the identification of many slow-growing and fastidious microorganisms. The current study showed the limitation of the automated VITEK 2 system for the identification of *A. actinomycetemcomitans*. Misidentification might lead to prolonged hospitalization, patient mortality, and increased healthcare cost. In addition, VITEK2 took 6hours and MALDI-TOF approximately 10-minutes in identifying bacteria. Improved clinical outcomes are associated with rapid identification of the causative pathogen and administration of appropriate antimicrobial therapy. Our findings are in line with other studies that MALDI-TOF MS has better performance than VITEK 2 [12,13]. Thus, MALDI-TOF MS constitutes a valuable diagnostic tool in clinical microbiology laboratories.

## Ethics declarations

Study ethics: The informed consent was obtained from the patient for publication of this case report.

## Declaration of Competing Interest

The authors declare that they have no conflict of interest

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