



The challenges of detecting and responding to a Lassa fever outbreak in an Ebola-affected setting



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ABSTRACT

Objectives: Lassa fever (LF), a priority emerging pathogen likely to cause major epidemics, is endemic in much of West Africa and is difficult to distinguish from other viral hemorrhagic fevers, including Ebola virus disease (EVD). Definitive diagnosis requires laboratory confirmation, which is not widely available in affected settings. The public health action to contain a LF outbreak and the challenges encountered in an EVD-affected setting are reported herein.

Methods: In February 2016, a rapid response team was deployed in Liberia in response to a cluster of LF cases. Active case finding, case investigation, contact tracing, laboratory testing, environmental investigation, risk communication, and community awareness raising were undertaken.

Results: From January to June 2016, 53 suspected LF cases were reported through the Integrated Disease Surveillance and Response system (IDSR). Fourteen cases (26%) were confirmed for LF, 14 (26%) did not have a sample tested, and 25 (47%) were classified as not a case following laboratory analysis. The case fatality rate in the confirmed cases was 29%. One case of international exportation was reported from Sweden. Difficulties were identified in timely specimen collection, packaging, and transportation (in confirmed cases, the time from sample collection to sample result ranged from 2 to 64 days) and a lack of response interventions for early cases.

Conclusions: The delay in response to this outbreak could have been related to a number of challenges in this EVD-affected setting: a need to strengthen the IDSR system, develop preparedness plans, train rapid response teams, and build laboratory capacity. Prioritizing these actions will aid in the timely response to future outbreaks.

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Introduction

Lassa fever is a rare viral hemorrhagic fever (VHF) listed by the World Health Organization (WHO) as one of the emerging pathogens likely to cause severe outbreaks in the near future with few medical countermeasures (WHO, 2015a). There is limited published research on the response to outbreaks of this significant public health threat, essential information to improve preparedness activities.

Liberia is one of the few countries endemic for Lassa fever, the others being found across West Africa where 300 000–500 000

new infections are estimated to occur annually (Ogbu et al., 2007). This is also the region of the world most affected by the Ebola virus disease (EVD) epidemic of 2013–2016 (Agua-Agum et al., 2016). Data on annual incident cases of Lassa fever in Liberia are limited, with previous reports focusing on hospital-based outbreaks (Monath et al., 1973) or exported cases (Kyei et al., 2015; Amorosa et al., 2010).

Lassa fever is caused by the Lassa virus, an arenavirus first reported in 1969 from Lassa, Nigeria (Frame et al., 1970). The primary animal reservoir for the Lassa virus is the rodent *Mastomys natalensis* (Monath et al., 1974). It is transmitted to humans through the excreta of infected rodents, often via contaminated food. Subsequent person-to-person transmission can occur through direct contact with bodily fluids, often due to a lack of appropriate infection prevention and control (IPC) measures whilst receiving care (Fisher-Hoch et al., 1995; McCormick, 1987). There is

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some debate over the relative contribution of human-to-human transmission, with a recent study using data from Sierra Leone suggesting just 20% of Lassa fever cases were attributable to this mode of infection (Lo Iacono et al., 2015; Shaffer et al., 2014).

Lassa fever has an incubation period of 6–21 days, and symptoms include headache, fever, weakness, and mucosal bleeding amongst others (WHO, 2017a). Many of those infected will be asymptomatic or have mild infections not requiring clinical treatment. The case fatality rate is estimated at 1–15% (McCormick et al., 1987a,b), with high mortality reported in nosocomial events (Monath et al., 1973; Fisher-Hoch et al., 1995). Lassa fever is difficult to distinguish from other VHF's such as EVD, as well as other diseases that cause fever, including malaria, shigellosis, typhoid fever, and yellow fever, due to the varied and non-specific symptoms. Laboratory investigation therefore plays an important role in both diagnosis and surveillance of Lassa fever, with a definitive diagnosis requiring testing available only in regional reference laboratories.

Lassa fever is one of Liberia's 14 immediately notifiable epidemic-prone diseases under the Integrated Disease Surveillance and Response system (IDSR) (Ministry of Health Liberia WHO and C for DC and P, 2016). In 2014–2016, Liberia reported nearly 11 000 cases of EVD and 5000 deaths as part of the world's largest EVD epidemic (WHO, 2017b). During the EVD epidemic, surveillance for other IDSR notifiable diseases was compromised and laboratory testing for diseases other than EVD was limited. The epidemic significantly impacted the already weak healthcare system in Liberia (Gostin and Friedman, 2015; Heymann et al., 2015; Shoman et al., 2017), including the surveillance system and diagnostic capacity to respond to other public health events.

The outbreak

On February 19, 2016, a cluster of three suspected Lassa fever cases, including one death, was notified to the Liberia Ministry of Health (MOH) from Suakoko District, Bong County. The MOH was requested to assist the County Health Team (CHT) in responding to this outbreak with the support of the WHO Liberia Country Office. Investigations commenced to find additional cases, identify the sources of infection, and control the outbreak.

The public health action taken to contain the outbreak and prevent further cases is reported herein. The challenges encountered when mounting an effective response to a Lassa fever outbreak in an EVD-affected setting were also explored, including the implications for strengthening disease surveillance, response, and prevention activities in Liberia.

Methods

The epidemiological investigations into this outbreak carried out by the response team are described below. These included a retrospective review of surveillance data and health facility-based records, as well as outbreak response activities following guidelines, where available, for the response to a Lassa fever outbreak (WHO, 2017a; World Health Organisation C for DC and P, 2017).

The surveillance system

In Liberia, notification of suspected cases of Lassa fever to the MOH by all healthcare facilities (HCF) is mandatory as part of the IDSR system (Ministry of Health Liberia WHO and C for DC and P, 2016). If a person presents with signs and symptoms consistent with the suspected case definition for Lassa fever (Box 1), the clinician should make a notification to the district surveillance officer (DSO) by the fastest possible means. The patient should be isolated immediately, appropriate IPC precautions taken, and a blood specimen taken for laboratory testing.

All epidemic-prone diseases have an alert and action threshold, requiring further investigation. Due to its epidemic potential and pathogenicity, the alert threshold for Lassa fever is one suspected case, and a thorough investigation must be undertaken for each case reported. Case investigation is conducted by the district and county health teams, but support can be requested from the national MOH team. The action threshold, and also the definition of a Lassa fever outbreak in Liberia is one confirmed case.

On a weekly basis, summary numbers of all 14 suspected epidemic-prone diseases reported from HCFs in the county are notified from the CHT to the MOH (Ministry of Health Liberia WHO and C for DC and P, 2016). This information is then analyzed and additional information on response actions is requested. The MOH publishes this information for stakeholders in the weekly IDSR bulletin (Ministry of Health Liberia WHOLCO, 2016).

Laboratory diagnosis and specimen referral system

During the Ebola epidemic, an embargo was placed on the transportation of samples internationally. Therefore diagnostic capacity was severely compromised, as testing for Lassa fever was not available in-country and referral to the regional Lassa fever laboratory in Kenema, in neighboring Sierra Leone, was not an option.

In the weeks preceding identification of the index case of this outbreak in February 2016, the regional laboratory in Kenema had agreed to lift the embargo and accept specimens from Liberia for Lassa fever testing, although this had not yet occurred in practice.

Outbreak investigation

Following the notification of three suspected cases from the rubber factory community in Suakoko District, Bong County, a rapid response team consisting of representatives from the national MOH disease prevention and control department, the environmental health department, and the WHO, was deployed to Bong County on February 20, 2016. They joined the Bong County surveillance officer (CSO) and Suakoko DSO to conduct further investigations.

Additionally, a team from the MOH supported by the WHO reviewed data on Lassa fever cases previously notified in 2016. An outbreak was suspected in Bong County and an alert was issued to the neighboring counties of Nimba, Gbarpolu, and Lofa, also considered to be endemic for Lassa fever.

Box 1. Lassa fever case definition.

Suspected case of Lassa fever: illness with gradual onset with one or more of the following: malaise, fever, headache, sore throat, cough, nausea, vomiting, diarrhea, myalgia, chest pain, hearing loss, and a history of contact with excreta of rodents or with a case of Lassa fever.

Confirmed case of Lassa fever: a suspected case that is laboratory-confirmed (positive IgM antibody, PCR or virus isolation).

Source: Liberia IDSR guidelines.

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