

# Strategies to Prevent Spillover (STOP Spillover)

## Understanding the Environmental and Sociodemographic Risk Factors for Lassa Fever in eastern Sierra Leone

Suna Kumba Tucker<sup>1</sup>; Alpha Jabbe<sup>1</sup>; Dr. Edward Magbity<sup>1</sup>; Momojah Jabbe<sup>1</sup>; Lily Kainwo<sup>1</sup>; Jennifer Scheffee Peterson<sup>1</sup>; Dr. Bruno M. Ghersi<sup>2</sup>; Dr. Katherine Prager<sup>3</sup>; Dr. Elaine M. Faustman<sup>4</sup>; Elizabeth Creel<sup>5</sup>; Elizabeth Gold<sup>5</sup>; Nichole Davis<sup>5</sup>; David Jojo<sup>6</sup>; Watta Hai<sup>6</sup>; Miatia H Jusu<sup>7</sup>; Daniella Ademukula<sup>8</sup>

1. Tetra Tech, 2. Tufts University Cummings School of Veterinary Medicine, 3. University of California Los Angeles, 4. University of Washington, 5. JSI, 6. Njala University, 7. WEAP, 8. Ministry of Agriculture and Food Security, Sierra Leone

### Background

- ❑ Lassa fever is an acute viral hemorrhagic disease, caused by Lassa virus. It is shed in the feces, urine and body fluids of the primary reservoir host, the multimammate rat, *Mastomys natalensis* (see photo below).
- ❑ Lassa virus transmission to humans occurs most commonly through contact (e.g. ingestion, inhalation, mucus membrane, cuts/abrasions) with virus contaminated objects and food, or infected animals. Viral inhalation may occur during cleaning and sweeping areas with infected rodent excretions.
- ❑ Person-to-person transmission is possible, and is most common in low resourced health care settings. Casual contact without the exchange of body fluids does not spread the virus.
- ❑ Lassa fever occurs mainly in West Africa where approximately 300,000 people get infected with the Lassa virus annually. 80% of people infected have no or mild symptoms; however, one in five people develop a severe disease. An estimated 5000 people die from the disease each year in West Africa.
- ❑ Lassa Fever is particularly severe in pregnant women, especially during their third trimester, and their unborn children; the fetal death rate can exceed 85%.
- ❑ In search of food, rodents migrate during the dry season from their natural habitats in forests and farms to human settlements, where they seek shelter. Human settlements provide favorable breeding sites for rodents, which flourish and remain in areas with poor sanitation even after the onset of the rainy season.
- ❑ Human activities and practices, sociodemographic characteristics, and environmental factors as well as food handling and storage practices, and destruction of rodent habitats affect human-rodent interactions and the risk of human exposure to Lassa virus.
- ❑ In Sierra Leone, these factors have received little attention in Lassa fever research. It is critical to understand the variables that contribute to rodent abundance, transmission, and occurrence of Lassa fever virus in order to better predict, control and reduce the spread of the virus, and reduce associated mortality and morbidity rates in Sierra Leone.

#### References:

WHO. 2019. Introduction to Lassa fever. [https://cdn.who.int/media/docs/default-source/documents/emergencies/health-topics---lassa-fever/lassa-fever-introduction.pdf?sfvrsn=b1b96509\\_2&download=true](https://cdn.who.int/media/docs/default-source/documents/emergencies/health-topics---lassa-fever/lassa-fever-introduction.pdf?sfvrsn=b1b96509_2&download=true)



Photo 1: *Mastomys natalensis* (Photo Credit: Dr. Bruno Ghersi)

### Methods

#### RESEARCH OBJECTIVE:

- ❑ The objective of this study is to describe human behaviors, beliefs, and practices that may exacerbate the frequency of human-rodent contact, and outline potential sustainable control techniques in Sierra Leone.

#### STUDY AREA:

- ❑ The study was conducted in 8 communities around the Gola Rainforest in Kenema district, Eastern Sierra Leone.

#### DATA COLLECTION, MANAGEMENT AND ANALYSIS:

- ❑ Qualitative data was collected using key informant interviews (KII), focus group discussions (FGDs) and direct observations.
- ❑ Target respondents included male and female farmers (interviewed separately), male and female youth (18-35 years old; interviewed separately), and mothers (5 FGDs per community). Traditional chiefs, community health workers (CHWs), and older farmers were target respondents for KIIs (3 KIIs per community).
- ❑ Forty FGDs took place with 277 respondents from eight communities, and KIIs included 24 respondents from these communities, reaching a total of 301 people (N = 169 women; 56%).
- ❑ Data analysis was done manually, using thematic analysis methods. Data analysis focused on specific research questions. Data outliers were also identified and reported.
- ❑ Findings from formative research were used to create personas to inform social behavior change activities and approaches to reduce zoonotic spillover risks.

#### STUDY LIMITATIONS:

- ❑ A limited number of respondents participated in the survey, and information obtained cannot be generalized to communities outside of the target zone.
- ❑ Some questions related to respondents' cultural or religious practices including hunting and eating rats. Respondents considered these to be sensitive questions they could not always answer openly (i.e., people were uncomfortable admitting they eat rats).

#### ETHICAL CONSIDERATIONS:

- ❑ The study protocol was approved by the Tufts University IRB and local ethical approval was granted by the Sierra Leone Ethics and Scientific Review Committee prior to data collection. Participants provided informed consent.



Photo 2: Traditional home where grain is stored in local communities surveyed (Photo Credit: Jen Peterson, Tetra Tech)

### Results

#### Human - rodent interactions

- ❑ Crop drying and grain storage facilities are rudimentary. Crops are dried in the sun by spreading grains on plastic sheets, old clothes, bed nets, or on the ground.
- ❑ Farmers store crop harvests in barns and kitchens, and most often in their homes. Men and women farmers feel that their grain storage and food storage practices directly result in increased rodent incursions into their homes, when rodents search for food and shelter.
- ❑ Many male farmers and male youth said that they eat rats, increasing their risk of contacting Lassa virus.
- ❑ Most respondents identified women and children as the highest risk group for Lassa fever virus transmission. Health workers and elderly people were also identified as high-risk groups.
- ❑ All focus groups identified waste disposal practices as key contributors to rodent infestations.

#### ENVIRONMENTAL VARIABLES THAT CONTRIBUTE TO LASSA RISK:

- ❑ According to many farmers encountered, rodent populations in homes increase when crops are harvested and brought from fields to homes (August-November).
- ❑ However, other farmers (about half of the male and female farmers reached) said rodents are present all year in their homes, and their abundance does not vary by season.
- ❑ Several traditional chiefs mentioned that where there are effective and enforced community bylaws and sanitation inspection officers, there are fewer rats. People use poison, cats and traps to reduce rodent populations in their homes.

### Conclusions

- ❑ Humans and rodents in target communities come into contact almost daily. Contact is more frequent in homes than in farmers' fields.
- ❑ Attempts to control or eradicate rodents with baits and traps have had limited results in Sierra Leone and elsewhere in the region.
- ❑ Community members identified improved hygiene and sanitation practices (in particular garbage and solid waste management practices) and improved food and grain storage methods (storing grains in wooden boxes and plastic drums) that could significantly reduce rodent populations in the community and household, thereby decreasing human-rodent interactions. These improved practices are being tested in 6 target and 2 control communities to evaluate their social and cultural acceptability and economic efficacy, and to validate their potential sustainability in Eastern Sierra Leone.

### Acknowledgements

This study was conducted in collaboration with members of the STOP Spillover consortium, funded by USAID and led by Tufts University. External stakeholders including staff from the Gola National Rainforest Park, the University of Sierra Leone, Njala University, the District Health Management Team in Kenema, and the Ministries of Agriculture and Food Security; the Ministry for Environment and Climate Change, the Environmental Protection Agency in Sierra Leone, and the Ministry of Health and Sanitation participated in this research.

This research was made possible by the generous support of the American people through the United States Agency for International Development (USAID). The contents are the responsibility of STOP Spillover implementing partners and do not necessarily reflect the views of USAID or the United States Government.