

## Can Haver Hill Fever be Transmitted through Ingestion?

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There are many infectious diseases of multiple etiologies that are transmitted through different routes, such as direct contact (dermatophytosis, monkeypox), inhalation (aspergillosis, chlamydiosis), ingestion (amoebiasis, shigellosis), bite of arthropods (Lyme disease, yellow fever), abraded skin/wound infection (necrobacillosis, tetanus), bite of animals (rabies, herpes simiae), and blood transfusion (toxoplasmosis, West Nile fever) [1-4]. Haver Hill fever also known as erythema arthriticum epidemicum, spirillary fever, streptobacillary rat bite fever, streptobacillosis, is an infectious zoonotic disease, which is caused by *Streptobacillus moniliformis*, a Gram negative, non-motile, fastidious, non-spore forming, highly pleomorphic, rod-shaped bacterium that colonize the nasopharynx of healthy rats [2,5,6].

Humans usually get the infection following the bite or scratch of an infected rat or occasionally by other rodents [2]. The exposure to contaminated bodily fluids of infected rodents can also result in Haver Hill fever. Rat is considered as a synanthropic mammal that prefers to resides in and around human dwellings, and is dependent on human habitation [2]. Rodents are known to transmit several infectious diseases to humans [2]. There are evidences to believe that transmission may sometime occur through ingestion of milk, water or food contaminated by organisms from the rat excreta [2]. This communication is an attempt to delineate whether Haver Hill fever can be transmitted through the ingestion of contaminated food.

The natural infection has been described in humans; and also, in gerbils, guinea-pigs, mice, rats, squirrels, and weasels [2,6]. Rats are recognized as the primacy host of *Streptobacillus moniliformis* [6] Haver Hill fever is a direct bacterial anthroozoonosis that is reported in several nations of the world including India [2,5-7]. The infection has been described in immunocompetent as well as immunocompromised subjects [5,7].

Haver Hill fever in humans starts with sudden onset. Clinical manifestations of disease in humans include high fever, headache, chills, nausea, vomiting, myalgia, arthralgia, polyarthritis, bluish-red exanthema, and pustules [2]. In addition, cough, epistaxis, palpitations are also observed [5]. The skin rashes are reported to occur in 3 out of 4 patients [6]. The complications of Haver Hill fever include endocarditis, pneumonia, and meningitis [2,6]. Death usually occurs due to endocarditis. It is reported that cardiac valvular abnormalities can occur in 50% of Haver Hill fever cases [7].

In animals, conjunctivitis, arthritis, bronchopneumonia, pneumonia, abscesses in the lymph nodes, middle ear infection, acute septicaemia, tenosynovitis, and abortion are observed [2].

Clinical signs of the patient, such high fever, headache, arthralgia, and bluish-red exanthema, pustules with a history of rat bite may be useful in tentative diagnosis. However, the laboratory help is imperative to establish an unequivocal diagnosis of Haver Hill fever. Direct microscopic examination of pus, joint fluid for the organism by Giemsa stain, isolation of bacterium from blood, skin lesions, joint fluid, lymph nodes into laboratory media (blood agar, brain heart infusion with blood), and detection of antibody in serum of patient are helpful to diagnose Haver Hill fever [2]. Recently, polymerase chain reaction (PCR) is employed for the detection of *Streptobacillus moniliformis* infection [8]. This bacterial zoonosis should be differentiated from brucellosis, ehrlichiosis and Lyme disease [2,6].

A number of antibacterial antibiotics, such as ampicillin, amoxicillin, ceftriaxone, cephalixin, doxycycline, erythromycin, gentamicin, penicillin and streptomycin are used in the management of disease [2]. The patient who is allergic to penicillin can be treated with doxycycline. It is suggested that treatment should be continued for about 4 weeks [2]. The fatality rate in untreated patients may reach above 10% [9]. The bacterium showed sensitivity to several antibiotic including amoxicillin, penicillin G, cephalixin, ceftriaxone, erythromycin, and gentamicin [5].

Currently, no vaccine is available to protect the susceptible population. Hence, the prevention and control of disease depend of certain measures which include avoid contact with rodents, destruction of rodents, provision of rat proof building, washing of hands with antiseptic solution after dealing with rat in the laboratory, protective wears to laboratory workers, immediate attention to the skin injury or wound by rat, proper pasteurization of milk, protection of food and water from rat and other rodents, and environmental sanitation [2,10]. It is important to mention that animal handlers, laboratory employees, and sewer workers should take suitable precautions against exposure to the rat and other rodents to prevent the transmission of infection [10]. Furthermore, laboratory staffs should be well acquainted with proper handling techniques of small animals [2].

It is advised that the patient showing the symptoms of fever, arthralgia, and skin lesions with a history of rat bite should be meticulously investigated for *Streptobacillus moniliformis* infection by employing standard laboratory techniques. It is emphasized that ingestion can also be considered as one of the routes of transmission of Haver Hill fever. Sincere attempts should be made to develop a very sensitive, specific, and low cost method that can easily identify the *S. moniliformis* infection in rats.

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