

Peer Reviewed

Rat Bite Fever

An 8-year-old boy presented to his physician for recurring symptoms, including high fever of 18 hours' duration.



A viral infection was suspected and conservative treatment with antipyretics and rest recommended. The fever abated and recurred a few days later, accompanied by maculopapular rash, headache, chills, myalgia, and arthralgia. The boy was admitted to the hospital, and an infectious disease consultation was requested.

HISTORY

During examination, the physician learned that the family had purchased a healthy-looking pet rat from a local pet store 2 weeks earlier. However, 3 days before onset of the boy's fever, the rat had bitten the boy; the bite was described as "very minor."

Rat bite fever was suspected and treatment with penicillin started. Detection of *Streptobacillus moniliformis* by polymerase chain reaction (PCR) assay confirmed the diagnosis.

On the physician's recommendation, the parents contacted their veterinarian to discuss what could be done to prevent disease recurrence.

? Ask Yourself...

- What is the best approach to preventing occurrence or recurrence of rat bite fever?
- A. Collect an oral swab from the rat for bacterial culture.
 - B. Collect an oral swab from the rat for PCR testing for *S moniliformis*.
 - C. Treat the rat with antimicrobials for *S moniliformis* eradication.
 - D. Remove the rat from the household.
 - E. Discuss rat bite prevention and general hygiene practices.

CONTINUES

Streptobacillus moniliformis is a common oral commensal that can be found in most (if not all) rats.

CORRECT ANSWER: E
Discuss rat bite prevention and general hygiene practices.

Rat bite fever is a rare but serious infection predominantly associated with pet rats. In North America and Europe, *S moniliformis* is the cause, while *Spirillum minus* is most common in Asia.¹ *S moniliformis* is a common oral commensal that can be found in most (if not all) rats.¹ Transmission is mainly through biting, although contact of rat saliva with skin lesions and other close contact (kissing, sharing food) are also a concern. Some cases have been reported in the absence of any known high-risk contact.² Rat bite fever in humans has been associated with other species, including various rodents and dogs.¹⁻⁴

SIGNS & COMPLICATIONS

Children under 12 years of age are most often affected,⁵ likely because of close rat contact, frequency of rat ownership, and greater likelihood of being bitten. Typically, the first symptoms of disease occur 2 to 3 days after exposure, although

longer incubation periods (>3 weeks) have been reported.⁶ There is usually an abrupt onset of a high fever with headache, chills, vomiting, severe arthralgia, and myalgia. Fever may be relapsing and a rash typically develops, but there is usually no obvious abnormality at the site of the bite. Polyarthrititis is common and may be relapsing. The most serious consequence is endocarditis, which is uncommon but potentially life-threatening. Other complications include meningitis, myocarditis, pericarditis, pneumonia, and distant abscessation.⁵⁻⁹ Severe vomiting and pharyngitis (Haverhill fever) are most common after oral exposure.

TREATMENT OPTIONS

Response to appropriate treatment—typically with penicillin—is usually good, but endocarditis carries a poorer prognosis. Overall, the mortality rate is 7% to 10% if untreated.^{6,10}

Because *S moniliformis* is so common in healthy rats, screening the rat makes little sense, as it is a difficult organism to isolate by culture and a



Take-Home Messages

- Although the incidence of zoonotic infection is low in humans, zoonotic disease is an ever-present risk for pet owners.
- All rats should be assumed to be colonized with *S moniliformis*. Rat owners should be aware of the risk, use good practices to reduce likelihood of bites, properly clean any bite wounds, and avoid contact of rat saliva with broken skin or mucous membranes.
- Physicians need to be aware of pet exposure to facilitate accurate and prompt diagnosis of zoonoses.
- Rat bite fever should be considered in any person who develops a fever shortly after a rat bite or close contact with rat saliva.
- Although rare, rat bite fever can be severe, so the risk for infection to rat owners should not be ignored.

MEASURES TO REDUCE THE RISK FOR RAT BITE FEVER¹¹



- Good handling to reduce the risk for bites
- Proper training of children on how to handle rats
- Closely supervising children while they handle rats
- Restricting handling by children who cannot (or will not) properly handle rats
- Regularly inspecting cages and fixing any sharp edges that might lead to injuries that could inoculate *S moniliformis*
- If skin lesions are present, avoiding contact with rats or wearing gloves when handling rats; at a minimum, good attention should be paid to hand hygiene
- Avoid kissing or sharing food with rats

negative result does not exclude colonization. PCR testing is highly sensitive but of limited availability. In addition, a positive result would be fully expected because of the almost ubiquitous carriage of the organism. Treatment of rats to eliminate *S moniliformis* colonization is not recommended.¹¹ There is no evidence that decolonization is effective or required.

A key consideration is whether the problem is the rat, management, a high-risk household, or the inherent and unavoidable potential for zoonotic disease exposure by pet owners. In this household, there was no indication that the child was at higher risk for infection as a result of an underlying immunocompromising condition. There was no evidence that the rat posed a particularly high risk since the inciting bite was a result of poor handling and the rat had shown no further tendency to bite. Ultimately, it was up to

the owners to determine whether they were willing to tolerate any degree of risk, as one can never expect to have an animal free of zoonotic pathogens.

OUTCOME

After considering the issues, including attachment to the pet, the owners elected to keep the rat. Preventive measures (see **Measures to Reduce the Risk for Rate Bite Fever**) were discussed. They asked the infectious diseases physician about the need for prophylactic antimicrobial therapy should any future bites occur, but this was not recommended because there is currently no evidence that it is needed.

See **Aids & Resources**, back page, for references & suggested reading.

Screening rats for the organism is unnecessary, as it is difficult to isolate and negative results do not rule out colonization.