Table 1.

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| PMID | | Age | Area | Rat Exposure, Route of inoculation, Incubation period | | Diagnostics | Prodromi | Clinical Features And Complications | Biochemistry | Differential Diagnosis | Treatment Regimen | Hospital Admission | Outcome |
| 11484516  (2001) **(1)**  114  11484516 (2001) (1)  84516  (2001) (1) | | 16 | BE | -Bite of a pet rat a few days before admission | | Blood cultures:  growth after 72h of incubation  >Gram stain: pleomorphic, filamentous and branching, non-motile Gram-negative bacilli with swellings  >Culture: positive  >Identification (phenotypically and gaschromatographically): *Streptobacillus moniliformis* | -minus D1:  -recurrent vomiting  -headache | D0:  -fever  -headache  -recurrent vomiting |  | \*meningitis  \*urinary tract infection | amoxicillin-clavulanate IV (3 days) and PO (10 days) (4x 500mg) | yes | CR |
| 11757440 (2001) (2)11757440(2001) (2)  011757440 (2001) (2)11757440 (2001) (2)11757440 | | 48 | NO | -Bite by pet rat, 10 days before hospital admission | | Blood cultures:  >Culture positive: *Streptobacillus moniliformis* |  | -minus D5: fever + malaise  -minus D3:  rash and arthritis hand and feet  D0: hospital admission | CRP: 231 md/dl ESR: 88/hour aspartate aminotransferase: 87U/L alanine aminotransferase 218 U/L gamma-GT 461 U/L |  | Erythromycin > 2 weeks IV penicillin | yes | CR |
| 11518380 (20  11518380 (2001) (3)  01) (3) | | 13 | UK | -rat bite on the fingertip 5 days before the onset of symptoms in a pet shop | | Right hip joint effusion (arthrotomy and joint lavage) >seropurulent material  >Gram stain: Gram-negative bacilli  >culture: *Streptobacillus moniliformis* (using special culture media) sensitive to penicillin | -minus D9: malaise and fluctuating arthralgia affecting the right hip | D0:  -progressive worsening of right hip pain and inability to bear weight  -initially apyrexial, 39°C a few hours after admission | L: normal  ESR: >100/hour  CRP: 69 mg/L |  | IV penicillin > oral amoxycillin (6 weeks) | yes | CR |
| 12922949 (2003)  12922949 (2003) (4)  (4) | | 62 | UK | -minus D21: rat bite on left foot | | right knee aspiration:  >purulent >neutrophilic formula  >Gram stain: regular Gram negative intracellular bacilli >culture: positive (small grey colonies) >Gram stain colonies: filamentous cells with many bulbous swellings, typical of *Streptobacillus moniliformis* Blood cultures: negative  TTE: negative | -minus D17: pain over his left foot followed by pain and swelling in both knees, elbows, wrists, the small joints of both hands, and the left ankle | D0:  -febrile -jaundice -synovitis affecting the wrists, interphalangeal and metacarpophalangeal joints of the hands, effusions in the right knee, right ankle, and left midtarsal joint | L: 29.3×109/L with 90% PMN  CRP: 197 mg/l Liver function tests: cholestatic hepatitis  serum bilirubin 55 μmol/l alkaline phosphatase 399 U/l alanine aminotransferase 230 U/l aspartate aminotransferase 63 U/l  Hepatitis B and C serology: negative | -sepsis  -hepatitis  -streptobacillary septic arthritis | Oral ciprofloxacin and doxycycline (history suggestive of type I hypersensitivity to penicillin) > high dose IV penicillin G 18 MU during 4 weeks (skin tests to penicillin G: negative) | y | CR |
| 12810419 (2003)   |  | | --- | | 12810419 (2003) (5) |   (5) | | 56 | UK | -rat bite  in the web space of the index and middle finger of the right hand 3 weeks before admission | | left ankle aspirate:  >urate crystals  left thumb MCP joint aspirate:  >Gram stain:  “odd” Gram positive coccus  >culture:  Gram negative pleomorphic coccobacillus *Streptobacillus moniliformis* (confirmed by DNA sequencing) | -10D: fevers,  cough, sore throat, and loose stools  -8D: acute polyarthritis affecting the right wrist, left  thumb, both feet, and the right ankle, followed by arash over elbows, fingers, and feet | -Apyrexal  -maculopapular, nonblanching  rash with pustules and necrosis over  the extensor surfaces of both elbows and left calf  -acute, erythematous synovitis  affecting the right elbow, wrist, and shoulder, left thumb  MCP joint, both mid-tarsal joints, and right ankle  -healing lesion in the web space of the index and middle finger of the right hand  Complications:  >Critical ischaemia on his right hand  from the mid-palm distally  >Pyrexia >Acute worsening of his joint symptoms (left ankle and thumb)  Diagnosis: rat bite fever complicated by polyarticular  gout | L: 12.6\*109/l  neutrophils: 11.4\*109/l  CRP: 225mg/l  ESR: 79 mm/1st hour | -reactive arthritis  -vasculitis | methylprednisolone and cyclophosphamide  (presumed medium vessel vasculitis)  Colchicine (gout)  IV benzylpenicillin and flucloxacillin > 6 weeks  oral doxycycline | yes | gradual recovery, with persistent damage to the right wrist and left hand extensor tendons |
| 18562588 (2005)  18562588 (2005) (6)  (6) | | 80 | FR | -shaking chills and back pain, a few days after a rooster scratch on his left hand | | -Blood cultures: positive >3 anaerobic bottles  >2 aerobic bottles > gram stain: pleomorphic forms with fusiform gram-negative rods  > culture: positive > identification by conventional biochemical and carbohydrate analysis: failed > identification by 16S rRNA sequencing from agar cultures: failed   Aspiration of the abscess:  > Gram stain: pleomorphic fusiform gram-negative rods > Culture: negative > 16S rRNA PCR assay: obtained 450-kb amplicon shared 99% homology with that of the 16S rRNA gene of *Streptobacillus moniliformis*   Pericardial and pleural effusions and collections in the right iliac psoas in contact with a screw of the right prosthesis > Culture: negative | -minusD7: shaking chills without fever and back pain that irradiated to both legs, which gradually disappeared | Medical history:  -bilateral total hip replacement  D0:  -deterioration of general health  -inflammatory syndrome  Complications:  -psoas abscess and spondylodiscitis at T5 and T6 and at L2 and L3 | L: 19 x 109/L with 18 x 109/L neutrophils CRP: 488 mg/L Procalcitonin: 13 ng/ml (<0.5 ng/ml) | -Sepsis  -Cauda equina syndrome  -lumbar hernia  -Spondylodiscitis  -Malignancy | IV amoxicillin-clavulanic acid 3\*1g + ofloxacin 2\*200 mg > imipenem – cilastatin 2\*1g + ciprofloxacin 2\*400 mg + teicoplanin 1\*600 mg > 9 week treatment with IV ofloxacin 2\*200 mg + clindamycin 3\*600 mg + metronidazole 3\*500 mg | yes | CR |
| 16186643 (2005) (7  16186643 (2005) (7)  ) | | 23 | NL | -nine pet rats -an assistant at a veterinary clinic -no overt bite | | Blood cultures:  >Gram stain: gram-negative rods >Culture: *Streptobacillus moniliformis* A PCR for *Streptobacillus moniliformis* using the saliva of the pet rats: positive | -malaise for several weeks  - painful and swollen joints (knees and wrists most prominently)  - a large red lesion on the right upper arm, which had resolved spontaneously  - painful, small, red spots on her hands and feet with especially the palmar side of the hands and fingers affected | D0:  - fever accompanied by rigors - slight swelling of the left wrist, with diminished flexion - a maculopapular rash with numerous small, dark-red eruptions, some of which with a blister-like appearance on both hands and feet - a small aphthous lesion on lateral edge of the tongue | CRP: 22 mg/l | - systemic lupus erythematosus  - Henoch-Schonlein purpura - cytomegaly/ Epstein-Barr virus infection - toxic drug reaction - secondary syphilis | Treatment with oral clarithromycin | yes | CR |
| 16254115 (2005)  16254115 (2005) (8)  (8) | | 7 | FR | -two pet rats and direct contact with rats’ faeces | | Blood cultures: negative  Cerebrospinal fluid cultures: negative  Blister fluid samples:  >Gram stain: pleomorphic Gram negative rods  >culture positive  >Biochemical identification: unsuccessful  >Antimicrobial susceptibility testing: unsuccesfull  >bacterial 16S ribosomal DNA PCR: 99% similarity with the Genbank *Streptobacillus moniliformis* sequence Z35305 (type strain ATCC16467) |  | D0:  -fever  -bilateral arthralgia in the knees, ankles, elbows, and wrists  -maculopapular morbilliform exanthema on the palms and soles, associated with several blisters (3–8 mm in diameter), containing a whitish fluid, on the face and elbows  D5:  -bilateral desquamation of the fingers and toes | L: normal  CRP: 300 mg/L  ESR: 60 mm/hour | -atypical Kawasaki disease -toxic shock syndrom | Erythromycin (7 days) and amoxicillin (15 days) | yes | CR |
| 18023687  (2007) (9)  18023687 (2007) (9) | | 29 | GE | -right hand injury 2 weeks before admission | | Aortic valve:  > Gram stain: Gram-positive/Gram-variable straight, curved, and filamentous rods  > Culture: tiny colonies on blood sheep agar, showing long filamentous Gram-variable rods  >Identification: 16S rRNA gene sequencing:  *Streptobacillus moniliformis*    Blood cultures: negative | Right hand injury with progressive lethargy and weakness | D0: Fever, dyspnea, dizziness, increasing somnolence  Complication: Endocarditis with giant floating vegetations on a degenerated, insufficient aortic valve and a large perivalvular abscess cavity |  | -Sepsis | empirical antibiotic therapy: ampicillin, ceftriaxone, and gentamicin > penicillin, fosfomycin, and gentamicin | Yes | Almost normal left and right ventricular function with a well-functioning aortic valve prosthesis on echocardiography |
| 22180758 (2009)   |  | | --- | | 22180758 (2009) (10) |   (10) | | 23 | UK | manipulation of a dead rat two weeks before his illness | | blood cultures:  culture: weak growth of a Gram variable rod  PCR: *Streptobacillus moniliformis* |  | D0:  - swinging pyrexia, rigors  - headache  - abdominal pain, vomiting with right upper quadrant tenderness  - right shoulder pain with unremarkable examination  - no rashes | L: 12×109 cells/L  CRP: 333 mg/L  alkaline phosphatase 130 IU/l (NR 45–120 IU/L), aspartate transaminase 278 IU/l (NR 0–40 IU/l), alanine transaminase 339 IU/l (NR 0–40 IU/l), γ-glutamyltransferase 210 IU/l (NR 11–50 IU/l) | Atypical Pneumonia  Urinary tract infection | oral amoxicillin/clavulanic acid and erythromycin | yes | CR |
| 21292904 (2011) (11)  21292904 (2011) (11) | | 89 | FR | -living alone in precarious conditions in contact with rats | | Blood cultures:  >1 anaërobic bottle: growth detection >gram stain: pleomorphic filaments and branching Gram-negative bacilli. |  | D0: foot burns (domestic accident)  D4: fever, somnolence |  | -Sepsis | Amoxicillin- clavulanate and gentamicin>D9: ceftazidime, vancomicin, and metronidazole>D11: rifampicine | yes | Died on day 14 |
|  | |  |  |  | | >Culture: negative >16S-rRNA gene amplification PCR assay followed by sequencing: *Streptobacillus. moniliformis*  -Centrifugation shell vial technique: inoculation of previously frozen blood culture broth sample on Colombia blood agar (bioMerieux) and ECV 304 human endothelial cell monolayers:  after 24 hours, a cyto- pathic effect was observed on the monolayer cells  shell vial super- natant:  >Gimenez and gram staining: Gram-negative bacillus  inoculated onto Colombia blood agar and new shell vials: both positive.  bacterial identity was verified again by 16S rRNA gene sequencing |  |  |  |  | and doxycyclin |  |  |
| 22744925 (2012) (12)  22744925 (2012) (12) | | 55 | NL | -rat breeding to feed pet snakes with regular rat bites | | Left thenar eminence pus culture: > Gram stain: pleomorphic Gram-negative bacillus  > S16 rRNA sequencing: *Streptobacillus moniliformis* | -MinusD4: fever with headaches, myalgia and neck pain | D0: -subfebrillitas - nausea - red spotted non-blanchable maculopapular rash on both palms and soles joint - pain of the wrists and fingers with enlarged and painful left thenar eminence | L: 8.6 x 109/l  CRP: 235 mg/l | -Leprospirosis, -Parvovirus B19 -Coxackievirus - Enterovirus - Syphilis | Oral doxycyclin | No | CR |
| 25414213 (2014) (13)  25414213 (2014) (13) | | 49 | UK | -homeless man  -no overt animal bites or rodent contact  -contaminated food  products? | | Positive blood cultures:  > Direct Gram stains: long and thin filamentous gram-negative rods in loops and coils  >Culture: Small grey–white colonies  > MALDI-TOF MS: S. moniliformis (ID scores of 1.8 and 2.1)  >16S ribosomal RNA (rRNA) gene detection and sequencing: S. moniliformis  > susceptibility testing: unsuccessful |  | - septic with high-grade fever (40°C)  - progressively worsening right leg pain, swelling and rash  -apical pan-systolic murmur  -splinter hemorrhages  -TTE and TEE: vegetation on mitral valve  -splenic infarcts secondary to probable septic emboli  Infective endocarditis | L: normal  CRP: 117 mg/L  normocytic normochromic anemia | cellulitis with deep vein thrombosis  occult abscesses (chest, abdomen, pelvis) | IV benzylpenicillin and flucloxacillin > co-amoxiclav and gentamicin > meropenem and doxycycline > IV high-dose benzylpenicillin 6\*2.4 g and oral doxycycline 2\*100 mg  (6 weeks) | yes | CR after mitral valve replacement |
| 24695665 (2014) (14  24695665 (2014) (14)  ) | | 29 | UK | -direct contact with multiple pet rats | | Blood cultures: negative  Right ankle joint aspiration  >purulent  >microscopy: no organisms  >culture: no growth on culture  >bacterial 16S rRNA PCR: negative.  Repeat right ankle aspirate:  >bacterial 16S rRNA PCR:  positive for the 16S rRNA gene, diagnostic for *Streptobacillus moniliformis* infection | -minus D5: worsening generalized malaise, fever, sore throat and polyarthralgia | D0:  - malaise  - fever  - sore throat  - polyarthralgia  - bilateral plantopalmar rash  (widespread, partially blanching, rash with vesicular, petechial and pustular components over both feet, hands, legs and buttocks) | L: 10.62×109 cells/L  CRP: 211 mg/L  ESR: 36 mm/h (normal <14 mm/h) | Vasculitis  Viral exanthematous pustulosis | empirical broad-spectrum antibiotics>IV benzylpenicillin  (2 weeks)> oral amoxicillin (3 weeks) and physiotherapy | yes | CR (minimal pain on impact activities) |
| **28652481 (2017) (15**  28652481 (2017) (15)  **)** | | 44 | UK | -purchase of live rats to feed pet snakes -no overt rat bites or scratches -direct contact of bare hands with rat and snake faeces two days before onset of systemic symptoms | | -Blood cultures: negative -Aspiration of right knee effusion >purulent >neutrophilic formula >Gram stain: pleomorphic, filamentous, gram-negative rods arranged in chains and tangles >culture: positive for *Streptobacillus moniliformis* | -minus D14: acute malaise, headache, myalgias, subjective fevers, vomiting and diarrhea with resolution | Medical history: -mild psoriasis -bilateral ankle fractures -right metacarpal fracture  -right knee anterior cruciate ligament repair  D0:  -subfebrillitas -swelling of ankles and right knee, hand, wrist and shoulder  -large right knee effusion  -no rashes | L: 10.3 × 109/L  CRP: 340 mg/L | -Septic arthritis -Seronegative inflammatory arthritis (spondyloarthritis) -Rheumatoid arthritis  -Crystal related arthritis  -Sarcoidosis | IV cefazolin (2 days) > IV penicillin G 6\*2 MU (2 weeks) > IV ceftriaxone 2g (2weeks) | yes | - Extension of therapy with 2 because of persistent mild wrist pain at completion of the course of IV penicillin G - CR |
| 28322713 (2017) (16)  28322713 (2017) (16) | | 59 | FR |  | |  | -15-day history of fever and arthralgia (left knee, right wrist) but no signs of rash | un­able to stand had acute progressive onset of dyspnea | L: 15 × 109/L, predominantly neutro­phils, CRP: 125 mg/L |  |  | Yes, IC |  |
| 31859955 (2019) (17)  31859955 (2019) (17) | | 76 | PT | rat bite | | lumbar puncture: normal CSF  CT scan: normal Blood cultures: positive Identification by PCR and Sanger sequencing targeting bacterial 16S rRNA: *Streptobacillus moniliformis*  TEE negative Magnetic resonance imaging (MRI) with T2-weighted images: high signal intensity in the C5, C6, and C7 vertebrae with meningeal enhancement and the left sternoclavicular joint. | medical history: cervical degenerative disc disease | D0:  -four-day history of fever, prostration, myalgias, and headache -subfebrile, hypotensive, incised wounds on two fingers of her left hand -neck stiffness  D3: worsening neck pain and tetraparesis   Diagnosis: vertebral osteomyelitis and septic arthritis associated with rat bite fever | L: 14,670/μL (86.3% neutrophils) CRP: 334 mg/dL |  | IV ceftriaxone 2 g (26 days) > oral amoxicillin- clavulanate (eight months) after hospital discharge | yes | CR |
| 32998485 (2020)   |  | | --- | | 32998485 (2020) (18) |   (18) | | 20 | No | -scratches from pet rats a few days before start of illness  -worked as a nurse in a veterinary clinic | | Blood cultures:  >culture: gram-negative rods >identification using MALDI- TOF MS: *Streptobacillus moniliformis* | -couple of episodes of chills in the days prior to admission to the hospital | D0: 3-to-4-day history of fever, headache, dizziness, nausea and a maculopapular exanthema on her arms and palms of her hands | L: 13 ∙ 109/L (normal differential count) CRP: 222 mg/l | viral syndrome | IV cefotaxime 3 x 2g (3 days) > IV ceftriaxone 1 x 1g (4days) > PO therapy phenoxymethylpenicillin 4 x 1g (7 days) | yes | CR |
| 32117690 (2020) (19)  32117690 (2020) (19) | | 66 | UK | -minus D8: bite by a small rodent on her right thumb, brought into the home by her cat | Blood cultures: negative Joint aspirate and arthroscopic washout: negative operative tissue samples (two-stage revision) >16S PCR: *Streptobacillus moniliformis* | |  | Medical history:  osteoarthritis:  2011: right unicondylar knee replacement  2014: right total knee replacement  D0:  -progressive thumb inflammation  -acute-onset right knee inflammation -self-discharge  D2: Re-admission  - progressive deterioration of her right knee, unable to weightbear  -pyrexia, sweating and intermittent rigors  - erythematous and tensely swollen thumb with development of a soft tissue abscess  - right prosthetic knee was hot, with a moderate effusion and severe generalised tenderness  Complications: sepsis, delirium | L: 19.2 x109/L  CRP: 353 mg/L | -Surinfected bite wound  -sepsis  -prosthetic joint infection | IV vancomycin and doxycycline>meropenem (6weeks) (type-1 hypersensitivity to penicillin-based antibiotics) | yes | CR after two-stage knee revision |
| Roeselare (2020) (20)  Roeselare (2020) (20) | 11 | | BE | -bite of a pet rat | Blood cultures: positive  (MALDI-TOF) | | -minus D14: recurrent fevers  -polyarthritis (left shoulder, ellbow, knee and finger)  -fluctuating rash on trunck and limbs | D0:  -fever  -polyarthritis  -rash | L: 12 700/mm3 with 10 130/mm3 neutrophils  CRP: 8,6 mg/dl | -infectious syndome:  -Enterovirus  -Parvovirus B19  -EBV  -Brucella | amoxicillin (4\*1g) for 2 weeks | yes | CR |

Table 1.