

# Prevention of sexual transmission of Ebola in Liberia through a national semen testing and counselling programme for survivors: an analysis of Ebola virus RNA results and behavioural data



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## Summary

**Background** Ebola virus has been detected in semen of Ebola virus disease survivors after recovery. Liberia's Men's Health Screening Program (MHSP) offers Ebola virus disease survivors semen testing for Ebola virus. We present preliminary results and behavioural outcomes from the first national semen testing programme for Ebola virus.

**Methods** The MHSP operates out of three locations in Liberia: Redemption Hospital in Montserrado County, Phebe Hospital in Bong County, and Tellewoyan Hospital in Lofa County. Men aged 15 years and older who had an Ebola treatment unit discharge certificate are eligible for inclusion. Participants' semen samples were tested for Ebola virus RNA by real-time RT-PCR and participants received counselling on safe sexual practices. Participants graduated after receiving two consecutive negative semen tests. Counsellors collected information on sociodemographics and sexual behaviours using questionnaires administered at enrolment, follow up, and graduation visits. Because the programme is ongoing, data analysis was restricted to data obtained from July 7, 2015, to May 6, 2016.

**Findings** As of May 6, 2016, 466 Ebola virus disease survivors had enrolled in the programme; real-time RT-PCR results were available from 429 participants. 38 participants (9%) produced at least one semen specimen that tested positive for Ebola virus RNA. Of these, 24 (63%) provided semen specimens that tested positive 12 months or longer after Ebola virus disease recovery. The longest interval between discharge from an Ebola treatment unit and collection of a positive semen sample was 565 days. Among participants who enrolled and provided specimens more than 90 days since their Ebola treatment unit discharge, men older than 40 years were more likely to have a semen sample test positive than were men aged 40 years or younger ( $p=0.0004$ ). 84 (74%) of 113 participants who reported not using a condom at enrolment reported using condoms at their first follow-up visit ( $p<0.0001$ ). 176 (46%) of 385 participants who reported being sexually active at enrolment reported abstinence at their follow-up visit ( $p<0.0001$ ).

**Interpretation** Duration of detection of Ebola virus RNA by real-time RT-PCR varies by individual and might be associated with age. By combining behavioural counselling and laboratory testing, the Men's Health Screening Program helps male Ebola virus disease survivors understand their individual risk and take appropriate measures to protect their sexual partners.

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## Introduction

In March, 2015, a 44-year-old female from Monrovia, Liberia, contracted Ebola virus disease and died in an Ebola treatment unit (ETU). An extensive investigation revealed one epidemiological link to Ebola virus exposure: unprotected sexual intercourse with a male

Ebola virus disease survivor.<sup>1</sup> A semen specimen collected from the Ebola virus disease survivor tested positive for Ebola virus RNA by real-time RT-PCR (rRT-PCR) 199 days after he first became ill with Ebola virus disease. Although no infectious virus was isolated from the semen, genetic analysis of the Ebola virus collected

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### Research in context

#### Evidence before this study

We searched PubMed and MEDLINE for the following search terms: “Ebola” and “sexual transmission”, “semen”, and “viral persistence”. The search was done from Nov 15, 2015, to May 30, 2016. Search results were then limited to research studies using RT-PCR or virus culture, or both, to detect the presence of Ebola virus in semen of survivors of Ebola virus disease. This search yielded seven articles. Four publications reported results for Ebola virus disease survivors of the 2014 west Africa Ebola virus disease outbreak treated in west Africa. Of these, the largest cohort of Ebola virus disease survivors tested was 100. The longest period of time between disease onset and the detection of Ebola virus disease RNA by RT-PCR was 276 days. Viral culture results were not reported in the four articles reporting semen test results of Ebola virus disease survivors cared for in west Africa. One article reported semen test results from five male Ebola virus disease survivors cared for in the USA. The longest period of time between disease onset to the detection of Ebola virus disease RNA by RT-PCR in these men was 290 days. The highest cycle threshold value for the nucleoprotein gene target for semen specimens from which Ebola virus disease was isolated by viral culture was 30.

#### Added value of this study

We describe the preliminary test results and behavioural outcomes for, to our knowledge, the first national semen testing and counselling public health programme for Ebola

virus disease survivors. We present serial RT-PCR semen test results for 429 Ebola virus disease survivors in Liberia, and report a possible association of age and the duration of detection of Ebola virus RNA by RT-PCR. We also report, to our knowledge, the longest interval between discharge from the Ebola treatment unit and the collection of a positive semen sample (565 days). We found that counselling paired with laboratory testing favourably affected reported condom use by men enrolled in the programme, with 74% of participants who reported not using a condom at enrolment subsequently reporting using a condom at their last sexual encounter.

#### Implications of all the available evidence

We found that the duration for which Ebola virus is detected in the semen of Ebola virus disease survivors varies by individual. As such, semen testing programmes that combine behavioural counselling and laboratory testing can play an important part in educating male survivors of Ebola virus disease of their risk of transmitting Ebola virus through sex and could potentially mitigate future outbreaks associated with sexual transmission. The Men’s Health Screening Program can serve as a model for future semen testing programmes for Ebola virus. We also found that the duration in which Ebola virus is detected in the semen of Ebola virus disease survivors might be associated with age. Future studies should be designed to investigate this possible association and to identify other factors that might be associated with prolonged viral persistence in semen.

from the semen of the Ebola virus disease survivor closely matched the Ebola virus recovered from the female patient.<sup>2</sup>

Based on virus-isolation results from previous Ebola virus disease and Marburg virus disease survivors,<sup>3–5</sup> Ebola virus disease survivors were encouraged to practice abstinence or use condoms for 90 days after recovering from the disease. However, the possibility of infectious Ebola virus persisting in the semen of survivors beyond this timeframe prompted WHO to issue new guidance. In May, 2015, WHO released interim guidance for male Ebola virus disease survivors.<sup>6</sup> This interim guidance recommended the following: (1) in addition to receiving condoms and sexual risk reduction counselling at ETU discharge, all male survivors should be offered semen testing for Ebola virus RNA by rRT-PCR until their semen tests negative twice for Ebola virus RNA; (2) male survivors and their sexual partners should be provided with condoms and receive counselling to ensure safe sexual practices until their semen has twice tested negative; and (3) if a survivor’s semen has not been tested, he should practise safe sex for at least 6 months after onset of symptoms.

At the time WHO released their interim guidance, semen testing for Ebola virus RNA was not widely available in Liberia. To address this gap, on July 7, 2015,

the Liberian Ministry of Health, in collaboration with WHO, the Academic Consortium Combating Ebola in Liberia, and the US Centers for Disease Control and Prevention (CDC), launched the Men’s Health Screening Program (MHSP). Based on the principles outlined in WHO’s interim guidance,<sup>6</sup> the MHSP provides male Ebola virus disease survivors with semen testing for Ebola virus RNA by rRT-PCR and behavioural counselling on safe sex practices. We describe Liberia’s national semen testing programme for Ebola virus, present preliminary semen testing results, and report sexual risk behaviours.

## Methods

### Study design and participants

The MHSP operations manual is provided in the appendix (pp 2–34). The MHSP operates out of three locations in Liberia: Redemption Hospital in Montserrado County, Phebe Hospital in Bong County, and Tellewoyan Hospital in Lofa County (figure 1). Men are eligible to enrol if they are aged 15 years or older and can provide an ETU discharge certificate. Due to insufficient laboratory capacity and challenges in specimen transportation during the height of the Ebola virus disease outbreak in Liberia, laboratory confirmation of Ebola virus infection was not available for all patients with suspected Ebola

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