

Rat-bite Fever, Canada

To the Editor: Rat-bite fever was once considered an infection exclusive to children living in poverty; however, dense urban housing and changing pet-keeping practices may be altering this profile (1,2). To date, ≈200 cases of rat-bite fever have been reported in the United States (3), and a recent study reported a 2-fold increased incidence in California during the 1990s (1). We report on 2 cases that occurred in Ontario, Canada, in the early 2000s.

The first case occurred in a previously healthy 29-year-old man who was bitten on the finger by a pet rat. The wound healed spontaneously. After 24 hours, fever and emesis developed; 4 days later, diffuse maculopapular rash and migratory arthritis of the knees, ankles, and finger joints ensued. Physical examination showed a maculopapular rash over the lower extremities, an effusion of the left knee, and a warm, erythematous left ankle.

Laboratory investigations showed hemoglobin level of 134 g/L, leukocyte count of $16.0 \times 10^9/L$, and neutrophil count of $13.8 \times 10^9/L$. Aspiration of the knee produced 70 cm³ of cloudy fluid; synovial fluid analysis showed $666 \times 10^6/L$ leukocytes with a predominance of neutrophils.

Ceftriaxone, 2 g once a day, was given intravenously for 7 days. Although symptoms improved within 24 hours, the effusion recurred within 48 hours of discontinuing the initial course of ceftriaxone. The knee was surgically drained, and ceftriaxone was continued for 5 weeks. Systemic symptoms and the effusion resolved.

The second case occurred in a previously healthy 9-year-old girl who had mucosal contact with a pet rat. She sought treatment after 7 days of generalized maculopapular and pustular rash and 10 days of fever and headache. She had an associated asymmetric, migratory arthritis.

Physical examination showed superficial scratches from the rat; temperature of 39.6°C; heart rate of 102 bpm; swelling, erythema, and decreased range of motion in several joints; and pustular lesions on the soles of the feet.

The patient's leukocyte count was $8.3 \times 10^9/L$. Synovial fluid from the knee showed $45.5 \times 10^6/L$ leukocytes with 89% neutrophils; the culture showed no growth. Gram stains of blood and pustule swabs showed large, pleomorphic, gram-negative bacilli with long filaments and irregular swellings. Growth occurred on the blood culture after 28 hours of aerobic incubation at 35°C in 10% horse serum. Characteristic puff-ball colonies of *Streptobacillus moniliformis* were seen in supplemented thioglycolate broth.

Identification of the organism was confirmed by using the Sherlock (MIDI Inc., Newark, DE, USA) system. The major cellular fatty acid components of the isolate matched an *S. moniliformis* reference strain. The patient received penicillin and gentamicin intravenously for 6 days and was discharged home with a 10-day regimen of amoxicillin. One year later, she remained asymptomatic.

Rat-bite fever commonly results from infection with the zoonotic pathogens *S. moniliformis* and *Spirillum minus*. *S. moniliformis* is more common in Western countries, and *S. minus* predominates in Asia (3). *S. moniliformis* colonizes the nasopharynx of healthy rats (4) and is transmitted by the bite or scratch of rats, squirrels, mice, guinea pigs, and, rarely, cats and other rodent predators. Occasionally, it is transmitted by ingestion of contaminated milk or water. (5,6). The site of inoculation with *S. moniliformis* usually heals before systemic symptoms develop. After the incubation period of 1 to 22 days, patients experience fever, chills, myalgia, headache, and rash. The rash consists of macules, vesi-

cles, and pustules on the extremities; soles and palms are frequently involved. Joint symptoms range from polyarthralgia to migratory polyarthritis with purulent effusions. A nonsuppurative migratory polyarthritis occurs in ≈50% of patients (5,7). In rare cases, rash and arthritis may be absent (8).

When *S. minus* (a spirochete) is introduced by rat bite, the bite wound initially heals but then ulcerates, followed by regional lymphadenopathy and a distinctive rash of red and purple plaques. Arthritic symptoms are rare (9).

Complications of rat-bite fever include destructive joint disease, pericarditis, endocarditis, abscesses, pneumonia, parotitis, pancreatitis, and, rarely, meningitis and amnionitis. Development of endocarditis results in a mortality rate of up to 50% (5).

S. moniliformis can be isolated and cultured from synovial fluid, blood, and abscesses. By contrast, *S. minus* has not been recovered on artificial media but can be seen by using dark-field microscopy with Giemsa or Wright stains.

Laboratory personnel must be notified when rat-bite fever is suspected because *S. moniliformis* does not grow in a routine sheep blood or MacConkey agar; it requires rat or horse serum, defibrinated blood, or ascitic fluid to sustain growth. Growth of *S. moniliformis* is inhibited by sodium polyanetholesulfonate, a substance that is added to blood culture bottles to inhibit the antimicrobial action of blood (4,8).

Optimal treatment for rat-bite fever is penicillin G given intravenously for 7 to 10 days, followed by penicillin V taken orally for 7 days. Alternatively, tetracycline may be used (5,7,9).

Although rat-bite fever is uncommon, it is increasingly seen as a result of changing patterns of urban living and pet-keeping practices. If unrecognized, this infection can have

debilitating sequelae and can be life threatening.

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Cutaneous Injury and *Vibrio vulnificus* Infection

To the Editor: *Vibrio vulnificus* infection is transmitted by eating contaminated seafood or by exposure to seawater through an open wound (1). Among immunocompromised persons, especially those with chronic liver disease, *V. vulnificus* can cause a life-threatening illness characterized by blistering skin lesions, necrotizing fasciitis, and septic shock (2-5). However, the epidemiology and risk factors for severe forms of *V. vulnificus* infection among healthy persons are less well documented (4-6).

We conducted a retrospective clinical record review of *V. vulnificus* infections in persons admitted to all public hospitals from January 1, 2003, through August 31, 2005, in Hong Kong, which has a population of >6 million persons. We defined a case-patient as a patient with culture of *V. vulnificus* from any clinical specimen. A record search of clinical case notes was performed through a computerized clinical management system maintained by the Hospital Authority, which manages all public hospitals in Hong Kong. For each case-patient identified, we reviewed demographic data (age, sex, occupation, residence), clinical and laboratory data (date of onset, symptoms, laboratory investigation findings, diagnosis, outcome), and potential risk factors (past health and possible source of exposure) associated with the case. We compared previously healthy patients with patients who had predisposing medical conditions in terms of demographic profile, clinical signs and symptoms and outcome, and known exposure factors. Mann-Whitney U tests, χ^2 tests, or Fisher exact tests were used to detect significant differences ($\alpha = 0.05$).

We identified 29 cases over the 32-month study period. Twenty-two

(76%) patients had disease onset from May through August, the summer season in Hong Kong. Fifteen (52%) cases were in men, and the median age was 70 years (range 24-82 years). Fifteen (52%) patients had underlying illnesses that were known to predispose them to *V. vulnificus* infection, including chronic liver disease (30%), chronic renal failure (15%), diabetes mellitus (7%), and thalassemia major (3%). Fourteen (48%) patients were previously healthy. No significant differences in age and sex were found.

Among the 14 previously healthy patients, the consequences of *V. vulnificus* infection included necrotizing fasciitis (70%), severe cellulitis (7%), primary septicemia (14%), and gastroenteritis (7%). Two patients who had necrotizing fasciitis and 1 patient with primary septicemia died. Compared with patients with predisposing medical conditions, patients with a history of good health had a higher (but not significant) proportion of necrotizing fasciitis (70% vs 47%, $p = 0.12$), a lower proportion of septicemia (14% vs. 27%, $p = 0.26$), and an equal number of severe cases of cellulitis (7% vs. 7%). Furthermore, fewer patients with a history of good health died than did patients with predisposing illnesses (21% vs. 33%, $p = 0.25$). The median duration between symptom onset and admission for all patients was 1 day (range 0-3 days), with no significant difference between the 2 groups.

A history of cutaneous injury or a skin prick from a seafood part (e.g., fish fin, shrimp spine, or crab leg) was significantly more common among previously healthy patients than among patients with predisposing illnesses (70% vs. 27%, $p = 0.02$). Ten (83%) of the 12 previously healthy patients with necrotizing fasciitis and septicemia reported a history of cutaneous injury. The corresponding proportion was significantly lower (31%) among patients with predisposing medical conditions ($p = 0.01$). Among