

**RAT BITE FEVER: SODOKU DISEASE AND HAVERHILL FEVER****Indrieș Mirela\***

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**Abstract**

*Rat bite fever is an uncommon disease known for its endemicity to occur worldwide. Although most patients tend to develop mild symptoms with improvement from conventional antibiotics, it can progress with severe complications with a mortality rate as high as 13% without proper treatment. Since many cases do not have a history of rat bite and may present with fever, rashes, and arthritis it is essential to distinguish it from other diseases. It is important to insist on epidemiological criteria and clinical manifestations to aid prompt detection and treatment of the disease.*

**Keywords:** Rat Bite Fever, Sodoku Disease, Haverhill Fever.

**INTRODUCTION**

Rat bite fever is a zoonosis, transmitted through the bites or the scratches of the rodents, especially rats, or by some domestic animals (dogs, cats, etc.). On the etiological and clinical we distinguish:

1. Sodoku Disease, described by Japanese authors, caused by *Spirillum minus* and
2. Haverhill Fever, described by American, caused by *Streptobacillus moniliformis*.

**1. Sodoku Disease (Spirillary Rat Bite Fever)**

Sodoku comes from joining of the 2 Japanese words: so = rat, doku = poisoned. From the patients blood was isolated a spirochaete, which in 1924 was called *Spirillum minus*. This body is a short Gram-negative spiral with two or three turns and it has never been cultivated in artificial media.

**Epidemiology:**

*Spirillum minus* commonly causes rat bite fever in Asia and sporadic cases have been reported in Australia, Africa, America and Europe. *S. Minus* was identified in the tongue muscles of the rats, mice, dogs and cats that are healthy carriers. The disease is transmitted to humans accidentally, directly through bites or scratches, or indirectly by handling or ingestion of food contaminated with urine of infected rats. 25% of rats tested were carriers of *S. minus* (1).

**Clinical Signs:**

The incubation period for Sodoku disease is 5 days to 4 weeks. The debut is suddenly, with fever (39-40 degrees), chills, and the period of state is characterized by a feverish intermittently a syndrome. Febrile relapses separated by afebrile periods are often seen in spirillary rat bite fever, these relapses can recur several times over 1 to 3 months. Simultaneously, presents a cutaneous syndrome, protrudes through a maculopapular rash, red-purple, with a tendency of junction, at the level of the hairy skin of the head, face and torso. At the level of the bite, the cutaneous lesion could cures spontaneous, but most of the times could become a red-purple zone accompany by regionally adenopathy with canker and necrosis (2). During this state patients can presents myalgias and arthralgia, which

often can develop into arthritis. In severe forms, patients may show signs of impaired CNS: headache, hallucinations, delirium to coma. Complications: endocarditis, meningitis, infarction, hepatitis, pleurisy, epididymitis, severe feripriva anemia. In the absence of treatment, the febrile syndrome may persist for 1-2 months, causing a mortality of 6-10%.

#### **Diagnosis:**

Spirillary rat bite fever is usually diagnosed by identifying the organism in the blood, lymph node aspirates, the bite wound, or erythematous plaques. *Spirillum minus* may be found in darkfield or phase contrast preparations, or after Giemsa, Wright's, or silver staining. This body is a short, spiralshaped, Gram-negative rod (0.2 to 0.5  $\mu$ m by 3 to 5  $\mu$ m) with two to three coils and bipolar tufts of flagella. It has not, to date, been successfully grown on artificial media. If microscopy is unsuccessful, blood or wound infiltrate can be inoculated into mice, guinea pigs or rats for *S. minus*-free diagnosis (3).

#### **2. Haverhill Fever (*Streptobacillary Rat Bite Fever*)**

Rat bite fever caused by *Streptobacillus moniliformis* is known by the name Haverhill Fever, Haverhill Fever was described in India 2000 years ago and is more outspread than Sodoku disease. In 1926, *Streptobacillus moniliformis* determined an epidemic disease in Haverhill town from Massachusetts (4).

#### **Epidemiology:**

*Streptobacillus moniliformis* is a microaerophilic, Gram negative bacillus, immobile, uncapsulated, pleomorphic bacillus (Fig.1). It often has spherical, oval, fusiform, or club-shaped swellings, in some cases, clumps of this bacterium may look like proteinaceous debris (5). It is found in the nasopharynx of the rats. The disease occurs sporadically in humans in poor housing. Haverhill fever is spreading all over the world, most common in the U.S. and occasionally in Europe. Transmission to humans is made directly through bites or scratches of the rats and by ingestion of the uncooked contaminated food or the water contaminated with urine of sick rats or indirectly, by manipulating with unprotected hands of dead rats or laboratory sick animals. *Streptobacillus moniliformis* penetrates through intact skin.

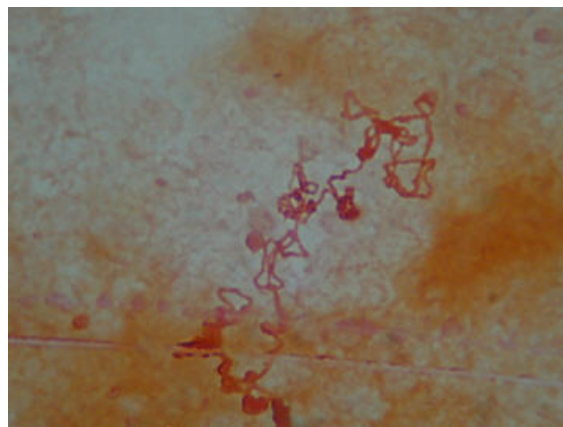


Figure 1. Gram stain appearance from blood culture, body identified as *Streptobacillus moniliformis*

[www.nzma.org.nz/journal/120-1254/2545/](http://www.nzma.org.nz/journal/120-1254/2545/)

**Clinical Signs:**

Incubation is 3-10 days. The debut is sudden with the infectious syndrome, manifested by high fever 40 degrees, chills, headache. When *Streptobacillus moniliformis* penetrates digestive tract, the patients presents digestive syndrome, manifested by nausea and vomiting. Myalgia and arthralgia may be associated with migration character. During status period, the infectious syndrome persists with intermittent nature. The cutaneous syndrome is a skin rash petechiae located on the palms, plants and extremities (6). Half of the patients has a rheumatoid or septic arthritis, asymmetrical at the level of large joints (7). They described cases of septic arthritis as a separate entity due to *Streptobacillus moniliformis*. The fever cedes spontaneously after 3-5 days, even in the absence of antibiotics treatment and the joints manifestations disappears in about 10-14 days. Complications: endocarditis, myocardial infarction, pericarditis, pneumonia, meningitis, sdr. anemic.

**Diagnosis:**

In humans, streptobacillary rat bite fever is usually diagnosed by culture of blood, joints fluid, or the wounds. Depending on the medium, it occurs singly or in chains. *S. Moniliformis* is fastidious and must be grown in media with 20% serum, blood, or ascites fluid, the laboratory should be informed that this body is suspected, as it does not grow well on conventional media. Inoculation into rodents can also be used for diagnosis. Serology is not considered to be reliable in humans. Polymerase chain reaction (PCR) assays is the ideal method but unusable in humans because of the large costs.

***Rat Bite Fever Treatment and Prevention*****Treatment:**

Rat bite fever can be treated successfully with antibiotics. Etiologic treatment is with penicillin in doses of 2-4 MIU daily for 7-10 days. Penicillin is most often prescribed, but Clarythromycin, Ampyciline, and other antibiotics are also used. The treatment results in a shorter clinical course and may prevent serious complications.

**Prevention:**

The risk of infection can be reduced by avoiding exposure to rats, particularly wild rats. According to Centers for Disease Control and Prevention (CDC), the wild rats populations around homes should be controlled. Food and water storage should be designed to prevent contamination by rodents, and potentially contaminated water and food sources should be avoided. Pasteurization of milk and sterilization of drinking water decreases the risk of Rat Bite Fever. Bites from rodents should be avoided as much as possible. Proper handling techniques and protective gloves can help prevent bites from laboratory animals. In addition, hand-to-mouth contact should be avoided with handling any rat or cleaning its cage. The hands should be washed after contact with rodents. If a bite occurs, it should be cleaned and disinfected promptly (8). In addition, the CDC recommends that persons bitten by a rat seek medical attention with antibiotics therapy and prophylaxy.

**MATERIAL AND METHOD:**

It was performed a retrospective study on the medical records of the hospitalized patients or of the patients presented at the Clinical of Infectious Diseases Oradea during 01.01.2005-31.08.2009. Sodoku disease diagnosis was established on clinical and epidemiological criteria.

## RESULTS:

In the period 2005 January 1 – 2009 January 1 at the Antirabies Center of the Bihor County has addressed 4041 patients with animal bites wounds (1021 with treatment) (Fig. 2).

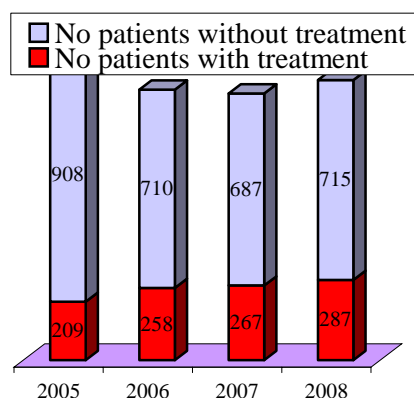


Fig.2 No patients who addressed with animal bites wounds

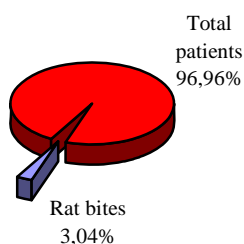


Fig 3 No patients with rat bites wounds

123 patients (3,04%) were with rat bites wounds (Fig.3). All patients were prescribed prophylactic antibiotic therapy: Clarithromycin or Betalactamaze Inhibitors. In Bihor county, the incidence of the rat bites wounds was between 0,033 ‰ in 2006 and 0,040 ‰ in 2008. Most of the patients became from rural areas and with poor social-economic conditions. It shows a growth from year to year the number of wound one bitten by rats and higher incidence of summer-autumn (Fig.4).

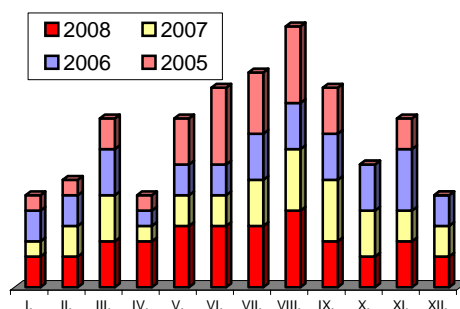


Fig.4 The rat bites distribution on months and years

In the last four years have been diagnosed 2 cases of rat bite fever, Sodoku interpreted as disease. The first case, the patient Z.F., aged 46 years, from rural medium, was hospitalized at 2 weeks after the onset of intermittent febrile syndrome caused by the rat bite on right arm, myalgias and arthralgia, vomiting and headaches. The clinical examination has revealed a red-purple zone at the level of the bite accompany by axilla adeneopathy, hepatosplenomegaly and asymmetric polyarthritis generally affecting the large joints. The laboratory tests highlighted an acute inflammatory syndrome. The second case, a patient N.A., aged 67 years, was presented with approximately the same symptoms, caused probably by ingestion of food contaminated with urine from by pet rodent.

## CONCLUSIONS:

Since many cases do not have a history of rat bite and may present with fever, rashes, and arthritis it is essential to distinguish it from other diseases. It is important to insist on epidemiological criteria and clinical manifestations to aid prompt detection and treatment of the disease.

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