



## RAPID RISK ASSESSMENT

# Increase of cases of Legionnaires' disease in EU travellers returning from Dubai, October–December 2016

22 December 2016

## Conclusions and options for response

An increase in cases of Legionnaires' disease – compared with previous years – is reported in EU travellers returning from Dubai. Twenty-six cases have been reported with onset of illness since 1 October 2016. Further cases with onset in recent weeks are being reported following travel to Dubai, indicating that there is a persistent common source of *Legionella* exposure. However, it cannot be ruled out that these travellers might have acquired their infection elsewhere than in Dubai, if their travel stay was shorter than the range of the incubation period.

The increase in cases cannot be fully explained by the increase in the number of travellers to Dubai from the EU.

The following options are possible in response to this outbreak:

- Conduct additional retrospective investigations for travel-associated Legionnaires' disease (TALD) cases reported by EU countries. Investigations should cover cases with onset of symptoms since 1 October 2016 and focus on possible places of exposure in Dubai, and on the way to and from Dubai. A questionnaire has been developed, and data collection is ongoing in affected EU countries.
- Use the above questionnaire to collate information on new TALD cases reported by EU/EEA countries, with a focus on possible places of exposure in Dubai, and on the way to and from Dubai.
- Quickly provide information collected about possible exposure sites in Dubai for TALD cases to local health authorities in order to guide the identification of possible sources of *Legionella* bacteria in the environment in Dubai.
- Support the continued investigations of the local Dubai health authorities on accommodation sites reported through ELDSNet [6] surveillance network by notifying new TALD cases in order to rule out risks associated with specific accommodation sites.
- Inform travellers – particularly those above 50 years of age, smokers and immunocompromised persons – to seek medical advice if they experience respiratory infection symptoms up to two weeks after travelling to Dubai to ensure early diagnosis and treatment.
- Remind clinicians to consider Legionnaires' disease in patients presenting with community-acquired atypical pneumonia with a history of travel to Dubai or the United Arab Emirates in the two weeks prior to disease onset.

It is important to implement precautionary control measures for technical installations (e.g. man-made water systems) at all accommodation sites that were frequented by cases during the disease incubation period. In

addition, it would be desirable that these risk-minimising measures are extended to also cover other potential sources of exposure in Dubai, for example misting devices, fountains, and other devices that create aerosols.

Any information from the Dubai authorities' retrospective review of possible cases of Legionnaires' disease among the Dubai population will be important in gaining a better understanding of the increase observed in travellers.

As Legionnaires' disease cannot be transmitted from human to human, the risk for the EU remains limited to individual cases among travellers in the above risk groups returning from Dubai.

## Source and date of request

ECDC internal decision, 19 December 2016.

## Public health issue

Increase in travel-associated Legionnaires' disease among returning EU travellers from Dubai, during October–December 2016.

## Consulted experts

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## Disease background information

Legionnaires' disease is a common cause of atypical pneumonia caused by *Legionella* bacteria, most commonly of the species *Legionella pneumophila*. Another clinical manifestation of the infection is Pontiac fever, a self-limited febrile illness that does not progress to pneumonia or death. Legionnaires' disease is characterised by a non-productive cough, accompanied by anorexia, malaise, myalgia and headache. Abdominal pain and diarrhoea are also common.

Illness can be severe and despite improvements in diagnostics and treatment options, fatality can occur in about 4 to 5% of cases among returning travellers if not treated appropriately with specific antibiotics. Both sporadic cases and outbreaks occur worldwide and are recognised more commonly in summer and autumn. An outbreak of Legionnaires' disease in the community may be difficult to detect due to low attack rates (0.1–5%) [1].

The incubation period of Legionnaires' disease is, for the majority of cases, between two and ten days, with a median of six days. However, the incubation period in some cases has been described as being as long as 19 days [2]. Legionnaires' disease usually affects more males than females and those above 50 years of age, with smokers, the elderly, or immunocompromised individuals at higher risk for complications.

A laboratory diagnosis of Legionnaires' disease can be made using a variety of laboratory tests including: culture/isolation of the causative organism, antigen detection in urine, a significant rise in antibody titres or PCR methods. Determination of the monoclonal subtype and molecular sequence typing can support linking between strains from the sampled environment and from patients.

Legionnaires' disease is a waterborne disease, associated with man-made water systems. In conditions that are favourable for *Legionella* growth (such as water temperatures in the range of 25–42 °C, stagnant water with sediment build-up, and low biocide levels) the bacteria can multiply. Aerosolisation of such a water supply can cause sporadic cases or outbreaks through inhalation of this aerosol. Cooling towers, evaporative condensers, humidifiers, decorative fountains, whirlpools, showers, etc. are examples of installations with identified risks [1,3].

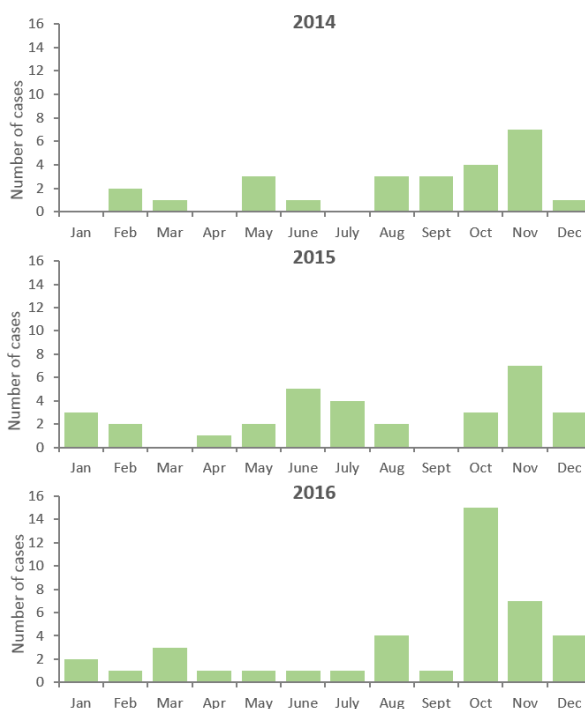
Control measures available to reduce the amount of *Legionella* in a water system depend on the system's engineering and use. They can include temperature control, disinfection using chemicals or other oxidising materials, and use of biocides or installation of filters [3].

## Event background information

### Epidemiological situation

The ECDC ELDSNet surveillance scheme on travel-associated Legionnaires' disease (TALD) [4] has observed an increase in the number of cases associated with travel to Dubai in recent months, compared with previous years. In October and November 2016, ELDSNet reported 22 cases, compared with 10 and 11 cases reported for the October–November period in 2015 and 2014, respectively. Though an annual increase of 40% has been observed in the number of TALD cases associated with Dubai and reported since 2011, the doubling of cases observed in October and November 2016 (compared with previous years) led to this rapid risk assessment (Figure 1).

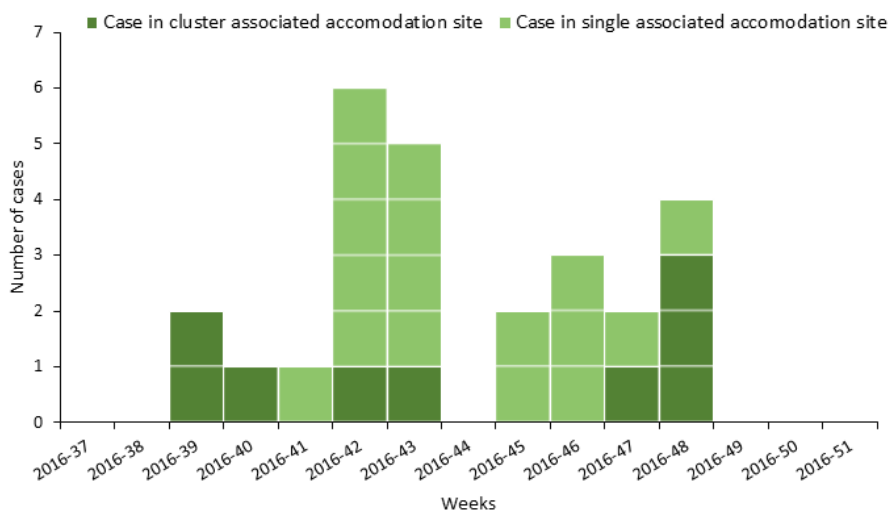
**Figure 1. TALD cases with history of stay in Dubai, United Arab Emirates, by year and month of onset, 2014–2016**



Source: ELDSNet, data as of 21 December 2016

As of 21 December 2016, 26 TALD cases with onset since 1 October 2016 have been reported to ELDSNet from seven EU Member States, with the United Kingdom reporting 12 cases. Other countries that reported cases were the Netherlands (4 cases), Sweden (3), France (3), Denmark (2), Germany (1) and Belgium (1). Figure 2 shows the distribution of TALD cases with onset of disease since 1 October 2016, by reporting EU country. There is a clustering of cases with onset of illness during weeks 42 and 43 in 2016, corresponding to a period following the annual school holidays in a number of EU countries.

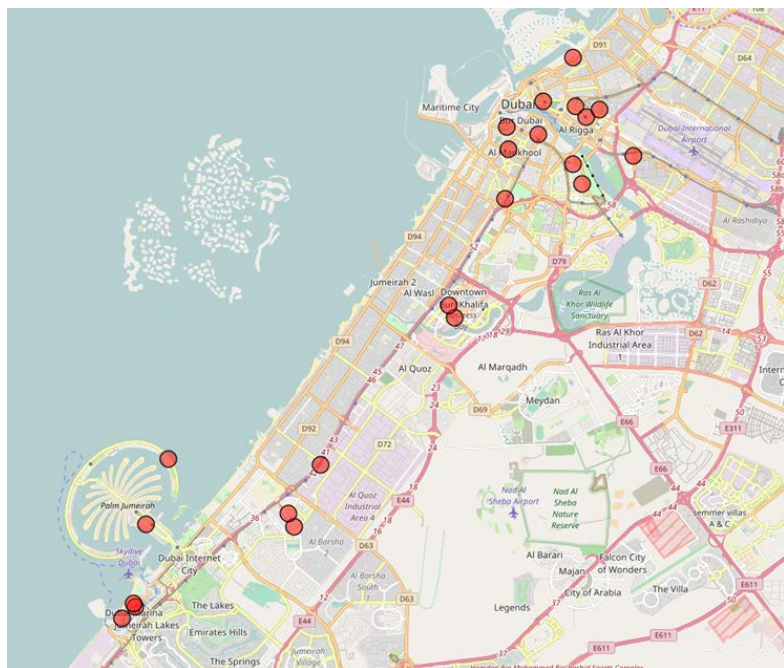
**Figure 2. Distribution of TALD cases with history of stay in Dubai, United Arab Emirates, by week of onset, accommodation site clustering, and reporting country, weeks 37–51/2016**



Source: ELDSNet, n= 26 cases

The 26 cases are associated with 22 accommodation sites in Dubai spread over a distance of 35 kilometres. Nine of the cases resided in accommodation sites that were, over the course of the last two years, associated with other cases of Legionnaires' disease (Figure 2). The distribution of accommodation sites frequented by cases during their stay in Dubai is geographically widespread. It is therefore unlikely that the accommodation sites were the place of exposure to *Legionella* (Figure 3).

**Figure 3. Accommodation sites in Dubai (N=22) where TALD cases\* stayed, as of 21 December 2016**



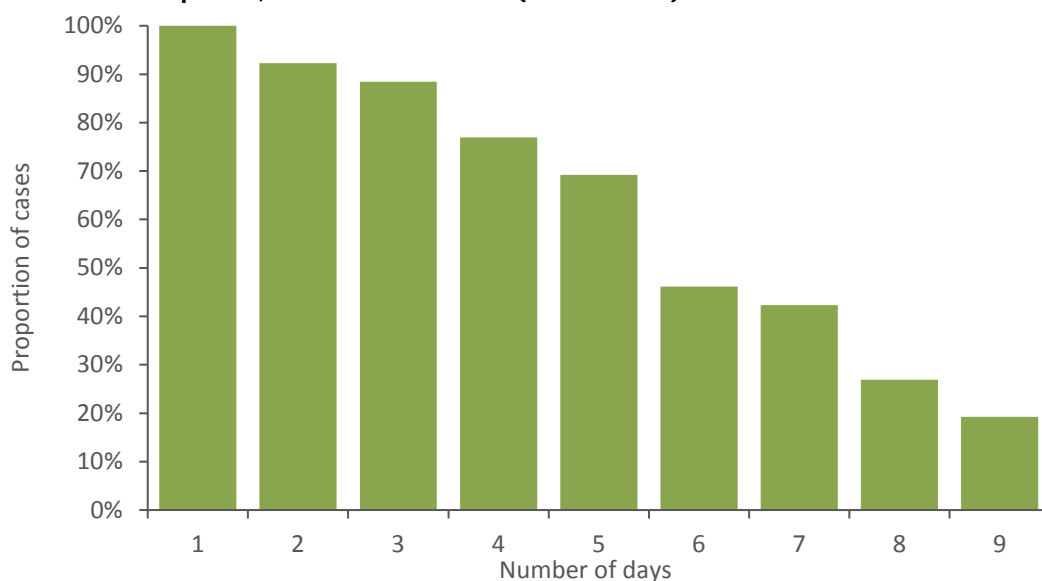
\* Twenty-six reported cases with disease onset since 1 October 2016

Legend: Dots represent the geographical location of an accommodation site where a reported case stayed.

Source of map: ECDC Legionnaires' disease outbreak geographic information tool.

All 26 cases were in Dubai during the incubation period (ELDSNet TALD surveillance definition of 2–10 days prior to illness onset). More than two thirds of cases (69%) were in Dubai for five or more of the nine days of their incubation period (Figure 4). After their visit to Dubai, two of the 26 cases spent two nights each in Abu Dhabi, one case spent three nights in Ajman (20 km north of downtown Dubai), one case spent five nights in Sharjah (8 km north of downtown Dubai), and one case spent seven nights on a ship during their incubation period – not counting the time spent in EU home countries.

**Figure 4. Distribution of TALD cases with travel in Dubai, by number of days spent in Dubai during the incubation period, weeks 37–51/2016 (n= 26 cases)**



**Figure 5. Distribution of cases with stay in Dubai, by age and gender, 2014–2015 and 2016**



The majority of cases (77%) reported since October 2016 are in the age group of 50 years and above, similar to what is observed for Legionnaires' disease cases in general. The median age among cases with onset since 1 October 2016 was 61.5 years, compared with 58 years for all cases with onset in 2014 and 2015. However, the male-to-female ratio of 1:1.6 observed in cases with onset since October 2016 is significantly lower than the ratio of 1:3 observed in 2014 and 2015 among travellers returning from Dubai (Figure 5).

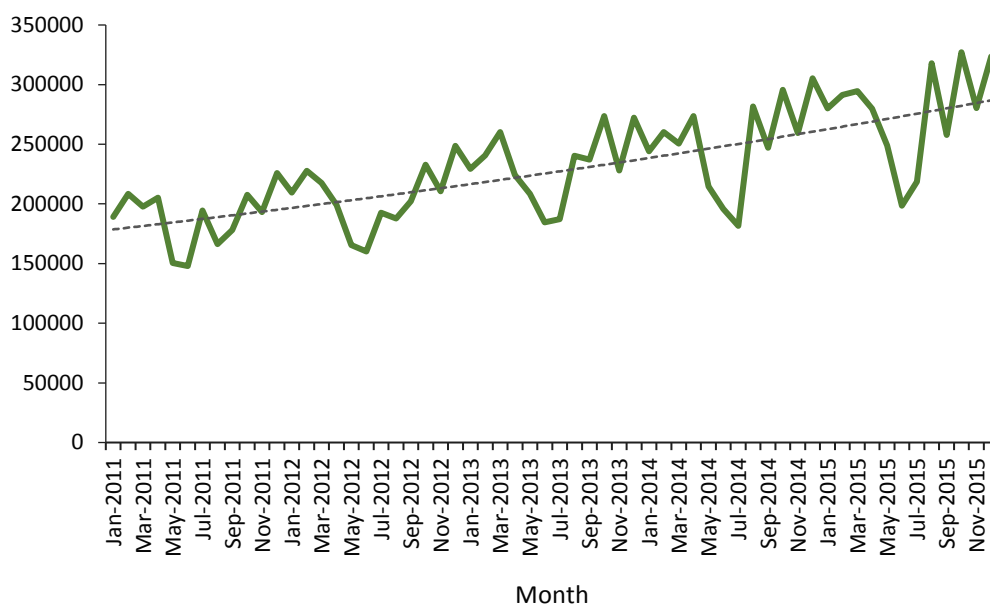
Of the 26 cases, 23 were diagnosed with a urinary antigen test, two with PCR, and one case with both urinary antigen test and PCR. One of the cases with onset of symptoms since 1 October 2016 had his/her infection further characterised as *Legionella pneumophila* serogroup 1 sequence base type 616. This type is uncommon in Europe and has been associated with other Legionnaires' disease cases returning from Dubai in previous years (personal communication, ELDSNet network).

Three additional Legionnaires' disease cases with the same *Legionella* sequence base type 616 in returning travellers from Dubai were reported in another EU Member State. Onset of illness for these three cases was since 1 October 2016, but the cases were not reported to the ELDSNet surveillance scheme because all three cases stayed at private accommodation sites in Dubai (personal communication).

According to the International Air Transport Association (IATA) database, the number of air passengers travelling from the EU/EEA to Dubai has steadily increased over the past five years, from 2 264 490 passengers in 2011 to 3 319 080 passengers in 2015 (+47%) (Figure 6). A 10% annual increase was observed between 2014 and 2015. Over the past five years, the countries with most EU/EEA travellers to Dubai were the United Kingdom (35% of EU/EEA passengers), Germany (20%) and France (9%), followed by Italy (8%), the Netherlands (4%) and Spain (4%). It is therefore not surprising that the majority of TALD cases with onset since 1 October 2016 are reported by the United Kingdom.

Passenger volumes show a distinct seasonal pattern: passenger numbers are consistently higher in the winter and lower in the summer, with peaks tending to correspond with the holiday seasons in the EU/EEA.

**Figure 6. Distribution of air passengers travelling from the EU/EEA to Dubai, by month, 2011–2015**



Source: IATA

## Environmental investigations

Public health authorities in the United Arab Emirates informed ECDC that environmental investigations at the notified hotels were undertaken. One of the hotels associated with a cluster reported to ECDC that their facilities were monitored monthly for *Legionella* bacteria in the hotel water system. In addition, the hotel conducted an investigation of the building after the disease cluster was reported; all samples were negative.

## ECDC threat assessment for the EU

ELDSNET observed a significant increase in the number of cases of TALD in EU travellers returning from Dubai over the past three months. Travel between the EU and Dubai has increased substantially in recent years, but the doubling of reported TALD cases observed between 2015 and 2016 surpasses the 10% increase that could be expected based on travel patterns alone.

As ELDSNet surveillance only includes travellers at public accommodation sites and does not cover private accommodations, e.g. stays with family and friends, the full extent of EU/EEA travellers affected with Legionnaires' disease returning from Dubai is not known. Similarly, ELDSNet is an EU/EEA surveillance system and does not receive surveillance notifications from countries outside the EU/EEA. However, the surveillance scheme covers the entire case travel history for all destinations worldwide during the 2–10-day incubation period. Two-thirds of the reported 26 cases stayed in Dubai for five days or more during their incubation period.

The majority of reported cases are associated with different accommodation sites dispersed geographically across Dubai, which suggests that cases were exposed to a common source not associated with accommodation sites. This is supported by the fact that samples collected at those Dubai accommodation sites where cases stayed were reported as negative for *Legionella* bacteria.

In the absence of identified and controlled sources of *Legionella* bacteria exposure, there could still be a risk for exposure to *Legionella* for persons visiting or living in Dubai. More cases of TALD in travellers returning from Dubai – and additional notifications on ELDSNet – can be expected in the coming weeks, especially in the context of the upcoming end-of-year holiday period.

It is currently not known if the local resident community in Dubai is also experiencing an increase of cases of Legionnaires' disease. The absence of an increase of cases in the local communities, if confirmed, could possibly indicate an environmental exposure in areas frequently visited by tourists, e.g. airports, shopping malls or tourist attractions.

Though the number of cases reported is still relatively small, the lower than expected male-to-female ratio, and the fact that the majority of cases is between 50 and 79 years of age, may help in identifying exposures associated with touristic activities that are typical for this age and gender profile.

Due to the relatively long incubation period (2–19 days), it cannot be excluded that diseased travellers acquired their infection outside of Dubai if their travel stay was shorter than the range of the incubation period. However, this is true for all cases of Legionnaires' disease reported through the surveillance scheme and cannot explain the unusual increase observed in recent months.

As Legionnaires' disease cannot be transmitted from human to human, there is no risk of further spread of the disease in the EU when affected travellers return to Europe. The risk associated with any specific source is therefore limited to a confined population in the area or at the site where a contaminated water-aerosolising installation is located.

## References

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- 2 Den Boer JW, Yzerman EP, Schellekens J, Lettinga KD, Boshuizen HC, Van Steenberghe JE, et al. A large outbreak of Legionnaires' disease at a flower show, the Netherlands, 1999. *Emerg Infect Dis.* 2002 Jan;8(1):37–43.
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- 6 ELDSNet. European Legionnaires' Disease Surveillance Network. [internet]. [Accessed 20 Dec 2016.] Available from: [http://ecdc.europa.eu/en/healthtopics/legionnaires\\_disease/ELDSNet/Pages/index.aspx](http://ecdc.europa.eu/en/healthtopics/legionnaires_disease/ELDSNet/Pages/index.aspx)