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Research Article

Klebsiella Pneumoniae Infection in a Squirrel Monkey (Saimiri Sciureus) in Grenada, West Indies

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Abstract

An 11 month-old squirrel monkey that died after one week of illness, characterized by anorexia, lethargy, pale mucosae, and dehydration was presented for post-mortem examination. A large retroperitoneal abscess with adhesions to the colon was found on necropsy. Culture of the pus from the abscess on blood agar and MacConkey agar, resulted in heavy growth of *Klebsiella Pneumoniae.* The significance of this organism as a cause of morbidity and mortality in non-human primates with particular reference to squirrel monkeys is discussed.

Keywords: *Klebsiella Pneumoniae*, squirrel monkey, Grenada.

Introduction

Klebsiella Pneumoniae is a Gram-negative, aerobic, non-motile, rod-to coccobacillus shaped, capsulated bacterium. This organism is a normal intestinal and oral commensal in many nonhuman primates, but infections from pathogenic strains can cause significant morbidity and mortality in these animals (Simmons and Gibson, 2012). Multisystemic abscesses due to invasive *K. pneumoniae* strains have been reported in African Green monkeys in the United States recently (Twenhafel *et al*., 2008). Also, in the recent past, wild-caught and captive monkeys in the Caribbean Island of St. Kitts have been shown to harbor potentially pathogenic strains of *K. pneumoniae* (Whitehouse *et al*., 2010). In all these contexts, international interest on this organism as a cause of disease in non-human primates exists. The

present report deals with a fatal case in a pet squirrel monkey in Grenada, West Indies.

History and Methods

An 11 month-old female squirrel monkey brought from Trinidad was kept as a pet along with dogs and rabbits in a Grenadian house-hold for 2 months. It was fed with vegetables, apples, eggs, and dog food. It was kept in a cage, but was allowed to wander about in the yard. It became ill, and the clinical signs included lethargy, pale mucosae, and dehydration. The animal died after one week of illness. It had no history of vaccination or any treatment.

Necropsy was carried out in approximately 24 hours after death, histopathological examination and culture of sample(s) from gross lesions for aerobic bacteria employing blood agar and MacConkey media were carried out. Following preliminary tests on bacterial isolate(s) for colony morphology, appearance on Gram stain, motility, indole, and oxidase tests, the Analytical Profile Index (API) 20 E strips (Bio-Merieux Inc., Durham, NC, USA) was used to identify species level as per the manufacturer's instructions. Antibiotic susceptibility tests were done against 8 drugs using the standard disk diffusion method on Mueller-Hinton agar, and the inhibition zone sizes were interpreted as recommended by the Clinical and Laboratory Standards Institute (2008).

Results and Discussion

The carcass showed emaciation. Necropsy revealed a large retroperitoneal abscess (4x3x2 cm) with chronic adhesions of the colon to the abscess and unilateral left moderate hydronephrosis. The abscess had a thick capsule with many degenerating neutrophils and necrotic debris. Aerobic culture of pus from the abscess on Blood agar and MacConkey agar yielded heavy, pure growth of a moderately mucoid Gram-negative, rod-shaped bacterium resembling *Klebsiella* spp. after 24 hours incubation at 37°C. . In the API 20E strip, the isolation gave positive reactions for beta-galctosidase, lysine decarboxylase, citrate utilization, urea hydrolysis, acetoin production, and fermentation of glucose, mannitol, inositol, sorbitol, rhanmnose, sucrose, melibiose, amygdalin, and arabinose. It gave negative reactions for arginine

dihydrolase, ornithine decarboxylase, hydrogen sulphide production, deaminase, indole production, and gelatinase. In the oxidase test, it gave a negative reaction. The organism was identified as *Klebsiella Pneumoniae* with 98% probability, which was a very good identification according to API database. The antibiotic susceptibility tests showed that the isolation was resistant to ampicillin, and susceptible to amoxicillin-clavulanic acid, cephalothin, chloramphenicol, enrofloxacin, gentamicin, sulfamethoxazole-trimethoprim, and tetracycline.

Monkeys, including squirrel monkeys are susceptible to several bacterial pathogens that cause disease in humans, and these include both Gram-positive organisms, particularly of the *Mycobacterium* spp. (Hariharan 1988, Brammer *et al*., 1995, Henrich *et al*., 2007), and Gram-negative organisms of the family

Enterobacteriaceae. Infections due to enteric organisms include those caused by *Shigella* (Juan-Sallés *et al*., 1999), *Yersinia pseudotuberculosis* (Buhles *et al*., 1981, Plesker & Claros, 1992, Iwata *et al*., 2010), and *Klebsiella Pneumoniae* (Richard, 1989). Other reported bacterial infections in these animals include a case of tularemia in the United States (Beckwith, 2006).

Subcutaneous abscesses were the feature of an epidemic infection with *K.pneumoniae* in a squirrel monkey colonyin French Guyana (Richard, 1989). Multisystemic abscesses have been reported in African Green monkeys (*Chlorocebusaethiops*) in a facility of the US Army Medical Research Institute recently (Twenhafel *et al*., 2008). A hypermucoviscosity phenotype of *K.pneumoniae* has been found to cause invasive infections in nonhuman primaes in the US and in the Caribbean Island of St.

Kitts in the recent years (Whitehouse *et al*., 2010, Burke *et al*. 2009). This emerging phenotype can cause abscesses, often associated with metastatic complications (Whitehouse *et al*., 2010). In our study, the isolation was moderately mucoid, and not “hypermucoid”. However, fatal infections due to regular colony types of *K. pneumoniae* has been reported in dogs, including deaths in several adult animals in the United States(Roberts *et al*. 2000). The possibility of a pet monkey acquiring virulent strains from dogs should not be ignored, especially when a monkey is kept in close contact with dogs in the same household, as it was the case in the present study. Vaccination of monkeys against *K.pneumoniae* infections may be a useful strategy. Protection of squirrel monkeys against this infection has been demonstrated using a *K. pneumonia* capsular polysaccharide vaccine many years ago (Richard, 1989, Postal *et*

al., 1988).The predisposing causes for the abscess formation in the present case are not known. In humans, diabetes is a predisposing factor for abscess formation due to *K. pneumoniae* (Lin *et al*., 2013). Immunodeficiency may have been present. Whether the monkey had lentivirus infection was not investigated, although there were no lesions consistent with such infection. Serotyping of the bacterial isolation and study of its virulence characteristics will be attempted in future.

This fatal case of *K. pneumonia* infection in a squirrel monkey is being reported for the first time in Grenada. This case further shows that this organism is becoming increasingly important as a cause of morbidity and mortality in captive monkeys. Pet owners and veterinarians should be aware of this infection and its zoonotic implications.

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