



## RAPID RISK ASSESSMENT

# Outbreak of pneumonic plague in Madagascar: recent introduction in the Seychelles

13 October 2017

### Main conclusions and options for preparedness

Madagascar has been experiencing an outbreak of plague since 23 August 2017, and 560 cases and 57 deaths (case fatality rate 10.1%) have been reported as of 12 October 2017. Of these cases, 394 are pneumonic plague, 143 bubonic plague, one is a septicaemic plague and the clinical presentation is undetermined for 22 cases. Cases have been mainly reported in the capital Antananarivo and the port city of Toamasina on the east coast. In addition, sporadic cases of pneumonic plague without apparent epidemiological links to the initial chain of transmission have been reported in several regions across the country.

The update of this risk assessment has been triggered by the continued evolution of the outbreak since the last risk assessment on the '[Outbreak of plague in Madagascar, 2017](#)' published 9 October 2017, and by the occurrence of one travel-associated case in the Seychelles with a recent history of travel to Madagascar.

While plague outbreaks in Madagascar are not unexpected, the high proportion of pneumonic plague cases is of concern. The current outbreak is the largest one to occur in the last decade in Madagascar. The risk of further transmission in this country is considered very high until public health prevention and control measures are fully implemented with the support of the World Health Organization (WHO) and international partners working in the country. The risk of regional spread in the Indian Ocean region is considered moderate.

The risk for travellers from the EU or for importation to the EU is considered low. WHO considers the risk for international spread of plague to be very low and advises against any restrictions to travel and trade with Madagascar based on the information to date. There is no restriction of movement in and out of Antananarivo, where cases have occurred, in accordance with the recommendations of the Malagasy authorities.

According to WHO, prophylactic treatment is only recommended for persons who have been in close contact with plague cases, or who have experienced other high-risk exposures such as bites from fleas or direct contact with bodily fluids or tissues of infected animals.

The measures for mitigating the risks for travellers to endemic plague areas include:

- International travellers being informed about the current plague outbreak and that plague is endemic in Madagascar.
- Use of personal protection against fleabites. As Madagascar is a malaria endemic area, the use of mosquito repellents for malaria prevention can protect against flea bites.
- Avoidance of direct contact with sick or dead animals.
- Avoidance of close contact with sick persons and in particular with patients diagnosed with pneumonic plague or patients with symptoms consistent with pneumonic plague.
- Avoidance of crowded areas where cases of pneumonic plague have been recently reported.
- Contacting travel clinics before departure to get information about the current plague outbreak in Madagascar including preventive measures and symptoms of pneumonic plague.

- Seeking immediate medical care if compatible symptoms develop.

If travellers returning from Madagascar present with suggestive symptoms (i.e. fever, painful lymphadenopathy, cough) they should seek medical advice and inform their healthcare provider of their trip to Madagascar. Individuals with relevant symptoms or signs should be asked about their travel history and activities and assessed for possible exposure to infectious human cases, and also for possible exposure to animal or rodent vectors within the preceding 10 days. If there is any suspicion they should be tested for plague.

Member States should review their preparedness plans for the low but distinct risk of receiving an imported case of pneumonic plague via a direct or indirect flight from Madagascar. Plans should consider the possibility of identification of a suspect case both at the point of entry, and after disembarkation and returning to the community.

## Source and date of request

ECDC internal decision, 11 October 2017.

## Public health issues

To assess:

- the likelihood of spread to other countries in particular neighbouring countries, including the EU Outermost Regions (ORs) and EU Overseas Countries and Territories (OCTs)
- the risk for EU citizens residing in or travelling to the affected areas in Madagascar
- the risk for travellers to the Seychelles or other countries with imported cases from Madagascar
- the risk related to a case of pneumonic plague in an aircraft or ship arriving from an affected area.

The update of this risk assessment is triggered by the rapid evolution of the outbreak since the last risk assessment on the '[Outbreak of plague in Madagascar, 2017](#)' published the 9 October 2017 and the occurrence of one travel-associated case in the Seychelles with recent travel history in Madagascar.

## Consulted experts

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## Disease background information

Plague is a bacterial zoonotic disease caused by the Gram-negative bacillus *Yersinia pestis*. Plague is predominantly a zoonosis of rodents. Plague is transmitted between animals and humans most often by the bite of infected fleas, but also by direct contact with infected tissues and the inhalation of infected respiratory droplets. Humans are described as incidental hosts, not contributing to the natural enzootic disease cycle.

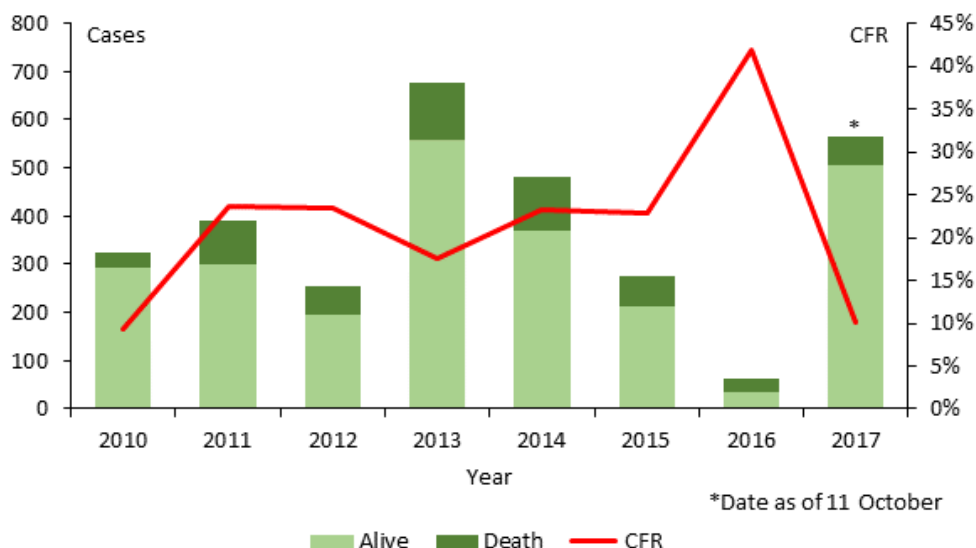
There are three main clinical presentations of plague: bubonic, septicaemic and pneumonic. The infection can be a severe disease in humans but can be successfully treated with early antibiotic treatment.

More information can be found in the ECDC and WHO factsheets about plague and in the previous risk assessment '[Rapid risk assessment: Outbreak of plague in Madagascar, 9 October 2017](#)' [1-3].

## Plague in Madagascar and the Seychelles

Madagascar, with a population of 24.9 million, is endemic for plague, and for the past decade has been the most affected country in the world, with around 400 cases of mostly bubonic plague reported annually [4] (see Figure 1). The epidemiology of plague in Madagascar shows all-year round transmission in endemic rural foci with zoonotic transmission leading to regular reports of bubonic plague cases [4,5]. More historical information on plague in Madagascar is available in the previous risk assessment 'Rapid risk assessment: Outbreak of plague in Madagascar, 9 October 2017' [3].

**Figure 1. Number of reported plague cases and case-fatality ratio in Madagascar, 2010 to 11 October 2017**



Source: Data from WHO until 2016 and from Ministry of Health in Madagascar for 2017 [6,7]

No plague cases were reported from 2010 to 2015 in the Seychelles according to the WHO Weekly epidemiological record published in February 2016. According to other available information, no cases were reported in 2016.

## Event background information

### Madagascar

On 23 August 2017, a 31-year-old male from Toamasina developed malaria-like symptoms while visiting the Ankazobe district in the central highlands of Madagascar [8,9]. On 27 August, respiratory symptoms appeared while he travelled in a shared public taxi from Ankazobe district, a known plague endemic area, to Toamasina via Antananarivo. His condition worsened and he died on 27 August 2017. His body was prepared for a funeral at the nearest hospital in the Moramanga district hospital located between Antananarivo and Toamasina. He was buried in a village close to Toamasina without safety procedures. Subsequently, 31 people who had been in contact with this case fell ill and four of them died [10].

The outbreak was detected on 11 September following the death of a 47-year-old woman from Antananarivo who was admitted to a hospital with respiratory failure caused by pneumonic plague [10]. The public health authorities immediately launched comprehensive field investigations.

On 29 September 2017, the Malagasy health authorities confirmed a fatal case of pneumonic plague in a basketball coach from the Seychelles. The case died in a hospital in Madagascar on Wednesday 27 September while in the country for the Indian Ocean Club basketball championship scheduled for 23 September to 1 October 2017 [11]. The Madagascar Ministry of Health and the Ministry of Foreign Affairs have informed the government of Seychelles and authorities of other countries participating in the championship including Comoros, Maurice and Seychelles. Remaining sporting events in the championship took place as closed-door matches in accordance with a Madagascar Ministry of Health recommendation [12]. National or international contacts of the case were traced and investigated in the preceding days. Exposed contacts received chemoprophylaxis as a precautionary measure and a follow-up has been implemented for those considered as having higher-risk exposures.

Between 1 August and 11 October 2017, the local health authorities have reported 560 plague cases, including 57 deaths [13-15]. Pneumonic plague accounts for 394 cases, bubonic plague for 143 cases, septicaemic plague for one case and 22 cases were unspecified. As of 11 October, the capital Antananarivo reports 276 cases including 25 deaths. At least eight healthcare workers from one district health hospital have contracted plague since 30 September 2017.

The current pulmonary plague outbreak has affected major urban centres including the capital Antananarivo (three million inhabitants) and the port city of Toamasina (around 275 000 inhabitants) on the east coast. In addition, sporadic cases of pneumonic plague without apparent epidemiological links with the initial cluster of cases have been reported in several regions across the country (see distribution of plague cases in the latest WHO epidemiological report) [15].

Local authorities and international partners are concerned that the outbreak may further spread as it is already present in several cities and the plague epidemic season usually runs from September to April [11].

Several public health actions have been implemented since the outbreak was notified to WHO on 13 September 2017 [8,9,15]. Under the leadership of the Minister of Public Health, a multisectoral national response coordination committee for the response to the plague outbreak was set up. WHO is supporting the Minister of Public Health in technical and operational support together with national and international partners involved in infection prevention and control of the plague outbreak. An estimated USD 6.8 million international response plan has been developed with the support of WHO and response partners.

Five isolation and treatment centres have been established in the capital Antananarivo. Field investigations of cases, contact tracing and monitoring of contacts are ongoing. In addition, awareness-raising campaigns about the spread of disease and prevention measures have been implemented in the community. The Minister of Public Health and WHO have implemented exit screening of departing passengers at the Antananarivo International Airport [15]. Regarding international health regulation (IHR) travel measures, WHO advises against any restriction on travel to or trade with Madagascar based on the available information.

## Seychelles

On 10 October, the Ministry of Health of the Seychelles issued a statement on its Facebook account to acknowledge one case of plague in the Seychelles [16]. The case is a 34-years-old man who returned from Madagascar to the Seychelles on 6 October, and had onset of symptoms on 9 October 2017. The case was isolated and is receiving antibiotic treatment. According to another media source, 258 contacts have been identified and offered prophylactic treatment [17]. Also according to media sources, the authorities are investigating the case's partner and child, who showed mild symptoms of the disease [18]. Air Seychelles cancelled all flights to and from Madagascar as of 6 October 2017 [19].

## ECDC threat assessment

Madagascar is experiencing an unprecedented outbreak of plague with 560 cases, including 394 pneumonic forms as of 11 October 2017. One case imported from Madagascar was reported by the Seychelles on 10 October. The control of the outbreak will depend on the ability to ensure rapid early detection, isolation and treatment of cases as well the implementation of appropriate control measures, especially comprehensive contact tracing and infection control measures.

The current outbreak affects densely urban areas including the capital, and also remote areas. Fourteen (64%) out of 22 regions in the country (including the north and south-east regions that are considered non-endemic) have been affected [15]. Therefore, the geographical extension of the outbreak poses a substantial challenge for the early detection of cases and the organisation of the response.

The current spread of pneumonic plague in densely populated urban areas is expected to continue if timely and efficient prevention and response are not extensively implemented. In contrast, the provision of care by traditional healers, unsafe burial practices, the limited application of infection control in healthcare settings, and the lack of compliance with public health precautions by some cases or contacts may amplify transmission, as has previously been observed in Madagascar [5,8,9,19].

The infection of two foreign visitors to Madagascar without a documented source of transmission is of concern and indicates that plague circulation is significant within the population. It is probable that the outbreak currently involves several uncontrolled and undocumented chains of transmission of pneumonic plague, although the full extent of the situation remains unclear at this stage.

The likelihood of further spread of the outbreak within the resident population in Madagascar is considered very high until the prevention and control activities implemented by the national authorities, with the support of the WHO and international partners, allow the outbreak to be controlled in the affected districts [14,15].

ECDC is closely following the evolution of the outbreak and the level of risk will be re-assessed in the event of further available information.

## The risk for EU citizens residing in or travelling to the affected areas in Madagascar

According to the Madagascar tourist office, 293 000 tourists visited Madagascar in 2016. The most popular months were October, November and December with around 40 000 visitors each month [21]. In 2016, around 137 000 visitors from 23 EU countries travelled to Madagascar by air, of which 75% originated from continental France. The peak travel months were July, August and October. In addition, there are daily flights to two ORs in the Indian Ocean, La Réunion and Mayotte. Madagascar is also a popular destination for cruises. The travel pattern from continental EU to Madagascar by month is available in Annex 1.

With the increase in the number of cases in Madagascar and the widening of the geographical spread, the probability of contracting plague in Madagascar is considered to be moderate for EU travellers, and would most likely result from a direct close contact with a case of pneumonic plague in the affected areas.

## The likelihood of spread to the EU and the EU Outermost Regions and EU Overseas Countries and Territories

### At regional level in EU OMRs and EU OSTs

The likelihood of spread of plague at the regional level will depend on the pattern of trade and travel with Madagascar and the intensity of transmission, mainly in the capital city and around other points of exit (airports and seaports). The regional risk as assessed by WHO is moderate due to frequent flights to neighbouring Indian Ocean islands.

The fact that a foreign visitor developed pneumonic plague in Madagascar before returning to his home country underlines the fact that an incubating traveller may develop symptoms during a flight and upon return to his/her home country. There is no evidence, at the moment, that contacts of the pneumonic case in the Seychelles have developed symptoms and they are likely to have received prophylactic antibiotic treatment, decreasing the risk of further spread and exportation.

Exit screening has been introduced in Madagascar and is likely to reduce further the potential spread of the outbreak beyond Madagascar [15]. However, to date, EU Member states should be aware that there is a low but definite possibility that a traveller infected with plague in Madagascar may be paucisymptomatic or asymptomatic when boarding a return flight to the EU and EU Outermost Regions (ORs) and Overseas Countries and Territories (OCTs), but may become unwell, either during the flight or after disembarkation.

The short incubation period of pneumonic plague and the fact that Madagascar is an island limits the risk of spread in the region by cases who travel by air while incubating their infection. Antananarivo is connected to neighbouring islands in the Indian Ocean, including Mayotte and La Réunion (EU OMRs), as well as the capital cities of eastern and southern African countries. No importation of infectious cases of plague to La Réunion and Mayotte has occurred in the past ten years.

According to WHO and as 9 October 2017, priority countries in neighbouring regions for WHO technical and operations support to enhance preparedness include South Africa, Mozambique, Tanzania, Mauritius, Comoros, Seychelles, and La Réunion and Mayotte [15].

### For the EU

Based on the available information to date (9 October 2017), WHO appraised the risk of international spread of plague as very low, and therefore currently advises against any restriction on travel to or trade with Madagascar [15].

The probability of importation to the EU through an incubating traveller arriving from Madagascar is considered low. This probability would be slightly higher among people in the EU or ORs returning home in Madagascar to visit friends and relatives (VFRs). The Malagasy community in France is estimated at between 100 000 to 140 000 residents, mainly living in the Ile-de-France region around Paris [22].

### Risk to travellers to the Seychelles or other countries with imported cases from Madagascar

For the Seychelles, October represents the month with the highest number of travellers coming from the EU (15 000 visitors from EU) according to the International Air Transport Association (IATA). During this month in 2016, travellers from France represented one third of EU travellers to Seychelles (5 000) followed by those from Germany (4 000).

To date, the risk for travellers visiting Seychelles is very low as response measures with regards to the recent travel-associated case were implemented in a timely manner.

The risk to travellers to other countries or territories that may report imported cases is hypothetical as no other travel-associated cases has been reported. Should local transmission occur after the introduction of plague case, the risk of further spread and exposure of residents or travellers would depend of the clinical form of the plague case, in particular for pneumonic case, and further development of local chains of transmission. This risk would be mitigated by the capacity of the country to detect travel-associated cases early, and conduct contact tracing and implemented post-exposure prophylaxis as necessary.

## Options for preparedness regarding potential travel-associated cases

Recent cases among two travellers visiting Madagascar demonstrate that the occurrence of plague cases among returning travellers is possible. To insure early detection of cases asymptomatic during the travel, returning travellers should be made aware of the symptoms of plague and seek care if any occur.

Public health authorities should ensure that their plans and procedures are ready for deployment for management of imported cases and their contacts. Preparedness plans should include arrangements for primary management and isolation of the patient, and occupational safety of healthcare staff. Existing plans for travel-associated infectious diseases with serious consequences may be usefully adapted and applied.

## Imported case at point of entry

EU Member States' authorities should assure that their points of entry are aware of the plague epidemic situation in Madagascar, and that plans and procedures for responding to the possibility of the arrival of a sick traveller from Madagascar are ready for deployment if required. Exit screening has been implemented in Madagascar. At this stage, entry screening is considered not likely to be a cost-effective measure for deployment by EU Member States. Returning passengers should be given relevant information and advice via airports and airlines or ad hoc leaflets.

## Measures for risk containment on commercial aircraft

Relevant measures for mitigating the risks associated with a symptomatic case of plague, particularly the pneumonic form, on board a commercial aircraft include:

- Advice for aircraft operators regarding the recognition and in-flight management of a passenger suffering a suspected severe respiratory infectious illness. The management of the suspected case should include the protection of air-crew and passengers from exposure to respiratory droplets from the ill passenger (e.g. apply standard precautions and consider the isolation of the patient and the use of a surgical mask for the patient to help reduce the spread of droplets). If the patient cannot tolerate wearing a mask, the cabin crew as well as people sitting near the patient, should be provided with surgical masks. [23].
- Isolation, and standard infection control precautions [23].
- Rapid communication of the event by pilot to health port authorities [24,25].
- Arrangements for tracing contacts and early post-exposure prophylaxis for passengers and crew (including measures for necessary subsequent contact: passenger locator cards, passenger list, crew lists).
- Advice to all passengers about self-monitoring of plague compatible symptoms and for seeking medical care.
- Arrangements for quarantine, for post-event disinfection and disinsection procedures for aircraft and ill passenger's belongings [26].

## Imported cases identified in the community

Member State public health authorities should ensure that healthcare and public health services (particularly hospital emergency departments, primary care doctors and local public health officers) are aware of the possibility that a travel-associated case of pneumonic plague may be first recognised in the community, after disembarkation. Procedures should be in place to enable the isolation and transfer of the patient to a defined receiving hospital, ensuring the safety of primary care and receiving hospital staff, and ambulance crews. Arrangements should be in place for tracing, administration of prophylaxis and monitoring of contacts.

## Shipping and cruise ship operators

The Member State health authorities should also be aware of the epidemic situation, and the risk of infection in Madagascar. Preventive advice should be available for passengers before disembarkation, and contingency plans for management of the situation if a passenger becomes ill with suspected plague infection should be put in place [27].



## Disclaimer

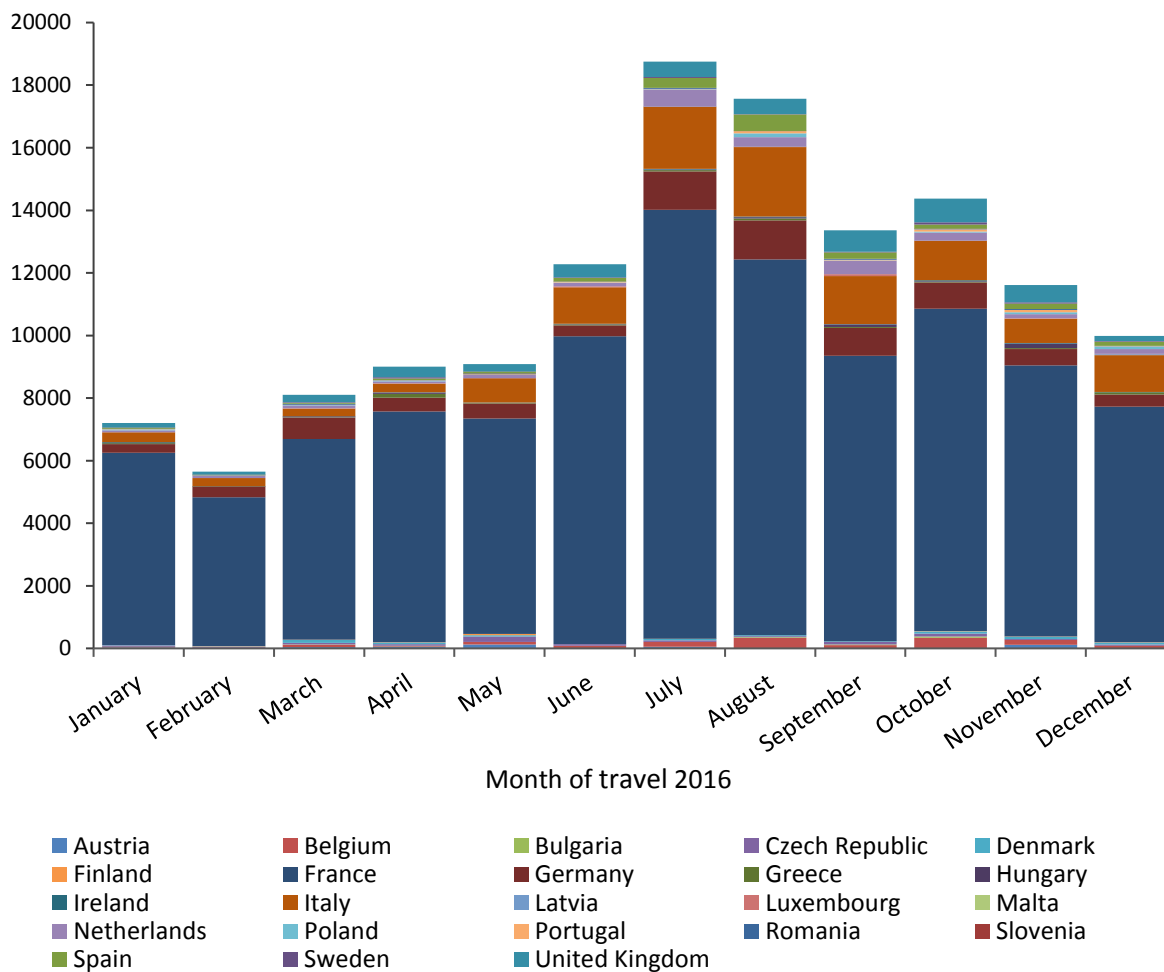
ECDC issued this risk assessment document on the basis of an internal decision in accordance with Article 10 of Decision No 1082/13/EC and Article 7(1) of Regulation (EC) No 853/2004 establishing a European centre for disease prevention and control. In the framework of ECDC's mandate, the specific purpose of an ECDC risk assessment is to present different options on a certain matter with their respective advantages and disadvantages. The responsibility on the choice of which option to pursue and which actions to take, including the adoption of mandatory rules or guidelines, lies exclusively with the EU/EEA Member States. In its activities, ECDC strives to ensure its independence, high scientific quality, transparency and efficiency.

This report was written under the coordination of an Internal Response Team (IRT) at the European Centre for Disease Prevention and Control (ECDC). All data published in this risk assessment are correct to the best of our knowledge on 12 October 2017. 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.

# Annex 1. Estimated number of travellers from the EU to Madagascar by month and country of departure in EU/EEA, 2016

**Figure 2.** Estimated number of travellers from the EU to Madagascar by month and country of departure in EU/EEA, 2016

Number of travellers



Source: IATA



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