Transmission of Methicillin-resistant Staphylococcus aureus (MRSA) between Human and Hamster

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ABSTRACT

Transmission of methicillin-resistant Staphylococcus aureus (MRSA) between humans and animals is increasingly recognized. We newly document that the transmission of MRSA between human and hamster is also possible.
CASE REPORT

We describe a case of suggested transmission of MRSA between a human and a pet hamster. This finding was one of the results of a project where MRSA-positive patients seen as outpatients at a large southeastern United States hospital were identified and contacted to determine if they had pets. If they had pets and consented to participate in the study, a visit was scheduled to obtain samples from pets to determine their MRSA status. The study developed as collaboration between a medical school and a veterinary college and was approved by Institutional Review Boards and Animal Care and Use Committees at both participating institutions.

The index patient was a 28 year old Caucasian male with advanced cystic fibrosis who had undergone initial bilateral lung transplant and repeat left lung transplantation. He also had chronic sinusitis that required three previous surgical procedures, diabetes mellitus, renal insufficiency, and presented with postnasal drip, cough, clear rhinorrhea, and headaches. He was diagnosed with chronic rhinosinusitis and underwent endoscopic ethmoidectomy, sphenoidotomy, and partial resection of bilateral nasal turbinates. Pre surgical culture of the patient’s sinus contents yielded MRSA and he was therefore contacted.

The clinical MRSA isolate from the patient was collected from the Duke Clinical Microbiology Laboratory and stored (-80 °C) until required for additional use. After written informed consent was provided by the patient, nasal and rectal swabs were collected from three hamsters at the patient’s residence. Nasal swabs were also collected from the patient’s housemate. Swabs from the animals were processed within a 24-hour time period at a microbiology laboratory in the NCSU College of Veterinary Medicine Population Health and Pathobiology Department.
S. aureus identification was performed in accordance with routine laboratory techniques. Swabs were rolled on Trypticase Soy Agar plates (containing 5% sheep blood) and Mannitol Salt agar (BD, NJ, USA) and incubated at 35C-37C for 24 and 48 hours. Colonies with typical S. aureus colony morphology were further analyzed using gram stain, catalase and tube coagulase tests. S. aureus diagnosis was confirmed by multiplex PCR, targeting thermonuclease (nuc) gene locus (11). Resistance to oxacillin and cefoxitin was determined in the S. aureus isolates by disk diffusion. S. aureus isolates were classified as MRSA if the inhibition zone was less than or equal to 21 mm for cefoxitin or less than or equal to 10 mm for oxacillin (3).

Nasal and rectal swabs from one hamster (female, 1.5 years) yielded MRSA. The other two hamsters and the housemate were S. aureus culture-negative. meca PCR was performed on the human and hamster MRSA isolates, and we evaluated their genetic relatedness using pulsed field gel electrophoresis (PFGE) and spa-typing as previously described (2, 8). The meca gene was detected in both the hamster and patient MRSA isolates. PFGE banding patterns of the human and hamster MRSA were identical to each other (Figure 1) but not equivalent to the most common hospital-acquired or community-associated MRSA types previously described by CDC. All the isolates were spa type 2, clonal complex 5.

**Fig.1:**

![PFGE gel image comparing human and hamster Smal DNA digestion patterns.](http://jcm.asm.org/)
MRSA is a significant problem for both human and veterinary medicine. MRSA infection has been described in several different animal species, and MRSA transmission between humans and different species has also been suggested (1, 4-7, 10, 12-14). Most of our current knowledge on this topic is based on anecdotal reports and several of the details of this interspecies exchange of MRSA are still unknown.

*S. aureus* has been previously isolated from hamsters (9). However, to the best of our knowledge there is no previous report of isolation of MRSA in a hamster. At the same time, this manuscript documents the first reported case of suggested MRSA transmission between a human being and a hamster.

The genotype of the hamster and human MRSA isolates were identical by PFGE banding patterns. The presence of MRSA with identical PFGE genotype on both the patient and his hamster strongly implies that hamsters are capable of carrying MRSA, and thus can potentially transmit it to pet owners. Conversely, patients who are colonized with MRSA may be also capable of transferring MRSA to hamsters.

The MRSA-positive hamster was acquired from the same source (a pet store) as the other two hamsters. In the household, the MRSA-positive hamster was housed in the same cage as her sister but separately from the other hamster. The three hamsters had daily contact with each other. Patient would daily feed and hold/play with the hamsters, but was not responsible for cleaning their cages. He reported that he would always disinfect his hands with alcohol-based hand sanitizer after touching the hamster(s).

In the current case, we believe that the hamster most likely became a carrier following the patient, who was at high risk for long-term MRSA carriage given his immunocompromised state.
and co-morbidities. However, the hamster was not MRSA screened at the time of acquisition and
had been living with the patient for about one year and four months before the patient had his
first (blood) MRSA positive culture. Our assumption on the direction of transmission is therefore
speculative. The possibility that both the hamster and the patient obtained their infection from a
third party or perhaps fomite cannot be excluded.

We recognize that our study has other limitations. The hamster died while we were
developing the study, which prevented us from collecting additional nasal swab samples so we
were unable to estimate the duration of colonization. On the other hand, the patient had multiple
MRSA positive samples (blood, sinus contents, nasal swabs, bronchoalveolar lavage) for a total
period of approximately one year and four months, which included some months after the
hamster’s death.

Despite these limitations, this report makes an important observation: MRSA exchange
between humans and hamsters is possible. Should testing of MRSA positive patients’ pets be
recommended? At this point we recommend MRSA positive patients to be informed that their
companion animals can be a potential source of infection or re infection. In the presence of a
MRSA positive human or animal, heightened hygiene practices should be instituted and
unnecessary close contact should be avoided. Screening of household pets might be indicated in
situations of recurrent MRSA infections despite adequate treatment or when in the presence of
immunocompromised patients. We speculate that the clinical significance of the findings are
important for immune-compromised patients who keep pets in close proximity but at this point
we cannot determine the prevalence or clinical significance of this phenomenon.
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Potential Conflicts of Interest for Vance G. Fowler, Jr. MD, MHS

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