In conclusion, infection with MAYV occurs more frequently than expected in central Brazil. Mayaro fever should be considered in the differential diagnosis with DENV, CHIKV, and Zika virus infections in areas characterized by arbovirus cocirculation.

Acknowledgment

We thank Lívia Carício Martins for supporting testing activities.

Dr. Brunini is an associate professor at the Faculty of Nursing, Federal University of Goiás. Her primary research interests include infectious disease epidemiology and HIV and sexually transmitted diseases.

References

1. Anderson CR, Downs WG, Wattley GH, Ahin NW, Reese AA. Mayaro virus: a new human disease agent. II. Isolation from blood of patients in Trinidad, B.W.I. Am J Trop Med Hyg. 1957;6:1012–6.
2. Azevedo RSS, Silva EVP, Carvalho VL, Rodrigues SG, Nunes-Neto JP, Monteiro H, et al. Mayaro fever virus, Brazilian Amazon. Emerg Infect Dis. 2009;15:1830–2. http://dx.doi.org/10.3201/eid1511.090461
3. Figueiredo ML, Figueiredo LTM. Study of two different enzyme immunoassays for the detection of Mayaro virus antibodies. Mem Inst Oswaldo Cruz. 1989;84:303–7. http://dx.doi.org/10.1590/S0036-46651989000300003

Address for correspondence: Giovanni Rezza, Department of Infectious Diseases, Istituto Superiore di Sanità, Viale Regina Elena 161, 00142 Rome, Italy; email: giovanni.rezza@iss.it

Ebola Virus Imported from Guinea to Senegal, 2014

Daye Ka, Gamou Fall, Viviane Cissé Diallo, Ousmane Faye, Louise Deguenonvo Fortes, Oumar Faye, Elhadji Ibrahim Bah, Kadja Mbaye Diallo, Fanny Balique, Cheikh Tidiane Ndour, Moussa Seydi, Amadou Alpha Sall

Author affiliations: Centre Hospitalier Universitaire de Fann, Dakar, Senegal (D. Ka, V. Cissé Diallo, L. Deguenonvo Fortes, K.M. Diallo, C.T. Ndour, M. Seydi); Institut Pasteur de Dakar, Dakar (G. Fall, Ousmane Faye, Oumar Faye, F. Balique, A.A. Sall); Hôpital National Donka, Conakry, Guinea (E.I. Bah)

DOI: https://dx.doi.org/10.3201/eid2306.161092

In March 2014, the World Health Organization declared an outbreak of Ebola virus disease in Guinea. In August 2014, a case caused by virus imported from Guinea occurred in Senegal, most likely resulting from nonsecure funerals and travel. Preparedness and surveillance in Senegal probably prevented secondary cases.

These authors contributed equally to this article.

1. These authors contributed equally to this article.
2. These authors contributed equally to this article.

Table. Clinical characteristics of 15 patients positive for IgM against Mayaro virus, Goiânia, Goiás, Brazil, June 2014–June 2015

| Sign or symptom       | No. (%) patients |
|-----------------------|-----------------|
| Fever                 | 15 (100)        |
| Arthralgia            | 14 (93)         |
| Joint edema           | 14 (93)         |
| Rash                  | 14 (93)         |
| Headache              | 13 (87)         |
| Weakness              | 13 (87)         |
| Myalgia               | 12 (80)         |
| Eye pain              | 8 (53)          |
| Icterus               | 4 (27)          |
| Photophobia           | 3 (20)          |
| Severe itching        | 3 (20)          |
| Lymphadenopathy       | 2 (13)          |
| Vomiting              | 2 (13)          |

the samples were collected after the viremic phase. Third, plaque-reduction neutralization testing was not performed, and because of the lack of convalescent serum, IgG seroconversion or titer increase were not evaluated; however, MAC ELISA is considered a valid technique for diagnosing recently acquired infection with MAYV (10). Finally, the frequency of rash (Table), higher than in other case series (4), might be overestimated because of stringent selection criteria used for MAYV testing.

10. Figueiredo LTM, Nogueira RMR, Cavalcanti SMB, Schatzmayr H, Figueiredo LTM. Detecting artificial anti-dengue IgM immune complexes using an enzyme-linked immunosorbent assay. Am J Trop Med Hyg. 1987;36:153–9.

The samples were collected after the viremic phase. Third, plaque-reduction neutralization testing was not performed, and because of the lack of convalescent serum, IgG seroconversion or titer increase were not evaluated; however, MAC ELISA is considered a valid technique for diagnosing recently acquired infection with MAYV (10). Finally, the frequency of rash (Table), higher than in other case series (4), might be overestimated because of stringent selection criteria used for MAYV testing.

10. Figueiredo LTM, Nogueira RMR, Cavalcanti SMB, Schatzmayr H, da Rosa AT. Study of two different enzyme immunoassays for the detection of Mayaro virus antibodies. Mem Inst Oswaldo Cruz. 1989;84:303–7. http://dx.doi.org/10.1590/S0036-46651989000300003
Ebola virus disease (EVD) is a hemorrhagic fever caused by Ebola virus (EBOV); the mortality rate is high (1,2). EBOV was discovered in 1976, simultaneously in Zaire (now the Democratic Republic of the Congo) and Sudan (3,4). Since then, small to large outbreaks have occurred sporadically in the Democratic Republic of the Congo, Sudan, Gabon, Uganda, Côte d’Ivoire, and Congo (5–7).

In March 2014, the World Health Organization (WHO) reported an EVD outbreak caused by Zaire EBOV in Guinea (8,9). The main feature of this outbreak was its extension into urban areas and neighboring countries (Liberia, Sierra Leone, Nigeria, Senegal, Mali). Ten countries on 3 continents were affected; 28,646 confirmed, probable, and suspected cases and 11,323 deaths were recorded.

In August 2014, Senegal was the fifth country in Africa to be affected by imported EBOV (10). We described this case, the patient’s itinerary and epidemiologic links with confirmed case-patients in Guinea, and the evolution of the disease and the virus.

The patient was a 21-year-old man from Forecariah, Guinea, who had traveled by land to Senegal during the night of August 13–14, 2014. The date of his illness onset was August 16, 2014; symptoms were fever, vomiting, diarrhea, yellow or black feces, anorexia, and asthenia.

On August 18, he visited a suburban medical center in the suburbs of Dakar, where he received treatment for malaria: quinine, antipyretic and antimicrobial medications, and intravenous rehydration. Diarrhea and vomiting stopped on day 4 after illness onset, but fever and asthenia persisted. On August 26, the patient was admitted to Fann Hospital, Dakar, with slight dehydration, fever (39.2°C), and herpetic lesions. Because no epidemiologic link with EVD was established, the patient was not isolated.

On August 27, a total of 12 members of the patient’s family, all suspected of having EVD, were admitted to an Ebola treatment center in Conakry, Guinea; test results indicated EBOV positivity for 6. Epidemiologic investigation indicated that a member of this family had traveled to Dakar and was hospitalized. The Epidemic Management Committee set up by WHO in Guinea established an epidemiologic link between the patient in Fann Hospital and the confirmed case-patients in Guinea and quickly informed the health authorities in Senegal. The patient in Fann Hospital finally acknowledged that he had attended his uncle’s nonsecure funeral in Guinea on August 10, before coming to Dakar (Figure).

On August 28, the man was transferred to an isolation center, and blood samples were sent to the Institut Pasteur laboratory in Dakar, a WHO-approved collaborating

![Timeline for case of Ebola virus disease imported into Senegal from Guinea, 2014. Flags indicate patient information; arrows indicate public health actions. BS, blood sample; RT-PCR, reverse transcription PCR.](image-url)

**Figure.**
Centre for EBOV diagnostics. Real-time reverse transcription PCR (RT-PCR) was positive for Zaire EBOV; viral load was 2.04 × 10⁴ genome copies/mL. ELISA of the same sample detected Zaire EBOV–specific IgM (titer 1:400) and IgG (titer 1:3,200). This case of EVD in Senegal was reported to WHO on August 29. The patient received supportive care, and his clinical course progressed well; on August 31, he was afebrile and his asthenia had decreased.

In terms of virus evolution, a second blood sample tested on day 18 after illness onset showed diminution of viral load (4.96 × 10³ genome copies/mL) and an IgG titer increase to 1:6,400. A third blood sample collected on day 20 showed a negative RT-PCR result, but a urine sample collected the same day showed a positive result with a viral load of 2.04 × 10⁴ genome copies/mL. RT-PCRs of blood and urine collected on days 24 and 34 were negative, and serologic analyses showed a high IgG titer (1:12,800).

The patient was declared cured on September 18, 2014. Epidemiologic investigations revealed a total of 74 contacts in Senegal, including 41 healthcare workers (from the suburban medical center and Fann Hospital). Symptoms developed in 5 of these contacts, but their test results were negative for EBOV. No secondary case was detected after 42 days of monitoring, and the outbreak in Senegal was declared over on October 17, 2014, with only 1 confirmed case reported.

The case-patient’s low viral load, detected during the first RT-PCR 10 days after illness onset, probably explains the absence of secondary cases in Fann Hospital. However, the absence of secondary cases in the suburban medical center that the patient had visited on days 3–4 after illness onset and among the family members in Dakar is a rare feature of EVD. The preparedness and surveillance established in Senegal after announcement of EVD in Guinea led to training of healthcare workers for proper use of protective equipment and security procedures with any patient, which probably prevented virus spread in the suburban medical center. This case of EBOV importation from Guinea to Senegal confirms the problems encountered with Ebola outbreak management, including the roles of nonsecure funerals and travel in virus spread.

Acknowledgments

We thank Moussa Dia, El Hadji Abdourahmane Faye, Ousmane Kébé, Khadija Mbaye, Davy Evrard Kiori, and Oumar Ndiaye for their excellent technical assistance in laboratory diagnosis.

This work was supported by grants from the Institut Pasteur de Dakar, Senegal, and the Ministry of Health, Senegal.

Dr. Ka is an infectious disease physician who works in the Infectious and Tropical Diseases Clinic, Fann Hospital, Dakar, Senegal. His research interests are EVD, HIV, and hepatitis. Dr. Fall is a virologist who works at Arbovirus and Viral Hemorrhagic Fever Unit, Institut Pasteur de Dakar, Senegal.

Her research interests include arbovirus–vector interactions, mechanisms of arbovirus transmission, and public health activities such as diagnosis of arboviruses and hemorrhagic fever viruses.

References

1. Cenciarelli O, Pietropaoli S, Malizia A, Carestia M, D’Amico F, Sassolini A, et al. Ebola virus disease 2013–2014 outbreak in west Africa: an analysis of the epidemic spread and response. Int J Microbiol. 2015;2015:769121. http://dx.doi.org/10.1155/2015/769121
2. Feldmann H, Klenk HD. Filoviruses. In: S. Baron, editor. Medical Microbiology, 4th ed. Galveston (TX): University of Texas Medical Branch; 1996.
3. World Health Organization. Report of an International Commission: Ebola haemorrhagic fever in Zaire, 1976. Bull World Health Organ. 1978;56:271e93.
4. World Health Organization/International Study Team. Ebola haemorrhagic fever in Sudan, 1976. Report of a WHO/International Study Team. Bull World Health Organ. 1978;56:247–70.
5. Centers for Disease Control and Prevention. Outbreaks chronology: Ebola virus disease [cited 2015 Aug 2]. http://www.cdc.gov/vhf/ebola/outbreaks/history/chronology.html
6. World Health Organization. Ebola virus disease [cited 2015 Nov 28]. http://www.who.int/mediacentre/factsheets/sfs103/en/
7. Colebunders R, Borchert M. Ebola haemorrhagic fever—a review. J Infect. 2000;40:16–20. http://dx.doi.org/10.1053/jinf.1999.0603
8. World Health Organization. Ebola virus disease in Guinea [cited 2015 Aug 18]. http://www.who.int/csr/don/2014_03_23_ebola/en
9. Baize S, Pannetier D, Oestreicher L, Rieger T, Koivogui L, Magassouba N, et al. Emergence of Zaire Ebola virus disease in Guinea. N Engl J Med. 2014;371:1418–25. http://dx.doi.org/10.1056/NEJMoia1404505
10. World Health Organization. Ebola virus disease update—Senegal [cited 2014 Nov 15] http://www.who.int/csr/don/2014_08_30_ ebola/en/

Address for correspondence: Ousmane Faye, Virology Pole, Institut Pasteur de Dakar, BP 220 Dakar, Senegal; email: ofaye@pasteur.sn

Tick-Borne Encephalitis

Virus in Ticks and Roe Deer, the Netherlands

Setareh Jahfari, Anke de Vries, Jolanne M. Rijks, Steven Van Gucht, Harry Vennema, Hein Sprong, Barry Rockx

Author affiliations: National Institute for Public Health and the Environment, Bilthoven, the Netherlands (S. Jahfari, A. de Vries, H. Vennema, H. Sprong, B. Rockx); Utrecht University, Utrecht, the Netherlands (J.M. Rijks); Scientific Institute of Public Health, Brussels, Belgium (S. Van Gucht)

DOI: https://dx.doi.org/10.3201/eid2306.161247