have been a cross-species infection from mice to bats in the same habitat.

Although bats rarely come in direct contact with humans, humans can come into more frequent contact with bat urine and feces and, in the case of fruit bats, bat saliva through partially eaten fruits. Bats in the Middle East are not eaten for food but are occasionally hunted. In this study, HKU9-related viruses were detected in apparently healthy fruit bat species from Egypt and Lebanon and appear to cause systemic infection. HKU9-related viruses are not known to cause human disease. MERS-CoV was not detected in bats sampled in this study. More surveillance for bat CoVs in the Middle East is needed, and the zoonotic potential for bat-CoVs requires further study.

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References


Ebola Virus Disease Complicated by Late-Onset Encephalitis and Polyarthritis, Sierra Leone

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To the Editor: Ebola virus (EBOV) disease is usually an acute illness, but increasing evidence exists of persistent infections and post-Ebola syndromes. We report a case of EBOV encephalitis.

A 30-year-old woman with no known EBOV contact sought treatment at an Ebola isolation unit in Freetown, Sierra Leone, on January 1, 2015 (day 7 of illness). She was afebrile and weak, but ambulatory, with a history of fever, vomiting, diarrhea, headache, and muscle and joint pain. According to local protocol, she was given oral antimalarial, antimicrobial, and antiemetic drugs and oral rehydration therapy. On day 8 of illness, after testing EBOV PCR–positive, she was given intravenous ceftriaxone (2 g) and artesunate (180 mg) for 7 days, respectively. On days 28 and 29, she was still unconscious; serum PCR test results on both days were negative for EBOV. On day 30, she was still unconscious; serum PCR test results on both days were negative for EBOV. On day 30, she was still unconscious; serum PCR test results on both days were negative for EBOV. On day 30, she was still unconscious; serum PCR test results on both days were negative for EBOV.

During days 13–15, the patient improved, moving independently and talking. On day 16, she became confused; by day 20, she was unresponsive to voices. Intravenous ceftriaxone (2 g) for 7 days, artesunate (180 mg) for 3 days, and Ringer’s lactate (4–6 L) with supplemental KCl for 5 days.

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given intravenous fluconazole (800 mg 1×/d). Admission blood test results showed anemia, elevated alanine aminotransferase and C-reactive protein, and low creatinine (online Technical Appendix, http://wwwnc.cdc.gov/EID/article/22/1/15-1212-Techapp1.pdf). HIV test results were negative.

On day 34, large-joint polyarthritis of the right shoulder, left elbow, and left knee developed. Affected joints appeared normal on radiographs, and synovial fluid (15 mL) from the left knee was EBOV PCR negative. She was given diclofenac (50 mg 2×/d) and 1 intramuscular dose of methylprednisolone (80 mg). Concurrent blood PCR on day 34 was negative.

By day 41 she was more alert, although her family reported she had slowed responses. Lumbar puncture was performed; opening pressure (30 cm H₂O) was elevated, and cerebrospinal fluid (CSF) was EBOV PCR−positive (Cₜ value 37.6), as determined by using the Public Health England in-house, optimized version of the Trombley assay (2) with a cutoff Cₜ value of 40. Concurrent catheter specimens of urine and blood samples tested EBOV-negative. FilmArray (BioFire Diagnostics, Salt Lake City, UT, USA) testing showed methicillin-resistant Staphylococcus aureus and Klebsiella pneumoniae in CSF and mixed pathogens in urine. A computer tomographic scan image of the patient’s head showed substantial cerebral atrophy without hydrocephalus (Figure).

On day 44, an underarm sweat swab sample was PCR−positive (Cₜ value 39.6) and a buccal swab sample PCR−negative for EBOV. Ongoing painful synovitis was treated with an additional 80-mg intramuscular dose of methylprednisolone. On day 51, a midstream urine sample was EBOV PCR−positive (Cₜ value 35.7), and an underarm sweat swab sample was EBOV PCR−negative. The patient was discharged; her family was advised to minimize contact with her body fluids.

At follow-up on day 64, the patient’s family reported she had impaired short-term memory and ongoing slowness. She had a score of 18/23 on the Mini–Mental State Examination, but general neurologic exam results were normal. A midstream urine test was still EBOV PCR−positive (Cₜ value 39.6); PCR of her sweat swab sample was inhibited (online Technical Appendix). She was referred to the local survivors’ clinic; no contact cases were reported.

The depressed mental status and presence of EBOV in this case-patient’s CSF are consistent with encephalitis, a finding in autopsies of persons with Marburg virus infection (3,4) and in EBOV nonhuman primate models (5). The general atrophy seen in computer tomographic scan images is consistent with a rapidly developing complication of a diffuse inflammatory process. Given inadequate antimicrobial drug doses for meningitis and clinical improvement, we believe methicillin-resistant S. aureus and K. pneumoniae were CSF sample contaminants.

This case shows the brain’s immune privilege is incomplete for EBOV and prompts a broader discussion regarding neurovirulence in Ebola virus disease. Our finding that EBOV can be present in CSF, even after serum clearance, adds to the knowledge of neurologic symptoms in acute infection and of postinfectious sequelae in observational clinical studies (6–8). This finding raises the possibility that EBOV persistence elsewhere in the body, or in multiple organs, could be an indicator of or risk for central nervous system invasion.

Figure. Representative axial cuts from noncontrast head computed tomography scan imaging of a 30-year-old woman with encephalitis resulting from Ebola virus infection, Sierra Leone. Images show global atrophy in keeping with nonobstructive ventriculomegaly and no periventricular low attenuation: A) subcortical atrophy, B) cortical atrophy. There was no evidence of hydrocephalus, previous stroke, or intracranial hemorrhage. A cavum septum pellucidum was noted in other images.
Our report has limitations. We could not perform many blood chemistry tests, in-country virus cultures, or deep sequencing on samples. Likewise, diagnosis of coma was challenging because of the lack of CSF cell counts, biochemistry values, and paired EBOV IgG and IgM titers in CSF and blood.

This case raises the practical issue that Ebola treatment requires understanding of multiorgan virologic and inflammatory complications; survivor care and research programs should screen for neurocognitive impairment and consider appropriate imaging. The case confirms previously reported intermittent EBOV PCR positivity in urine (9). The development of arthritis with synovitis, treated with corticosteroids, supports the diagnosis of reactive arthritis.

References:

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Ebola Virus Disease Complicated by Late Onset Encephalitis and Polyarthritis

Technical Appendix

Technical Appendix Table. Blood test results at admission for a 30-year-old woman with Ebola virus disease, Sierra Leone.*

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value or result</th>
<th>Reference range or value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hemoglobin, g/dL</td>
<td>8.4</td>
<td>11.5–16.0</td>
</tr>
<tr>
<td>Platelets, x 10^9/L</td>
<td>254</td>
<td>150–400</td>
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<tr>
<td>Leukocyte count, x 10^9/L</td>
<td>5.4</td>
<td>4.0–11.0</td>
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<tr>
<td>Creatinine, µmol/L</td>
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<td>70–150</td>
</tr>
<tr>
<td>Alanine aminotransferase, IU/L</td>
<td>90</td>
<td>5–35</td>
</tr>
<tr>
<td>C-reactive protein, mg/L</td>
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<td>&lt;5</td>
</tr>
<tr>
<td>HIV</td>
<td>Negative</td>
<td>NA</td>
</tr>
</tbody>
</table>

*Blood tests were not repeated after admission. NA, not applicable.

Technical Appendix Figure. Cycle threshold results for Ebola virus in body fluids of a 30-year-old woman with Ebola virus disease, Sierra Leone. CSF, cerebrospinal fluid.