that H13 viruses may have been introduced into domestic poultry from migratory birds and that they may have the potential to become a global cross-species threat.

This work was supported by the Youth Foundation of the Natural Science Foundation of Shandong Province (ZR2018QC005), the High-Level Talents and Innovative Team Recruitment Program of the Shandong Academy of Agricultural Sciences, the Special Fund of Institute Development (1-08-040 and 1-08-043), the construction of the discipline team for the Institute of Poultry Science (1-18-015), the National Key Technology Research and Development Program (2013BAD12B04), and the National Key Research and Development Plan (2016YFD0500203 and 2017YFD0500100).

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Rat-Bite Fever in Human with Streptobacillus notomytis Infection, Japan


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DOI: https://doi.org/10.3201/eid2407.171580

We report a case of rat-bite fever in a 94-year-old woman with Streptobacillus notomytis infection. We established an epidemiologic link between exposure to rats and human infection by performing nested PCRs that detected S. notomytis in the intraoral swab specimens obtained from rats captured in the patient’s house.

Streptobacillus is a genus of gram-negative, filamentous, rod-shaped bacilli belonging to the family Leptotrichiaceae. Since 2014, four novel species other than S. moniliformis have been reported: S. hongkongensis was isolated from 2 human patients, S. felis from the lung of a cat, S. ratti from black rats, and S. notomytis from a spinifex hopping mouse (1–4). We report a case of a human infection with S. notomytis.

A 94-year-old woman sought treatment at our hospital for general malaise, anorexia, and bilateral knee pain. At admission, her body temperature was 38°C; physical examination revealed swelling in both knees. Her skin was intact, with no rashes or animal bites. Laboratory tests revealed high leukocyte count (1.42 × 10⁹ cells/L) and elevated level of C-reactive protein (19.5 mg/dL).

Bilaterial knee arthrocentesis yielded 25 mL of purulent fluid; Gram stain demonstrated the presence of few, thin, gram-negative bacilli with pyrophosphate calcium crystals and neutrophils (Figure). Bacterial culture yielded transparent, small, smooth colonies on 5% sheep blood agar (Kyokuto, Tokyo, Japan) incubated at 37°C under 5% CO₂ for 48 h. However, the automated bacterial identification method (Vitek 2; bioMérieux, Tokyo, Japan) failed to identify the isolate. We evaluated the isolate (NR2245) by matrix-assisted laser desorption/ionization time-of-flight mass spectrometry using Bruker MALDI BioTyper software version 4.001 library database (Bruker Daltonik GmbH, Bremen, Germany) employing ethanol–formic acid extraction. We identified the isolate as S. moniliformis.
To identify the isolate from the patient’s synovial fluid, we performed 16S rRNA gene sequencing using a universal primer pair: 27F (5′-AGAGTTTGATCCTGCTCAG-3′) and 1492R (5′-GGTTACCTTGTTACGACTT-3′). The sequence (GenBank accession no. LC360808) showed 100% identity (1,089/1,089 bp) to S. notomytis AHL_370–1T (GenBank accession no. KR001919) and 99.6% (522/522 bp) and 99.9% (757/758 bp, respectively) to the gene sequence of S. notomytis KWG2 (522/522 bp and 757/758 bp, respectively) and 99.6% (20/522 bp) and 99.9% (757/758 bp) identity, respectively, to the gene sequence of S. notomytis AHL_370–1T.

We determined antimicrobial susceptibility pattern by broth microdilution. MIC of penicillin was \( \leq 0.06 \mu g/mL \); cefazolin, \( \leq 0.5 \mu g/mL \); ceftriaxone, 0.25 \( \mu g/mL \); vancomycin, \( \leq 0.25 \mu g/mL \); clarithromycin, 8 \( \mu g/mL \); minocycline, \( \leq 0.12 \mu g/mL \); and levofloxacin, \( \leq 1 \mu g/mL \).

S. moniliformis is known to cause rat-bite fever in humans (6). To study the association between exposure to rats and S. notomytis infection, we visited the patient’s house after her death and captured 2 rats (Rattus rattus), from which we collected stool and intraoral and rectal swab samples. On the same day, we brought the specimens at room temperature to our laboratory and performed bacteriological cultures in 5% sheep blood agar, incubated at 37°C under 5% CO\(_2\); the specimens did not grow Streptobacillus. We performed nested PCR with DNA extracted from each specimen, amplified the 16S rRNA gene using the universal primer pair 27F and 1492R, and performed nested PCR using the amplicons from the first PCR as templates, with the Streptobacillus-specific primers sbmF (5′-GAGAGA-GCTTTGCTACCT-3′) and sbmR (5′-GTAACTTCAG-GTGCAA-3′) (7). Only 1 rat’s intraoral specimen yielded PCR products, and the sequence of the amplicon by nested PCR showed 100% identity (1,089/1,089 bp) to S. notomytis AHL_370–1T.

Since 2014, a total of 4 novel Streptobacillus species have been reported. Whether these new species have recently emerged or existed previously is uncertain. In 2014, Eisenberg et al. identified 2 isolates recovered from rats in 2008 as S. notomytis (2); it is possible that S. notomytis may have been prevalent but unrecognized in Japan because identification is difficult by conventional methods (2). Fukushima et al. reported that 16S rRNA sequencing identified an isolate obtained from a rat-bite fever patient as S. notomytis, not S. moniliformis as originally identified (8). By detecting S. notomytis from the rats captured in this patient’s house, we support a potential epidemiologic link between rat exposure and human infection.

**About the Author**

Dr. Ogawa is a medical doctor at Nara Medical University Hospital. His primary research interest is HIV and the epidemiology of infectious diseases, with a focus on resistant pathogens.
Misconceptions about arboviruses transmitted by *Aedes* spp. mosquitoes, such as Zika virus, can lead to misplaced reactions and affect local public health officials’ abilities to contain outbreaks (1–3). Despite media campaigns on Zika virus, misperceptions persisted during the 2016 outbreak among some subgroups in Miami, Florida, USA (4). More than 4 in 10 Americans mistakenly thought that Zika virus infection was fatal and that symptoms were noticeable (5).

We conducted a survey on Zika virus perceptions and behaviors during the 2016 outbreak in Miami-Dade County, Florida, USA. Among women, Zika knowledge was associated with having a bachelor’s degree. Among men, knowledge was associated with knowing someone at risk. Interventions during future outbreaks could be targeted by sex and education level.

**Perceptions of Zika Virus Risk during 2016 Outbreak, Miami-Dade County, Florida, USA**

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DOI: https://doi.org/10.3201/eid2407.171650

We conducted a survey on Zika virus perceptions and behaviors during the 2016 outbreak in Miami-Dade County, Florida, USA. Among women, Zika knowledge was associated with having a bachelor’s degree. Among men, knowledge was associated with knowing someone at risk. Interventions during future outbreaks could be targeted by sex and education level.

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