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Wound infection caused by *Pasteurella canis* and *Neisseria animaloris* after a dog bite

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Sir,

A 24-year-old patient attended the emergency department after a dog bite on her right hand. On examination, she presented a deep wound in the index finger of the right hand, without other associated complications. Anti-tetanus toxoid was prescribed, the wound was cleaned and desinfected without suturing, and she was discharged with 500 mg/8 h of oral amoxicillin/clavulanic acid completing 7 days of treatment. After 3 days, the patient came again to the emergency department due to worsening of her condition On examination she presented edema, erythema, and increased temperature in the second finger of the right hand, with associated collection. Blood tests showed 15000 leukocytes/µL with 11200 neutrophils. Surgical debridement was conducted, opening of the tendon synovial sheath and opening of the "A1 pulley", and two samples were obtained through needle aspiration for cultures. Antibiotic treatment was started with clindamycin and amoxicillin/clavulanic acid (600 mg/24 h and 1200 mg/8 h).

The samples were inoculated on chocolate agar, Columbia CNA agar and Tryptic Soy Agar (TSA) with 5% sheep blood (Becton Dickinson, New Jersey, USA), MacConkey agar, Brucella agar with hemin and vitamin K1 and BBE with Amikacin agar. Chocolate, TSA with 5% of sheep blood and CNA agars were incubated under aerobic conditions with 5% of CO_2 at 36±1ºC, MacConkey agar under aerobic conditions at 36±1ºC aerobiosis, whereas Brucella and BBE with Amikacin agars under anaerobic conditions at 36±1ºC. Gram staining showed Gram-negative bacilli and Gram-negative cocci, growing white-greyish colonies (Figure 2A) and scarce white-yellowish colonies (Figure 2B) after 48 h of incubation in TSA with 5% of sheep blood. The white colonies were identified as *Pasteurella* spp. using the API^R 20E strips (Biomerieux, Marcy-l'Étoile, France), while the yellowish colonies (Figure 2B) were identified as *Neisseria* spp. using the API^R NH strips, being this considered as a contaminant pending confirmation of the species. The susceptibility of *P. canis* was studied by MIC Test Strips^R (Liofilchem, Teramo, Italy) in BD^R Mueller Hinton Fastidious agar under aerobic conditions with 5% of CO_2 at 36±1ºC, and the interpretation was conducted according to the v13.0 European Committee on Antimicrobial Susceptibility Testing (EUCAST) guidelines [1]. *P. canis* was susceptible to penicillin (MIC = 0.38 mg/L), amoxicillin/clavulanic acid (MIC = 0, 38 mg/L), cefotaxime (MIC = 0.02 mg/L), doxycycline (MIC = 0.5 mg/L), ciprofloxacin (MIC = 0.06 mg/L) and trimethoprim/sulfamethoxazole (MIC = 0.125 mg/L). After two days, the wound was evaluated again, presenting somewhat necrotic edges with good appearance, without suppuration or erythema (Figure 1B). Antibiotics were changed to ciprofloxacin (400 mg/12 g IV) due to the onset of diarrhea, completing 10 days of treatment. She was discharged with good wound evolution and on oral ciprofloxacin (500 mg/12 h).

Species identification was conducted by 16S rRNA gene sequencing, obtaining two sequences of 450 and 473 bp were obtained, which were analyzed by BLAST^R and identified as *Pasteurella canis* and *Neisseria animaloris* with an identification rate of 98.89% and 99.37%, respectively. Both sequences were registered in GenBank^R with accession numbers "OP326753" for *P. canis* and "OP326754" for *N. animaloris*. Given the good evolution and non-viability of the strain, no additional testing was performed for *N. animaloris*.

Infections following animal bites or scratches in humans are usually polymicrobial, reflecting the oral flora of the animal producing the injury through bites or scratches [2]. Contact with the saliva of colonized or infected animals is also a possible route of transmission of zoonotic infections. In fact some infections caused by *Pasteurella spp.* or *Capnocytophaga canimorsus* (mouth commensals of dogs or cats) may not be preceded by bites or scratches [3,4].

Skin and soft tissue infections are most frequently caused

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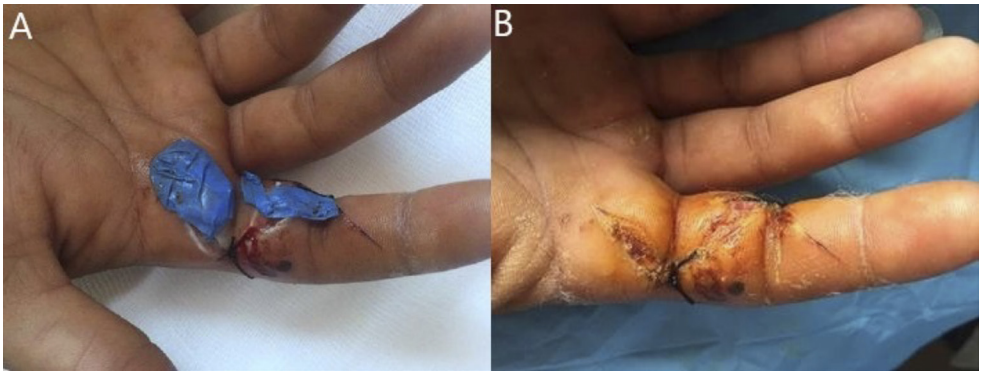

Figure 1 A: Surgical debridement of wound following dog bite due to complication with cellulitis and purulent collection.
B: Wound improvement with decreased cellulitis and erythema and absence of pus.

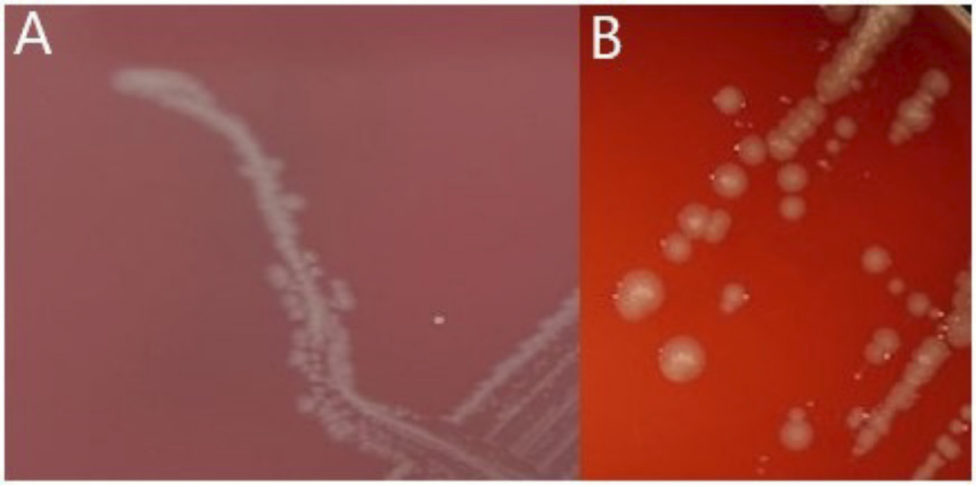

Figure 2 2A: growth of white-greyish colonies in TSA with 5% of sheep blood were firstly identified as *Pasteurella* spp. and then, species identification confirmed it as *P. canis*.
2B: growth of white-yellowish colonies in TSA with 5% of sheep blood were firstly identified as *Neisseria* spp. and then, species identification confirmed it as *N. animaloris* (we did not store an image the type of growth of *N. animaloris*, image belongs to Moa Skarin, Lise-Lotte Fernström & Ingrid Hansson).

by bacteria of the genus *Pasteurella*, with *Pasteurella multocida* being the most prevalent species. The most severe infections usually occur in patients who are immunocompromised, with comorbidities, or at extreme ages of life [3,5]. *P. canis* has been also reported causing from mild to severe infections such as skin and soft tissue infections to bacteremia or osteomyelitis [6,7]. In a retrospective study, *P. multocida* (48%) and *P. canis* (11%) were the main species found [7].

On the other hand, *N. animaloris* are Gram-negative facultative anaerobic cocci with arginine-dehydrolase activity, which reduce nitrites to gas and belonging to CDC group EF-4a as Gram-negative microorganisms recovered from human wound after dog or cat bites. [8]. It has been rarely reported causing both monomicrobial and polymicrobial infections with good response to treatment with beta-lactams or quinolones [9,10].

In the management of these infections, it is important to clean the wound with soap and water. The use of postexposure

antibiotic prophylaxis is controversial, although hand injuries seem to benefit from it, significantly decreasing infection rates. Beta-lactams, tetracyclines, or the combination of quinolones with clindamycin are often used as antibiotic prophylaxis [11]. In case of extreme pain, exposure of underlying muscle or bone, signs of superinfection, if the dog's rabies vaccination status or the patient's tetanus vaccination status is unknown, appropriate evaluation and treatment is important.

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None to declare

CONFLICT OF INTEREST

Authors declare no conflict of interest.

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