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Preparation and characterization of innovative poly(butylene adipate terephthalate)based biocomposites for agrifood packaging application

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26 November 2026

CORRESPONDENCE



Case Series of Patients with Marburg Virus Disease, Equatorial Guinea, 2023

TO THE EDITOR: As of December 2023, a total of 17 outbreaks of Marburg virus disease[1] have been documented worldwide. We describe five patients with laboratory-confirmed Marburg virus disease who were admitted to the Mondong Treatment Center in Bata, Equatorial Guinea, in March and April 2023 during the first identified outbreak of the disease in the country.

Initial diagnosis of Marburg virus disease and serial blood testing at 48-hour intervals were conducted by the Ministry of Health and Social Welfare of Equatorial Guinea (MINSABS) National Laboratory (see the Methods section in the Supplementary Appendix, available with the full text of this letter at NEJM.org). Ethics approval was obtained from the World Health Organization Research Ethics Review Committee.

Patients were monitored and given supportive care.[2] With the exception of Patient 3, who died before treatment could be administered, all patients received remdesivir under a Monitored Emergency Use of Unregistered and Experimental Interventions protocol, which was approved by MINSABS. Informed consent was obtained from all the patients. The disease in these patients was epidemiologically linked to two distinct chains of transmission (an epidemiologic summary is provided in the Supplementary Appendix) and had two clinical trajectories.

Marburg virus disease in the three survivors — Patients 1, 2, and 4 — was diagnosed at a mean of 2.3 days after symptom onset. The three patients were men and ranged in age from 29 to 43 years; they had no apparent preexisting chronic conditions. Common symptoms among the patients who survived included anorexia, epigastric pain, sore throat, and difficulty swallowing, all of which lasted 3 to 5 days, followed by a maculopapular rash beginning on approximately day 3 or day 4. The cycle threshold (Ct) values for viral RNA in blood measured on reverse-transcriptase quantitative polymerase chain reaction ranged from 25 to 28 on day 1 after symptom onset (Fig. S1 in the Supplementary Appendix). Between days 8 and 11 after symptom onset, the patients became asymptomatic, and viral RNA became undetectable between days 9 and 12.

The two patients who died were Patient 3, a 72-year-old woman, and Patient 5, a 2-year-old girl, who were admitted to the Mondong Treatment Center 9 and 8 days after symptom onset, respectively. On admission, Patient 3 had multiorgan dysfunction, primarily hemodynamic instability, and Patient 5 had encephalopathy with seizures and respiratory dysfunction. The viral RNA levels in the patients who died (Ct values at admission, 15.1 for Patient 3 and 21.6 for Patient 5) were higher than those in the patients who survived (Ct values at admission, 25.1 for Patient 1, 25.5 for Patient 2, and 27.6 for Patient 4). The condition in both patients rapidly clinically deteriorated to shock and death within 1 day after admission. Shortly before death, bleeding from the mouth and nares was noted in Patient 3, and oral and gastric bleeding was noted in Patient 5.

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Early manifestations of Marburg virus disease in our patients began with a nonspecific (prerash) prodromal phase, characterized by low-grade fever, malaise, and body aches, followed by a maculopapular rash that appeared on the upper body at approximately day 3 or 4 and, in certain patients, that extended to the lower body; these findings are consistent with those in previous reports.[3] As the disease progressed, gastrointestinal symptoms such as nausea and anorexia, along with mild upper respiratory symptoms, emerged. These symptoms progressed to severe manifestations characterized by encephalopathy, shock, and bleeding in the patients who died (Fig. 1).

Contrary to some reports and the recommended case definition for Marburg virus disease,[4] our patients had neither vomiting nor diarrhea. Hemorrhagic signs were observed only during the terminal stage of the disease, before death.

Despite the limited sample, these findings suggest the need to reassess the current case

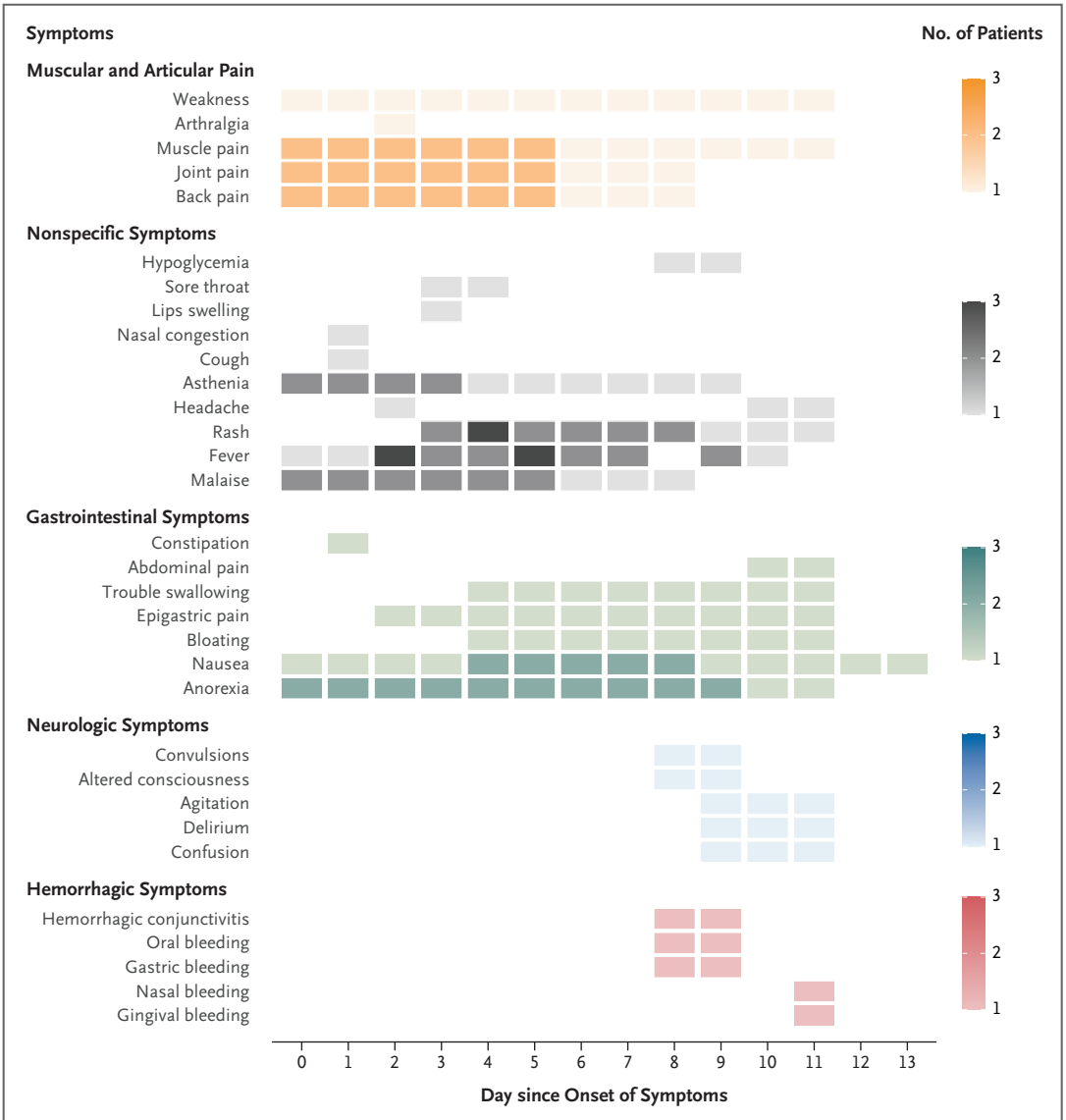

Figure 1. History of Symptoms in Five Patients with Marburg Virus Disease.

Day 0 is the day of the onset of symptoms; day 1 is the first full day after symptom onset. Different shades of each color indicate frequencies of symptoms (numbers in the key are the numbers of patients who presented with the symptom on a given day).

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definition of Marburg virus disease. Evidence on the efficacy and safety of therapeutics for the disease, including remdesivir, should be gathered through well-designed trials during future epidemic responses.

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Sudan Virus Disease among Health Care Workers, Uganda, 2022

TO THE EDITOR: Infections among health care workers represented a high proportion of cases during the first weeks of the 2022 Ebola outbreak in Uganda.[1] This Ebola outbreak, which was caused by Sudan virus, resulted in 19 infections in health care workers among 142 confirmed cases.[1] Not only are health care workers vulnerable to infection, but cases that occur early after detection of an Ebola outbreak carry an increased risk of death[2] as health systems scramble to set up well-functioning Ebola treatment units. Ethical priority for immediate and quality care of infected health care workers is buttressed by the need to minimize fear, burnout, and strikes among these workers, since such complications could ultimately lead to deaths among patients with or without Ebola disease.[3]

On September 20, 2022, Uganda declared an Ebola outbreak due to Sudan virus in the Mubende district. We report on seven health care workers who contracted Sudan virus disease, most likely through two nosocomial transmission events that occurred before the identification of the outbreak. On September 15, 2022, an exposure event occurred during an emergency exploratory laparotomy that was performed in a patient who was thought to have a perforated bowel (Figs. S1 through S3 in the Supplementary Appendix, available with the full text of this let-

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