

Lassa Fever Virus Diagnostic and Treatment Considerations

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Serious
Communicable
Diseases Program



Cluster of Lassa Cases Originating from Togo

- **25 Feb 2016: Case #1- health care worker in Togo was evacuated to Cologne, Germany for treatment of “falciparum malaria”**
 - 26 Feb 2016: Deceased from multi-organ failure; later autopsy findings suggestive of hemorrhagic fever
 - 9 Mar 2016: Lassa fever diagnosis was confirmed postmortem at the Bernhard Nocht Institute for Tropical Medicine in Hamburg
- **4 Mar 2016: Healthcare worker caring for Case #1 in Togo became ill**
 - 9 Mar 2016: Lassa virus test positive
 - 12 Mar 2016: patient transferred to Emory Serious Communicable Diseases Unit in Atlanta, USA
- **7 March 2016: Funeral home worker who cared for Case #1 prior to postmortem diagnosis becomes symptomatic**
 - 9 Mar 2016: Placed in home quarantine
 - 15 Mar 2016: Lassa Fever confirmed; transported to a special isolation unit in Frankfurt, Germany



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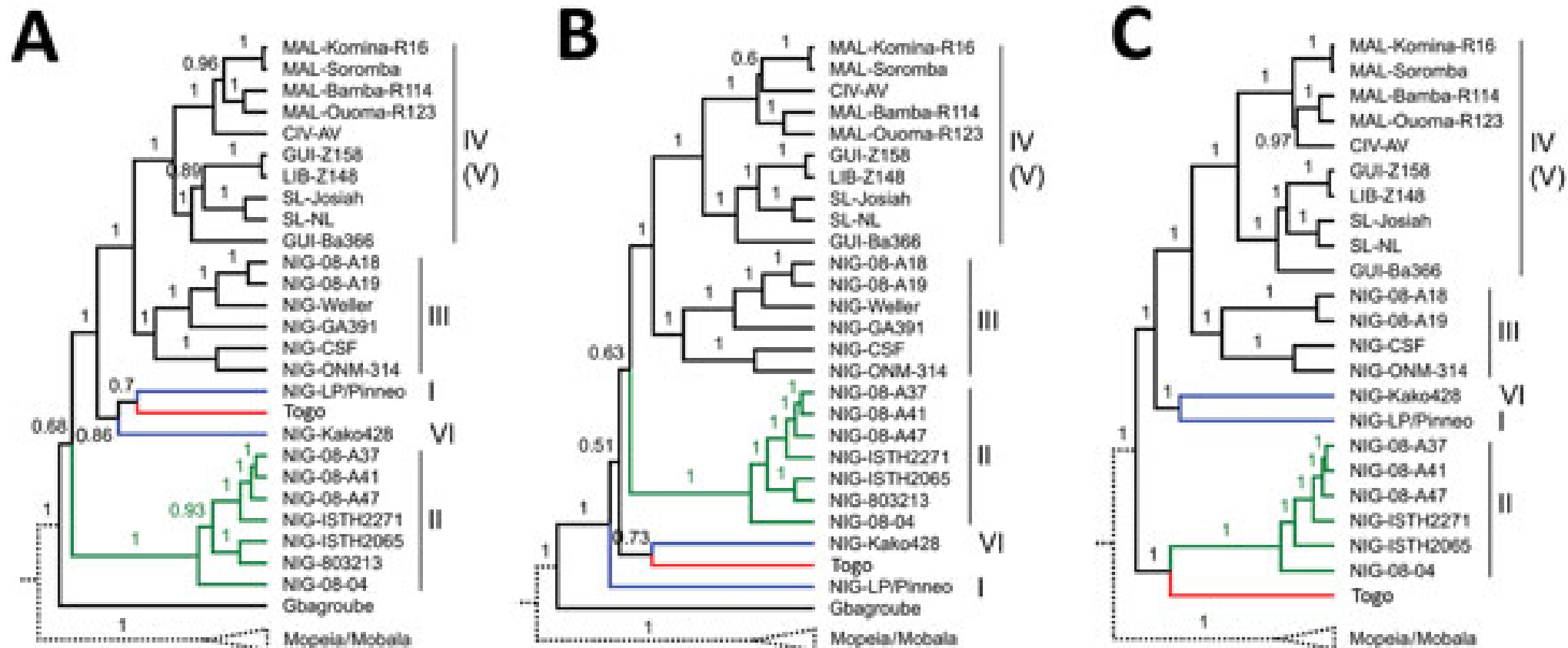
Lassa Cases in the United States are rare

Table. Patients with imported Lassa fever who were hospitalized in the United States*

Patient no.	Year of import	From	To	Clinical manifestations
1	1969	Nigeria	New York, NY	Fever, malaise, headache, nausea, sore throat, epigastric/right upper quadrant tenderness, pleural effusion, facial/cervical edema, dysphagia, elevated transaminases, cough, dyspnea, pulmonary infiltrates, epiglottal edema, lethargy, nystagmus, lightheadedness, dizziness without vertigo, ataxia, alopecia (2)
2	1975	Sierra Leone	Washington, DC	Abdominal pain, diarrhea, fever, headache, myalgia, arthralgia, conjunctival injection, lymphadenopathy, weight loss, pleuritic chest pain, pleural effusion, unilateral deafness
3	1976	Sierra Leone	Washington, DC	Abdominal cramps, nausea, vomiting, diarrhea, fatigue, headache, retroorbital pain, neck/back pain, paresthesias, right ear pain, fever, vertigo, syncope, dysmorphopsias, alopecia, weight loss, ecchymoses, insomnia, depression, hypotension, left-sided facial weakness, right-sided Babinski reflex, Weber test lateralized to the left (3)
4	1989	Nigeria	Chicago, IL	Shaking chills, fever, sore throat, myalgia, headache, dysphagia, bloody diarrhea, elevated transaminases, hypotension, adult respiratory distress syndrome, death (4)
5	2004	Sierra Leone and Liberia	Trenton, NJ	Chills, fever, sore throat, diarrhea, back pain, adult respiratory distress syndrome, death (1)

- Pennsylvania 2010
- Minnesota 2014
- New Jersey 2015
- Atlanta 2016

New Lassa strain from Togo



Diagnosis of Lassa Fever Virus occurs in referral laboratories

- Serology – IgG, IgM ELISA
 - IgG positive seroprevalence in Sierra Leone region 8-54%
 - IgM sensitivity 57% and specificity 77% compared to PCR
- Antigen detection by ELISA
- RT-PCR
 - Encountered difficulty with finding primers for all strains due to genetic variability
 - Development of new primers
 - Oligonucleotide array hybridization chip for post-PCR amplicons
- Lateral Flow Assays –
- Next generation sequencing in resource limited settings is here!

Diagnosis of Lassa fever in the United States

Lassa Fever Testing	
CDC-10343	
Synonym(s)	<i>Arenavirus</i>
CDC Pre-Approval Needed	Trevor Shoemaker (470) 312-0094 spather@cdc.gov John Klena (404) 639-0114 irc4@cdc.gov
Supplemental Information Required	See Supplemental Form
Supplemental Form	VSPB Specimen Submission Form. https://www.cdc.gov/ncezid/dhcpp/vspb/specimens.html

FilmArray® Global Fever Panel - RUO

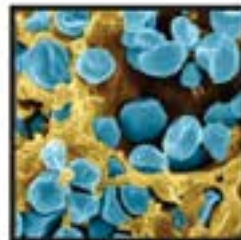
For Research Use Only.
Not for use in diagnostic procedures.

1 Test. 19 Targets. All in About an Hour.



Viruses

Chikungunya virus
Crimean-Congo hemorrhagic fever virus
Dengue virus
Ebola virus
Lassa virus
Marburg virus
West Nile virus
Yellow fever virus
Zika virus



Bacteria

Bacillus anthracis
Francisella tularensis
Leptospira spp.
Salmonella enterica serovar Typhi
Salmonella enterica serovar Paratyphi A
Yersinia pestis



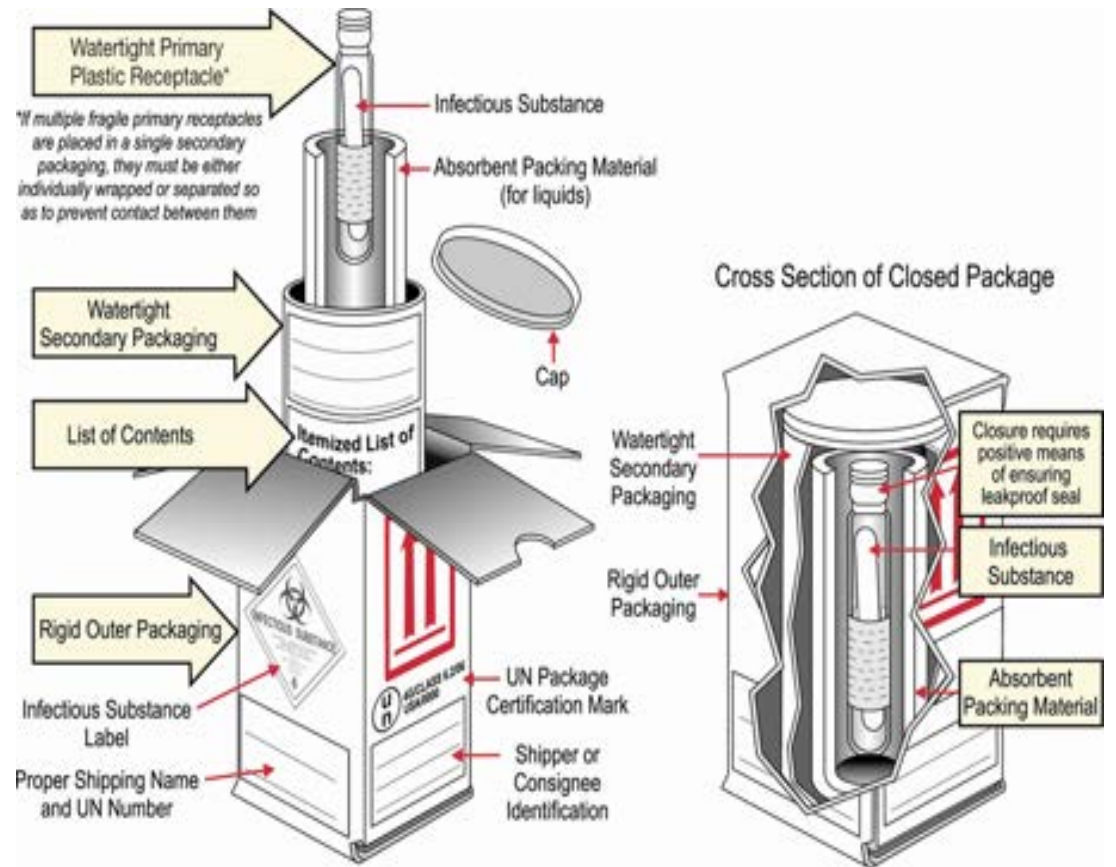
Protozoa

Leishmania spp.
Plasmodium spp.
P. falciparum
P. vivax/ovale

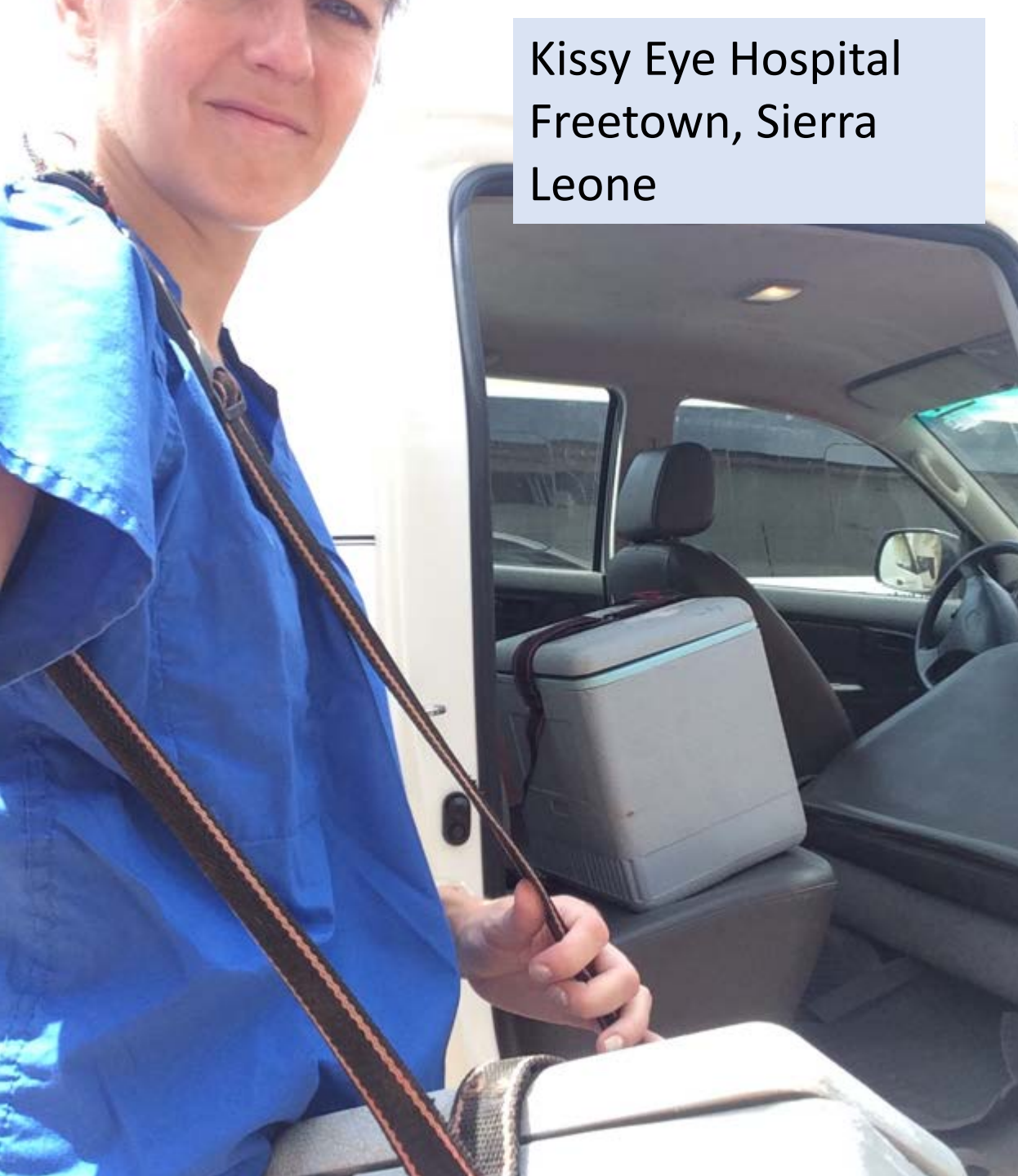
<https://www.biofiredefense.com/wp-content/uploads/2018/08/FilmArray-Global-Fever-Panel-RUO-InfoSheet-MRKT-PRT-0299.pdf>

Shipping for suspect Category A pathogens

- Required training of the individual packing the container
- Required shipper details
- Should not be considered a select agent until confirmed (subject to change)
- Category A vs suspect Category A (Category B)



Kissy Eye Hospital
Freetown, Sierra
Leone



Emory Hospital
Atlanta, GA, USA





Treatment similar in the repatriated patients in 2016 – in United States and Germany

- Ribavirin was initiated on day 6 and day 5, respectively
- Both patients received favipiravir on day 8 and day 5, respectively
 - First use in human Lassa Fever
 - Both received 5 days of treatment
- Both patients survived and had a meaningful recovery

Clinical Infectious Diseases

BRIEF REPORT

Favipiravir and Ribavirin Treatment of Epidemiologically Linked Cases of Lassa Fever

Vanessa N. Raabe,^{1,a} Gerrit Kann,^{2,a} Bruce S. Ribner,¹ Andres Morales,³ Jay B. Varkey,¹ Aneesh K. Mehta,¹ G. Marshall Lyon,¹ Sharon Vanairsdale,⁴ Kelly Faber,⁵ Stephan Becker,⁶ Markus Eickmann,⁶ Thomas Strecker,⁶ Shelley Brown,⁷ Ketan Patel,⁷ Philipp De Leuw,² Gundolf Schuettfort,² Christoph Stephan,² Holger Rabenau,⁸ John D. Klena,⁷ Pierre E. Rollin,⁷ Anita McElroy,⁷ Ute Ströher,⁷ Stuart Nichol,⁷ Colleen S. Kraft,^{1,9,a} and Timo Wolf,^{2,a} for the Emory Serious Communicable Diseases Unit^a

¹Division of Infectious Diseases, Emory University, Atlanta, Georgia; ²Department of Medicine, Infectious Diseases Unit, Goethe University Hospital, Frankfurt/Main, Germany; ³Samaritan's Purse, Togo, West Africa; ⁴Emory Healthcare, Atlanta, Georgia; ⁵Hospital of Hope, Mango, Togo; ⁶Institute of Virology and Germany Centre for Infectious Diseases Research (DZIF), Gießen-Marburg-Langen, Philipps University, Marburg, Germany; ⁷US Centers for Disease Control and Prevention, Viral Special Pathogens Branch, Atlanta, Georgia; ⁸Institute of Medical Virology, University Hospital, Frankfurt, Germany; and ⁹Department of Pathology and Laboratory Medicine, Emory University, Atlanta, Georgia

Updated therapeutic possibilities for Lassa?

- Intravenous ribavirin preferred over oral ribavirin
- Lower case-fatality rate for IV vs. no treatment in Sierra Leone
- Supportive care
- Other antivirals with in vitro activity if receive emergency IND approval from the FDA

FDA Contacts for Obtaining an Emergency IND

Product	Office/Division to Contact
drug products	Division of Drug Information (888) 463-6332 (301) 796-3400
biological blood products	Office of Blood Research and Review (240) 402-8360
biological vaccine products	Office of Vaccines Research and Review Contact the Office of Communication, Outreach and Development at: (240) 402-7800
On nights and weekends	Office of Crisis Management & Emergency Operations Center (866) 300-4374 (301) 796-8240

Current Lassa Activity

- Nigerian outbreak with 211 diagnoses in January 2022, 40 deaths

<https://www.who.int/emergencies/disease-outbreak-news/item/lassa-fever---nigeria>

- Togo outbreak with 1 individual, 26 contacts

<https://www.who.int/emergencies/disease-outbreak-news/item/lassa-fever-togo>



Questions?

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I eat Lassa
for breakfast

