RAPID RISK ASSESSMENT

Cases of Lassa fever in the Netherlands ex Sierra Leone

28 November 2019

Summary

On 20 and 24 November 2019, respectively, the Dutch public health authorities confirmed two imported cases of Lassa fever from Sierra Leone. Both were Dutch healthcare workers who worked in a rural hospital in Sierra Leone. They were probably infected during surgery they conducted together on two local patients on 4 November 2019. Both healthcare workers had onset of symptoms on 11 November and were medically evacuated to the Netherlands, where one of them died.

Whilst in the prodromal phase of the disease and still afebrile, the Dutch healthcare worker who later died in the Netherlands attended an international surgical training event in Freetown, Sierra Leone (11–12 November 2019).

ECDC has been informed of contact tracing activities being carried out in several EU countries including the Netherlands, Germany, Denmark and the United Kingdom. Outside of the EU, contacts were identified in Sierra Leone, Uganda and India.

The risk level for secondary transmission among healthcare workers in the EU/EEA and Sierra Leone depends on several factors such as closeness, duration of contact and the type of activity performed (e.g. by medical staff or those handling bodies of deceased Lassa fever patients in preparation for funeral). The type of personal protective equipment used is another factor. Healthcare workers involved in invasive care procedures are at increased risk of exposure. In healthcare settings, when appropriate infection prevention and control precautions and laboratory biosafety measures are in place, the secondary attack rate for Lassa virus transmission is extremely low.

Given that the deceased Dutch healthcare worker was in the prodromal phase during the international surgical training event on 11–12 November 2019 and that the maximum incubation period is three weeks, further cases among contacts may be detected. However, as he was in the prodromal phase of illness and the likelihood of virus transmission increases with disease progression, his contacts during this phase appear to be at low-risk of exposure. Nonetheless, the contacts of the cases who were in the hospital in Sierra Leone at the time are considered to be at risk. Contact tracing activities are ongoing and relevant public health authorities have been alerted. Further contacts of the cases from the period during which they were symptomatic in Sierra Leone may still be detected.

Lassa fever is endemic in most parts of Sierra Leone. Incidence of Lassa fever is higher in rural areas, where living conditions are basic and the likelihood of entering into contact with infected rodents is higher.

There is no risk of primary infection with Lassa virus in community settings in the EU/EEA since *Mastomys* spp. rodents are not native to Europe. The likelihood of the general population encountering a Lassa fever case in the EU/EEA is very low and transmission of Lassa virus from travel-associated or air-lifted cases has been rare.

EU/EEA travellers or EU/EEA citizens residing in Sierra Leone should be informed of the risk of exposure to Lassa virus, particularly in areas where *Mastomys* spp. rodents are present and during the main transmission season (roughly from November until April). Travellers should avoid consumption of food and drink which may have been contaminated with rodent droppings, exposure to rodents or dust contaminated by rodents or to people presenting with haemorrhagic fever.

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Event background

On 20 November 2019, the Dutch public health authorities reported the detection of an imported case of Lassa fever from Sierra Leone. The patient, a male Dutch healthcare worker, had symptoms with onset 11 November and was repatriated on a medical evacuation flight operated by a German company from Freetown to Amsterdam on 19 November 2019, when Lassa fever was not yet suspected.

On the flight standard precautions were not fully implemented [1]. Laboratory confirmation was done by RT-PCR and sequencing testing on plasma and urine samples [2].

The patient was hospitalised in Leiden University Medical Centre with strict isolation precautions in place and died on 23 November 2019.

Whilst in the prodromal phase of his disease and still afebrile, this patient attended an international surgical training event on 11 and 12 November 2019 in Freetown, Sierra Leone. This training was attended by healthcare workers from several countries.

On Sunday 24 November, the Dutch public health authorities reported a second imported case of Lassa fever from Sierra Leone. Retrospective case history indicated that this patient also had onset of symptoms on 11 November 2019 and was medically evacuated following strict isolation procedures, after the diagnosis of Lassa fever in Sierra Leone, to be admitted at the Major Incident Hospital in Utrecht in the Netherlands [3]. The diagnosis was confirmed by RT-PCR on plasma samples at the Erasmus University Medical Centre in Rotterdam in the Netherlands [2].

Both patients were healthcare workers working in a rural hospital in Sierra Leone. According to the local epidemiological investigation by the Ministry of Health of Sierra Leone, they were probably infected during surgery they conducted together on two local patients on 4 November 2019 [2].

A third confirmed case has been reported in a Sierra Leonean nurse, who was also part of the same surgery team [2,4]. In addition, one healthcare worker involved in the management of the two local patients who received surgery is considered a suspected case. Earlier suspected cases have tested negative.

ECDC has been informed of contact tracing activities in several EU countries, including the Netherlands, Germany, Denmark and the United Kingdom (UK).

As of 28 November, the Dutch public health authorities have identified 132 risk contacts among Dutch citizens in the Netherlands and in Sierra Leone, including 19 high-risk contacts (see Table 1). Two high-risk contacts came to the Netherlands with regular flights, as this was before the first Dutch patient had been diagnosed; nine high-risk contacts are Dutch healthcare workers involved in the initial assessment of the first patient; two high-risk contacts are relatives who had contact with the first patient during the assessment phase and one high-risk contact was with the first patient during repatriation. The other five high-risk contacts were repatriated on dedicated flights. The number of risk contacts is subject to change as new hospital staff caring for the patient in Utrecht will be added as low-risk contacts. A low-risk contact is currently in Norway and the Norwegian authorities have been informed. Four other Dutch low-risk contacts returned from Sierra Leone on 25 November 2019, one other low-risk contact is still in Sierra Leone and will return shortly. One German low-risk contact returned to Germany on 26 November 2019. In addition, one Danish low-risk contact has returned to Denmark (date unknown) and four more Danish low-risk contacts will return later this week.

As of 22 November 2019, the British public health authorities have identified 18 risk contacts among British citizens who were in contact with the Dutch cases. Eight of these were working in the same rural hospital in Sierra Leone and the other ten (low-risk) contacts came into contact with the Dutch healthcare worker at the international surgical training event in Freetown [5]. So far, no cases have been identified in the UK.

As of 22 November 2019, the German public health authorities stated that all four flight staff involved in the medical evacuation of the deceased Dutch healthcare worker are in home quarantine and are being monitored by the local health authorities.

Outside of the EU/EEA, in addition to Sierra Leone, contacts were identified in Uganda and India. All those who have been identified as contacts will be monitored for the development of Lassa-fever-compatible symptoms by their respective public health authorities for a maximum period of 21 days following their last contact with the Dutch cases.

Disease background

Disease characteristics

Lassa fever is an acute viral haemorrhagic illness caused by an arenavirus, *Lassa mammarenavirus*, and is considered a high-consequence infectious disease. It is endemic in West Africa (Benin, Guinea, Liberia, Nigeria, Mali, Sierra Leone and Togo). Neighbouring countries are also at risk, as the animal reservoir for Lassa virus, the multimammate rat, of the genus *Mastomys*, is widely distributed across West Africa. At present, there are an estimated 300 000 to 500 000 cases of Lassa fever annually in West Africa, with an estimated 5–10 000 deaths [6]. Less than 20% of the cases are attributed to human-to-human transmission, mainly in healthcare settings.

The pathogen was identified in 1969 when nurses became infected in Lassa, Nigeria [7].

The virus is present in rodent excreta (e.g. urine, saliva and respiratory secretions). Infected rodents excrete the virus in urine for an extended period and peridomestic environments where food and non-food items are poorly stored can be contaminated. Rodents can invade houses in the dry season in search of food but are also hunted as sources of meat. Infection of Lassa virus is thought to occur through ingestion of contaminated items or during the preparation of infected rodents for consumption. Transmission is also possible following inhalation or contact with mucous membranes of dust contaminated with rodent excreta. Human-to-human transmission may occur when infected people are symptomatic, but this is rare compared to rodent-to-human transmission [6,8]. In addition, Lassa virus transmission from human to human may occur in healthcare settings when the appropriate infection prevention and control practices are not strictly followed or in the period before the patient has been diagnosed as barrier nursing does not begin until after confirmation. There is a higher risk for people performing invasive procedures on and handling the bodies of Lassa fever patients in preparation for a funeral. Staff in maternity wards are also considered to be at high risk as Lassa virus is a significant cause of abortions in West Africa and large quantities of the virus are present in the aborted foetus and the placenta.

There is a risk of Lassa virus transmission through substances of human origin (SoHO) during the viraemic phase, however no such transmissions have been documented. Data are lacking on the occurrence of viremia during the incubation period or after resolution of symptoms. However, Lassa virus RNA can be detected in urine and semen for prolonged periods [9].

Imported cases have been reported among returning travellers to EU/EEA countries with a history of exposure in rural areas or hospitals in countries where Lassa fever is known to be endemic (Annex 1 and Kofman and colleagues [10]).

The incubation period is usually around 10 days but can range from 2–21 days [11]. About 80% of those who become infected with Lassa virus have mild or no symptoms and one in five infections results in severe disease [11]. In 20% of symptomatic cases, the clinical course results in a severe disease with multi-organ impairment. When symptomatic, the onset of symptoms is non-specific, with a general weakness, muscle aches and fever. Various symptoms are reported during this first phase such as nausea, vomiting, diarrhoea, sore throat, pharyngitis, dry cough, chest, abdominal and back pain. In the severe form, the symptoms worsen over a period of days and can culminate in haemorrhages (e.g. mucosal, intestinal and pulmonary), facial and neck oedema, respiratory distress, central nervous system symptoms (signs of encephalitis, drowsiness, coma) and shock [12]. Proteinuria may be noted. Community mortality of Lassa fever is low (on average <5%), however the case fatality rate can be up to 50% in hospitalised patients. In the most recent large outbreak in Nigeria (2018–2019), where surveillance is improving and ribavirin therapy is available, the case fatality was 20–25% [13]. Pregnant women (especially in the third trimester), children under five years and immunocompromised persons are at higher risk of severe disease and poor outcomes.

Clinical diagnosis is challenging and therefore the rapid laboratory testing of suspected cases is important. The method of choice for early detection of Lassa fever is RT-PCR [14]. However, there is little information on the virus load during the first few days after disease onset and a case report suggests that virus load during this time might be below the detection limit of the assay [15]. Therefore, it is recommended that Lassa virus RT-PCR testing should be repeated four days after disease onset in suspected cases to exclude or confirm the diagnosis. Molecular testing may be performed with in-house RT-PCR assays or commercially available real-time RT-PCR kits. Antibody assays, such as ELISA or IFA, are not sensitive during the early acute phase, but are the methods of choice to detect Lassa virus infection during convalescence or in mild or asymptomatic cases. Rapid antigen detection assays may be used in resource limited settings where RT-PCR is not available.

Differential diagnoses include severe malaria, typhoid fever, other viral haemorrhagic fevers, leptospirosis, typhus, tick-borne relapsing fever, non-typhoidal salmonellosis, meningococcal septicaemia and meningitis.

Laboratory infections with Lassa virus have been reported. Lassa virus is a risk group class 4 agent. Laboratory investigation of Lassa virus infection should be undertaken under ad-hoc biological containment conditions. Clinical specimens must be handled using standard precautions and sent to the reference laboratory in compliance with sample shipment regulations [16-19]. Lassa virus is susceptible to the usual disinfectants (e.g. 0.5% sodium hypochlorite, phenolic compounds, lipid solvents and detergents) and is inactivated by heat or UV irradiation [20,21].

Treatment of Lassa fever cases requires supportive care. Therapy using favipiravir may be considered as well as a combination therapy of ribavirin and favipiravir. Despite the lack of good clinical trial data [22], ribavirin is considered to be effective when given early in the course of the illness, notably when started within the first six days [23,24]. There is insufficient information on the effectiveness of favipiravir. Risks versus benefits should be assessed on a case-by-case basis.

Disease surveillance for Lassa fever in the EU

Lassa fever is a notifiable disease in the EU under the generic case definition for viral haemorrhagic fevers [25].

In the past 10 years, EU/EEA countries have reported five Lassa fever cases to The European Surveillance System (TESSy). Two cases were reported by the UK (ex-Nigeria and ex-Mali) in 2009, one by Sweden (ex-Liberia) in 2016 and two by Germany (ex-Togo and a secondary case infected in Germany) in 2016.

In literature, an additional imported Lassa fever case was reported from Sweden in 2011 (ex-Sierra Leone) [26,27].

Further information can be found in ECDC's Annual Epidemiological Report [28] and the online Surveillance Atlas of Infectious Diseases [29].

ECDC risk assessment for the EU/EEA

This document assesses the risk of Lassa fever infection among healthcare workers and EU/EEA citizens in relation to their potential exposure to a source of infection.

Probability of infection among healthcare workers in the EU/EEA and in Sierra Leone

The 2016 event of healthcare-associated Lassa virus transmission in Germany (from the corpse of a Lassa fever patient to a mortician) demonstrates the possibility of secondary transmission of Lassa virus during (unprotected) high-risk exposure in non-endemic countries. Significantly, caring for a Lassa fever patient in Sweden for a two-week period with only standard precautions did not lead to secondary transmission, although the diagnosis was unknown at the time [30]. However, there is an increased probability that healthcare workers in Sierra Leone and other Lassa-virus-endemic regions in West Africa will treat a Lassa fever patient as the disease occurs in most parts of the country [31,32].

The risk of secondary transmission depends on the closeness and duration of contact, the type of activity performed by healthcare workers and those handling or preparing the body of a person infected by Lassa fever (i.e. undertakers), and the type of personal protective equipment used (see Table 1).

Healthcare workers involved in invasive procedures on Lassa fever patients, handling the bodies of patients who have died of Lassa fever and working in maternity wards with Lassa-fever infected patients are at high risk of infection [33-36].

Table 1. Risk stratification* in transmission of viral haemorrhagic fever

Risk level	Type of contact
Very low or no recognised risk	Casual contact with a feverish, ambulant, non-diagnosed case. Examples: sharing a seating area or public transportation; receptionist tasks.
Low risk	Close face-to-face contact with a feverish and ambulant non-diagnosed case. Example: physical examination, measuring temperature and blood pressures.
Moderate risk	Close face-to-face contact without appropriate personal protective equipment (including eye protection) with a patient who is coughing or vomiting, has nosebleeds or diarrhoea.
High-risk	Percutaneous, needle stick or mucosal exposure to virus-contaminated blood, bodily fluids, tissues or laboratory specimens in severely ill or known positive patients

Adapted from [37].

* Risk stratification in household contacts is entirely on a case-by-case basis. The Netherlands also classifies that described as moderate-risk in this table as high-risk.

The risk of infection among healthcare workers can be significantly reduced by strict isolation of case(s), appropriate use of standard precautions, including basic hand hygiene, use of personal protective equipment, application of strict barrier nursing procedures, safe injection practices and safe burial practices [38].

Given that the deceased Dutch healthcare worker was in the prodromal phase of his illness during the international surgical training event on 11–12 November 2019 and the maximum incubation period is three weeks, further cases among contacts may be detected. However, taking into account the type of social interaction and the fact that the likelihood of virus transmission increases with the progression of the disease, at this stage the deceased's contacts appear to be at low risk of exposure [39,40]. The contacts of the cases during their time at the hospital in Sierra Leone are considered to be at risk, the risk category depends on the type of contact.

Contact tracing activities are ongoing and relevant public health authorities have been alerted. Further contacts with the two cases while they were symptomatic in Sierra Leone may still be detected.

Probability of infection among EU/EEA citizens visiting or residing in Sierra Leone

Most parts of Sierra Leone are considered to be at risk for Lassa fever [31,32]. The risk of exposure to Lassa virus is higher among visitors to rural areas, where living conditions are basic and the likelihood of entering into contact with infected rodents or their excreta is higher, especially in the months of the dry season. As travellers visiting family and friends are more likely to stay in rural areas, the risk of exposure to Lassa virus might be considered higher for travellers visiting family and friends than for regular tourists or business travellers.

The possibility of transmission to co-passengers and crew on board aircrafts can be assessed using the ECDC RAGIDA guidelines [41,42]. To date, Lassa fever infection has not been reported among passengers seated close to a sick patient during an intercontinental flight (Annex 1, and Kofman and colleagues [10]), and the risk of transmission during air travel is considered to be low.

WHO does not recommend applying travel or trade restrictions to countries affected by Lassa fever outbreaks.

Probability of infection among EU/EEA citizens (general population) residing in the EU/EEA

The risk of primary infection with Lassa virus in community settings in the EU/EEA can be considered non-existent since *Mastomys* spp. rodents are not native to Europe. Therefore the likelihood of the general population encountering a Lassa fever case in the EU/EEA is very low and transmission of Lassa virus from travel-associated or air-lifted cases is rare.

Options for response

Prevention of healthcare-associated infections

Delays in the identification of viral haemorrhagic fevers pose a risk within healthcare facilities and to close contacts of the affected individuals. Therefore Lassa fever needs to be considered when clinical and epidemiological criteria are met (exposure to rodents and their urine and droppings, exposure during hospital procedures in endemic countries, contact with patients or their bodily fluids) for any patient presenting with suggestive symptoms originating from West African countries, especially if not responding to anti-malarial and anti-bacterial medication. This is particularly true during the dry season (November to May), a period of increased transmission, and even if a differential diagnosis such as malaria has been laboratory-confirmed. In Lassa fever endemic areas, standard precautions [43] should be applied when caring for patients, irrespective of their diagnosis, but especially for those bleeding heavily for known or unknown reasons. The systematic and correct application of these precautions is effective in preventing the transmission of Lassa and other viral haemorrhagic fevers. Case ascertainment should involve asking about possible contact with people presenting with haemorrhagic fever or possible contact with infectious bodily fluid, consumption of food and drink possibly contaminated by infected rodent excreta and possible direct exposure to *Mastomys* spp. rodents.

Patients suspected of viral haemorrhagic fever are to be placed in isolation and carers should apply additional transmission-based precautions following a risk assessment (PPE) [34-36]. Once diagnosis is confirmed, the patient should be transported to a specialised treatment centre. Transport of cases, including emergency air evacuation, should be undertaken using appropriate infection control measures. The competent public health authority should be informed immediately and contact tracing should be initiated. A risk assessment of identified contacts should be performed and the contacts should be monitored for 21 days after the last potential exposure.

ECDC has produced a concise tool to support EU/EEA countries in their preparedness planning for the possibility of an imported case of high-consequence infectious disease, including Lassa fever [44].

In healthcare settings with appropriate infection prevention and control precautions and laboratory biosafety measures applied, the secondary attack rate for Lassa virus transmission is extremely low. When appropriate standard precautions are implemented these measures can prevent secondary transmission even if travel history information is not obtained, not immediately available, or the diagnosis of a viral haemorrhagic fever is delayed.

Laboratory capacity in the EU/EEA

Inactivation and molecular or serological testing of diagnostic specimens may be performed in BSL-3 facilities. Testing of samples for Lassa virus should be performed under BSL-4 conditions. Following risk assessment, appropriate measures to prevent contamination of laboratory personnel should be implemented during virus inactivation (e.g. using a glove box or class II cabinet in a BSL-3 laboratory, or a class III cabinet.) Sufficient capacity exists in the EU for testing purposes, however given the wide genetic diversity of circulating Lassa viruses, laboratory protocols for RT-PCR detection should be revised periodically [45-47]. Laboratories with the ability to diagnose Lassa virus infections are listed in the EVD-LabNet directory [48].

Post-exposure prophylaxis and vaccine

There is currently no evidence supporting the use of ribavirin as a post-exposure prophylaxis [11,49,50]. Oral administration of ribavirin is currently only recommended as a precautionary measure for post-exposure prophylaxis in the event of 'high-risk exposure' to Lassa virus after a risk-benefit analysis [24].

There is no vaccine for Lassa fever but several candidates are under development and encouraging results have been seen in trials involving non-human primates [51].

Prevention of infection among EU/EEA travellers or EU/EEA citizen residing in Sierra Leone

EU/EEA travellers and EU/EEA citizens residing in Sierra Leone should be informed of the risk of exposure to Lassa virus, particularly in endemic areas and during high transmission season. Incidence of Lassa fever is higher in rural areas, where living conditions are basic, as the likelihood of entering into contact with infected rodents is higher.

In areas where Lassa virus is circulating, preventive measures are based on reduction of exposure to rodent excreta with appropriate community hygiene practices (safe storage of food, avoiding exposure to dust, waste management, avoiding the consumption of rodents and reduction of rodent populations in and around homes). Travellers should avoid consumption of food and drink possibly contaminated by rodent droppings, direct exposure to rodents or dust contaminated by rodents and to people presenting with symptoms compatible with a haemorrhagic fever (e.g. fever, myalgia, gastrointestinal symptoms, abdominal and/or back pain, petechiae and spontaneous bleeding).

Despite insufficient evidence for sexual transmission, because the virus is shed in semen three months or longer after discharge [15], condom use in survivors may be advised [9,15].

Prevention of Lassa virus transmission through substances of human origin

No specific guidance or EU legislation exists on interventions to prevent SoHO transmitted Lassa virus. According to donor selection guidelines from some Member States, a donor with a history of Lassa fever is not eligible for SoHO donation, and contacts with infected persons or travellers to endemic countries must not donate SoHO for six months from the last contact with or return from an endemic country [52]. Sierra Leone is also a malaria endemic country. Thus, due to the geographical risk of malaria, the donor deferral interval is expected to be longer than that which would otherwise be recommended for donors returning from Lassa-endemic areas.

Limitations

This assessment is undertaken based on facts known to ECDC at the time of publication.

Source and date of request

ECDC internal decision, 25 November 2019.

Consulted experts

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All experts have submitted declarations of interest, and a review of these declarations did not reveal any conflict of interest.

Experts from WHO reviewed the risk assessment, but the views expressed in this document do not necessarily represent the views of WHO.

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This report was written with the coordination and assistance of an Internal Response Team at the European Centre for Disease Prevention and Control. All data published in this risk assessment are correct to the best of our knowledge at the time of publication. Maps and figures published do not represent a statement on the part of ECDC or its partners on the legal or border status of the countries and territories shown.

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Annex 1

Table 2. Imported and nosocomial cases of Lassa fever, EU/EEA, 2000–2016

Year	Month	Country	Occupation	Age	Country of infection	Medical evacuation	Travel history and hospitalisation	Lassa confirmed date post symptoms onset	Fatality (number of day post onset)	Ribavirin treatment	Contact tracing	References
2000	January	Germany	Student	23	Ivory Coast, Ghana and Burkina Faso	No	Travel on Day 3 via Morocco or Portugal in local hospital and Day 9 in reference hospital.	10 days	Yes (15)		232 contacts including 18 at high risk	[53,54]
2000	January	Germany	Physician	NA	Germany		Physical examination of Lassa patient on Day 9. Asymptomatic.	Seroconversion	No	Yes	Unknown	[39]
2000	February	Netherlands	Surgeon	48	Sierra Leone (Kenema county)	No	Travel on Day 4 to the Netherlands via Abidjan, then hospitalised on Day 5 and Lassa fever suspected on Day 9.	11 days	Yes (14)	Unknown	Contact tracing (airline contact)	[55]
2000	July	United Kingdom	Aid worker	50	Sierra Leone	Yes	Hospitalised in Freetown on Day 8, then travel on Day 13 to UK, hospitalised in local hospital, followed by a transfer to reference hospital.	n/a	Yes (30)		125 contacts including ten high-risk contacts.	[56,57]
2003	January	United Kingdom	Soldier	Unknown	Sierra Leone	N/A	Hospitalised in a reference hospital.	n/a	No	Unknown	Yes	[58]
2006	July	Germany		68	Sierra Leone	No	On Day 5, air travel to Belgium via Cote d'Ivoire and connection to Frankfurt. Hospitalised on Day 6. Lassa investigated on Day 11. Transfer to reference hospital on Day 16 where Lassa was investigated. The patient had underlying medical conditions.	8–10 days post arrival	No	Unknown	Yes	[59]
2009	January	United Kingdom	Retired	66	Nigeria, sick since 2 days	No	Hospitalised in London on Day 4 and transferred to reference hospital on Day 16, then investigated for Lassa.	15 days post arrival	Yes (24)	Yes from day 17	328 persons, none at high risk.	[16,60]
2009	February	United Kingdom	Engineer	24	Mali (close to Ivory Coast border)	Yes	Hospitalised on Day 11 in reference hospital. Standard universal infection control precautions were followed and visitors admitted (Lassa not suspected)	11 days	Yes (11)		123 persons including seven considered high-risk (healthcare workers and family members)	[16,60,61]
2011	March	Sweden	Aid worker	30s	Sierra Leone	Yes	Medical transport by medical flight in Sweden Intensive care unit.	Unknown	No	Yes	Unknown	[26,27]
2016	February	Germany/ US citizen	Surgeon	46	Togo	Yes	Air-travel to Germany where he was admitted with suspected malaria.	13 days post arrival	Yes (14)	No	45 contacts, including 33 staff of hospital in Germany	[62,63]
2016	March	Germany	Corpse repatriation team (case above)		Germany	No	Specialised ambulance to the isolation treatment centre.	Same day	No	Yes	21 contacts	[62,64]
2016	March	Sweden	Unknown	72	Liberia	No	Returned to Sweden five days before the onset of primary symptoms, was admitted to Sahlgrenska University Hospital in Gothenburg 10 days after onset of fever. Day 25, admitted to High-Level Isolation Unit (HLIU)	24 days	No	No	122 total contacts including 73 personnel at Sahlgrenska Hospital, four family members and 45 personnel at the HLIU in Linköping	[30]