

# Cluster of pneumonia cases caused by a novel coronavirus, Wuhan, China

17 January 2020

## Summary

On 31 December 2019, the Wuhan Municipal Health Commission in Wuhan City, Hubei province, China reported a cluster of pneumonia cases of unknown aetiology, with a common reported link to Wuhan's Huanan Seafood Wholesale Market (a wholesale fish and live animal market selling different animal species).

On 9 January 2020, China CDC reported that a novel coronavirus (2019-nCoV) was detected as the causative agent and the genome sequence was made publicly available. Sequence analysis showed that the newly identified virus is related to the SARS-CoV clade. Detection systems have been developed and are available for the Member States through WHO and the European Virus Archive global catalogue.

As of 17 January 2020, a total of 44 laboratory-confirmed cases infected with 2019-nCoV have been reported, 41 from Wuhan, China and three travel-associated to Thailand (2) and Japan (1). The onset of symptoms ranged from 8 December 2019 to 5 January 2020 and included fever, coughing, and dyspnoea. Chest radiology showed the typical features of a viral pneumonia with diffuse bilateral infiltrates. The majority of cases were males aged 40–69 years. Seven cases developed a severe disease and two with chronic and severe underlying conditions died. Most cases are epidemiologically linked to the specific food market in Wuhan, which was cleaned and closed to the public on 1 January 2020. Some cases reported having visited a different food market while others did not report any link to such environments but had been in contact with people showing respiratory symptoms. So far, none of the reported cases had a disease onset more than 14 days after the closure of the implicated market. Among the cases reported, two small family clusters were identified. In one cluster, all three members of the family had attended the specific Wuhan market before disease onset. In the other cluster, one member was the spouse of a salesman in the market. She developed symptoms after the husband and did not report having visited the market environment before onset of symptoms. There have been no cases reported in healthcare workers, and so there is no evidence of nosocomial transmission so far.

At the time of writing, the source of infection is unknown and therefore we assume that it could still be active and lead to further cases in China. The occurrence of a few cases having no history of contact with the implicated market or other any similar market suggests the possibility of the infection source being more widely distributed, or of human-to-human transmission similar to other coronaviruses such as SARS-CoV and MERS-CoV. The occurrence of a few family clusters also supports this latter hypothesis. However, there is currently no knowledge on the transmission mode or risk factors for transmission. Furthermore, there is no information on the disease spectrum or risk factors for severity. In light of these unknowns, we cannot exclude the possibility of low-level virus circulation in the Wuhan community and thus the possibility of other clusters occurring in the near future.

In light of the current knowledge and the number of unknown factors, ECDC considers that:

- There is currently a moderate likelihood of infection for EU/EEA travellers visiting Wuhan;
- There is a high likelihood of case importation in countries with the greatest volume of people travelling to and from Wuhan (i.e. countries in Asia).
- There is a low likelihood of importation of cases in EU/EEA countries, due to the less extensive traffic of people with Wuhan.
- Adherence to appropriate infection prevention and control practices, in particular in healthcare settings, in EU/EEA countries, and the evidence of limited person-to-person transmissibility, make the assessed likelihood that a case reported in the EU would result in secondary cases within the EU/EEA very low.

## Event background

On 31 December 2019, the Wuhan Municipal Health Commission in Wuhan City, Hubei province, China reported a cluster of 27 pneumonia cases of unknown aetiology, including seven severe cases, with a common reported link to Wuhan's Huanan Seafood Wholesale Market (a wholesale fish and live animal market selling different animal species) [1]. The cases presented with clinical features common to several infectious respiratory diseases such as fever, dyspnoea, and bilateral lung infiltrates on chest radiographs. Authorities placed all cases under isolation, initiated contact tracing activities and applied hygiene and environmental sanitation activities at the market, which was closed to the public on 1 January 2020. Preliminary investigations suggested a diagnosis of viral pneumonia. At that time, Chinese authorities reported no significant human-to-human transmission and no cases among healthcare workers.

On 5 January 2020, 32 additional pneumonia cases of unknown aetiology were reported in Wuhan with dates of onset ranging from 12 to 29 December 2019, raising the total number of reported pneumonia cases of unknown aetiology to 59. Laboratory investigations ruled out seasonal and avian influenza viruses, adenovirus, SARS and MERS coronaviruses (MERS-CoV) as causative agents. Environmental cleaning of the Wuhan's Huanan Seafood Wholesale Market was completed and further hygiene investigations were initiated, while the market remained closed [2].

On 9 January 2020, China CDC reported that a novel coronavirus (2019-nCoV) had been detected as the causative agent for 15 of the 59 pneumonia cases [3]. On 10 January 2020, the novel coronavirus genome sequence was made publicly available by The Shanghai Public Health Clinical Center & School of Public Health, in collaboration with the Central Hospital of Wuhan, Huazhong University of Science and Technology, the Wuhan Center for Disease Control and Prevention, the National Institute for Communicable Disease Control and Prevention, the Chinese Center for Disease Control, and the University of Sydney, Australia [4]. The sequence was deposited in the GeneBank database (accession number MN908947) [5] and was uploaded to the Global Initiative on Sharing all Influenza Data (GISAID). Preliminary analysis showed that the novel coronavirus (2019-nCoV) clusters with the SARS-related CoV clade and differs from the core genome of known bat CoV.

On 11 January 2020, the first death of a case with 2019-nCoV infection was reported. The patient was a 61-year-old male admitted to the hospital with respiratory failure and severe pneumonia who died on 9 January 2020 [6]. He suffered from severe underlying conditions (cancer and chronic liver disease). The patient reported having visited the Wuhan's Huanan Seafood Wholesale market all year round.

On 16 January 2020, a second death was reported. The patient was a 69-year-old male admitted to the hospital with severe myocarditis, abnormal renal function, function impairment of multiple organs, and pulmonary and pleural lesions compatible with pulmonary tuberculosis, and he died on 15 January 2020 [7].

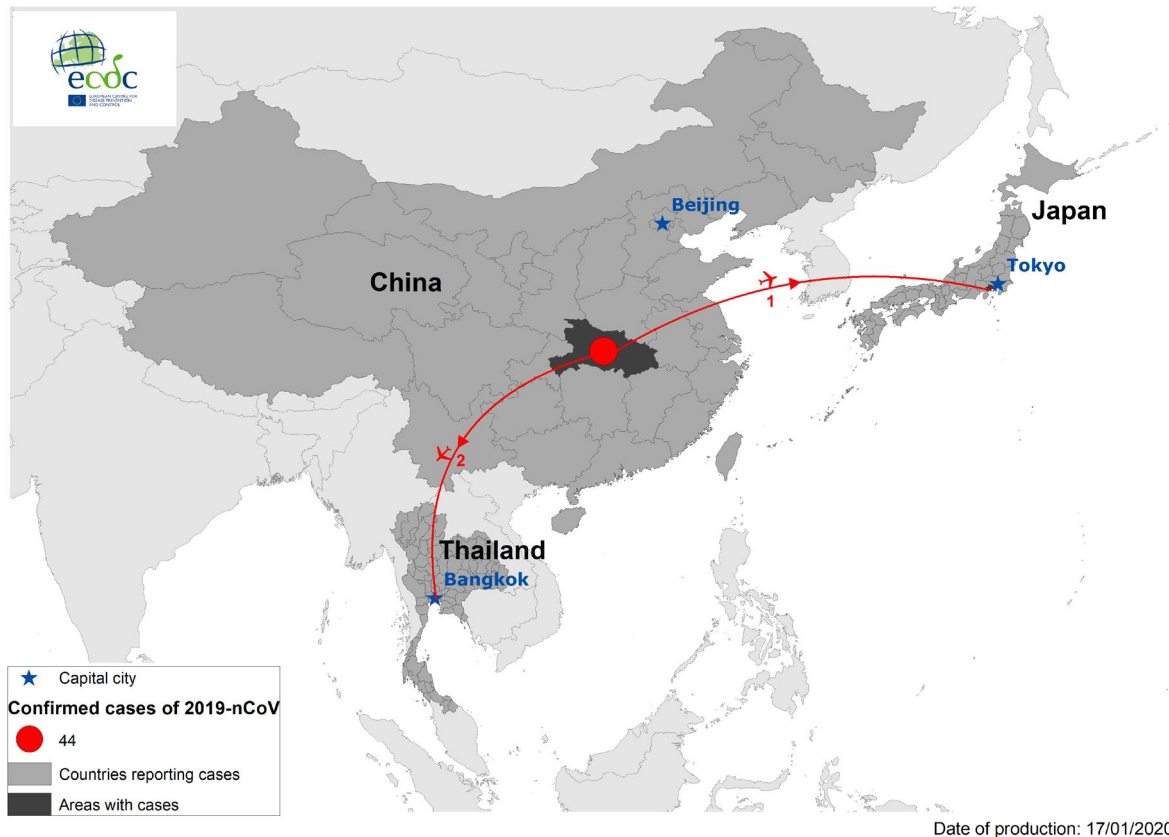
Since 31 December 2019 and as of 17 January 2020, a total of 44 laboratory-confirmed cases of novel coronavirus 2019-nCoV infection have been reported (Figure 1). Forty one of these cases were reported from Wuhan City, China, including two deaths, 12 discharged patients and five severe cases. The other three laboratory-confirmed cases are travel-related, two reported from Thailand and one from Japan [7]. The onset of symptoms of the identified laboratory-confirmed cases ranged from 8 December 2019 to 5 January 2020, including the travel-related cases. Preliminary results of epidemiological investigations in Wuhan, China showed that most of the cases were males 40–69 years old who had a history of recent exposure to the Wuhan Huanan Seafood Wholesale Market [8]. A few cases did not report having visited this market. Among the reported cases, two family clusters have been identified. One related to a man who was employed at the Huanan Seafood Wholesale Market and developed symptoms first, while his wife, who did not report having visited the market recently, developed symptoms later [9].

In China, 763 close contacts have been identified and monitored. Of these, 644 have completed the observation period, while 119 remain under medical observation. So far, none has tested positive for 2019-nCoV [7,10].

Three travel-related laboratory-confirmed cases with 2019-nCoV have been reported from Thailand (2) and Japan (1): The first identified travel-related and laboratory-confirmed case was a tourist, a Chinese citizen from Wuhan travelling to Bangkok. The case was detected through entry screening at Bangkok airport on 8 January 2020, hospitalised on the same day and tested positive for the novel coronavirus 2019-nCoV on 12 January. Close contacts were followed-up and are under medical observation [9,11]. The second reported case from Thailand was a Chinese citizen with no relation to the first case. The case was detected through entry screening on 13 January 2020, and was transferred to the Bamrasnaradu Institute for medical observations [12].

On 16 January 2020, the Japanese Ministry of Health reported an imported case of 2019-nCoV in Kanagawa Prefecture, Japan [13]. The case is a male in his 30s, who is a Chinese citizen residing in Japan. He travelled to Wuhan, China and developed fever on 3 January while visiting the city. He sought medical care on 6 January upon return to Japan and was hospitalised on 10 January. On 15 January, a sample from the patient tested positive for 2019-nCoV and the same day he was discharged. The case reported not having visited Wuhan's Huanan Seafood Wholesale Market, but having direct contact with a relative with unspecified respiratory symptoms.

**Figure 1. Geographical distribution of laboratory-confirmed cases (n=44) of 2019-nCoV, as of 17 January 2020**



According to media reports, Wuhan Tianhe International Airport has implemented exit screening for passengers traveling from Wuhan, China. Passengers' temperatures are measured and febrile passenger are placed under temporary quarantine [14].

According to the International Air Transport Association (IATA) data from 2018, the top five passenger destination countries from Wuhan in decreasing order are Thailand, Hong Kong Special Administrative Region, Japan, Taiwan and South Korea [15]. To our knowledge, entry-screening activities for all incoming travellers from Wuhan are implemented in Hong Kong [16], Indonesia [17], Malaysia [18], Myanmar [19], the Philippines [20], Singapore [21], Taiwan [22], Thailand [23], Russia [24], and Vietnam [25].

On 6 January 2020, the US Centers for Disease Control and Prevention (CDC) published a Watch – Level 1 travel notice related to the cases of pneumonia, addressing travellers to and from Wuhan as well as providing clinical information to healthcare practitioners to make them aware of the cluster of pneumonia cases [26]. On 8 January 2020, the US CDC also disseminated information on the cluster of cases with unknown pneumonia through the Health Alert Network (HAN). CDC advises healthcare providers to consider patients as being related to this cluster if they have severe respiratory symptoms, or have travelled to Wuhan since 1 December 2019 and had onset of illness within two weeks of returning, in the absence of any other known diagnosis. The US CDC recommends that symptomatic patients wear a surgical mask as soon as they are identified and that they should be evaluated in a private room with the door closed. According to CDC, healthcare providers should use contact precautions and wear an N95 disposable face piece respirator while evaluating these patients. For patients admitted in connection with in-patient care, in addition to standard precautions, the US CDC also recommends contact and airborne isolation precautions.

The airport of Wuhan has direct flight connections with some EU cities: Paris (France) with six weekly flights, London (the United Kingdom) with three weekly flights and Rome (Italy) with three weekly flights. Health authorities in the Member States concerned remain vigilant and are closely monitoring the ongoing situation in China.

Information on the novel coronavirus 2019-nCoV in China is regularly updated on the ECDC website [here](#).

WHO has also provided a risk assessment, a series of technical documents regarding the novel coronavirus 2019-nCoV and updated information regarding this cluster on its website <https://www.who.int/health-topics/coronavirus>.

# Disease background

## Coronavirus background information

Coronaviruses are enveloped positive stranded RNA viruses in the order of *Nidovirales* [27]]. With their characteristic surface, the virions have a crown-like appearance under the electron microscope which is why the viruses are named after the Latin word *corona*, meaning 'crown' or 'halo'. The subfamily *Orthocoronavirinae* of the family *Coronaviridae* is further classified into four coronavirus (CoV) genera: *Alpha-*, *Beta-*, *Delta-* and *Gammacoronavirus*. *Betacoronavirus* genus is further separated in five subgenera (*Embecovirus*, *Hibecovirus*, *Merbecovirus*, *Nobecovirus* and *Sarbecovirus*).

Coronaviruses were identified in the mid-60s and are known to infect humans and a variety of animals (including birds and mammals). Epithelial cells in the respiratory and gastrointestinal tract are the primary target cells. Due to these characteristics, viral shedding occurs via these systems and transmission can occur through different routes: fomites, airborne or faecal-oral.

To date, seven coronaviruses have been shown to infect humans. Common human coronaviruses Betacoronavirus HCoV-OC43 and HCoV-HKU1 as well as *Alphacoronavirus* HCoV-229E cause common colds but also severe lower respiratory tract infections in the youngest and oldest age groups; while *Alphacoronavirus* HCoV-NL63 is considered to be an important cause of (pseudo)croup and bronchiolitis in children [28].

Infections of humans with common coronaviruses are mostly mild and asymptomatic, but severe and fatal infections have also been observed. Occasionally, these viruses are able to cause lower respiratory tract infections and pneumonia in humans; this is more likely in immunocompromised individuals, people with cardiopulmonary underlying conditions, as well as the elderly and young children. Only very rarely do the human viruses cause severe disease, such as severe acute respiratory syndrome.

Since 2002, two additional coronaviruses infecting animals have evolved and caused outbreaks in humans: SARS-CoV (2002, *Betacoronavirus*, subgenus *Sarbecovirus*), and MERS-CoV (2012, *Betacoronavirus*, subgenus *Merbecovirus*).

During the emergence of severe acute respiratory syndrome-related coronavirus (SARS-CoV) in 2002–2003, the virus affected 8 096 people, causing severe pulmonary infections and 774 deaths (case fatality ratio: 10%) [29,30]. Bats were the likely origin of the virus, which spread further to Himalayan palm civets, Chinese ferret badgers and raccoon dogs sold for food at the wet markets of Guangdong, China. People handling or consuming these exotic animals were infected and spread the virus through human-to-human transmission.

Middle East respiratory syndrome-related coronavirus (MERS-CoV) was identified in 2012 in Saudi Arabia and since then the majority of human cases have been reported from the Arabian Peninsula. Human-to-human infections, particularly in healthcare settings, have been responsible for the majority of cases; however, dromedary camels are important animal reservoirs of the virus and are currently considered the main source of human MERS-CoV infections. The case fatality ratio of MERS-CoV infections is estimated at 35% [31,32].

## Novel coronavirus (2019-nCoV)

The novel coronavirus (2019-nCoV), which is connected to a cluster of acute respiratory illness cases from Wuhan, China is closely related to SARS-CoV, genetically clustering within the genus *Betacoronavirus*, subgenus *Sarbecovirus*. [33].

## Testing guidance and reporting for 2019-nCoV in the EU

Infection with the novel coronavirus should be immediately reported to the Early Warning and Response System (EWRS) in accordance with Decision No 1082/2013 on serious cross-border threats to health and to the IHR system in accordance with the International Health Regulations 2005 (IHR) [34,35].

ECDC has developed a guidance document [Laboratory testing of suspect cases of novel coronavirus \(2019-nCoV\) using RT-PCR](#) for the EU/EEA Member States, addressing questions on how to identify suspected cases and when to initiate testing [36].

Preliminary analysis indicated that dedicated novel coronavirus tests are preferable over pan-coronavirus tests. Pan-coronavirus tests will delay results, as they require subsequent sequencing to exclude infection with the common human CoVs. Therefore, laboratories are advised to implement molecular tests specific for 2019-nCoV, such as the test developed at the Institute of Virology, Charité, Berlin (Victor Corman, Christian Drosten) and published on the WHO webpage [37,38]. Extensive validation for specificity and robustness of use is currently at the planning stage. Synthetic positive controls can be obtained via the European Virus Archive global (EVAg) catalogue [39]. It is expected that more specific tests will be made available by other international reference laboratories in the near future.

Any positive test should be confirmed by a specific test. Positive samples can be sent for confirmatory testing to one of the two specialised laboratories for coronaviruses in the EU who offer their support:

- Charité – [Universitätsmedizin Berlin Institute of Virology](#), Berlin, Germany
- Erasmus Medical Center, [Department of Viroscience](#), Rotterdam, the Netherlands.

Case definitions for the European Region are currently under development by ECDC and WHO Regional Office for Europe [40].

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## ECDC risk assessment for the EU/EEA

A novel coronavirus (2019-nCoV) has been isolated and considered the causative agent of the cluster of 41 pneumonia cases in the area of Wuhan, Hubei province in China, and three travel-related cases in Thailand and Japan, arriving from Wuhan.

The majority of detected cases reported having visited the Wuhan Huanan Seafood Wholesale Market recently before disease onset. Some cases did not report any exposure to this specific market, but to other food markets in Wuhan. For a few cases there was no direct connection with a food market. The Wuhan Huanan Seafood Wholesale Market has been closed and disinfected. However, there is no information available on restrictions at other food markets in Wuhan. If the sources of the infections are indeed certain animals sold in the market, other markets in the city may continue to pose a risk of infection. At the moment, there is no information on the source of infection or the transmission mode.

As of 16 January 2020, there is no clear indication of sustained human-to-human transmission. The report of two small family clusters in Wuhan and the exposure history of the imported Japanese case (history of contact with a person with an acute, not laboratory-confirmed, respiratory infection in Wuhan) suggest that person-to-person transmission may have occurred. In the absence of detailed information from the ongoing studies in China, it is impossible to quantify the potential of the 2019-nCoV for human-to-human transmission.

The clinical information on confirmed 2019-nCoV cases reported so far suggests a milder disease course than that observed in SARS-CoV and MERS-CoV cases. However, in the absence of results from ongoing epidemiological investigations, it is impossible to assess whether there are population groups at higher risk of severe illness.

### Risk for travellers, importation and further spread in the EU

Three EU airports have direct flight connections to Wuhan and there are indirect flight connections to other EU hubs. The likelihood of EU/EEA travellers becoming infected while visiting any wet or live animal markets in Wuhan is considered to be moderate, as the source of infection is unknown and could still be active. The likelihood of infection for travellers visiting Wuhan, but not visiting these markets, is considered low, because so far there is no indication of virus circulation in the community.

Therefore, the likelihood of importation of cases of 2019-nCoV to the EU is considered to be low, but cannot be excluded in the current situation.

The upcoming Chinese New Year celebrations at the end of January 2020 will cause an increase in the volume of travel to/from China and within China, increasing the likelihood of possible cases arriving in the EU.

If a case is identified in the EU, rigorous infection prevention and control measures (IPC) should be applied. Current evidence that human-to-human transmission is limited indicates that the assessed likelihood of further spread in the community setting within the EU/EEA is very low, but the risk cannot be excluded.

### Risk of nosocomial transmission, infection prevention and control

So far, there are no reported instances of disease transmission to healthcare workers/medical personnel in China, Japan and Thailand. Therefore, the likelihood of nosocomial transmission is considered very low, provided that appropriate IPC measures are applied.

### Risk of transmission in airplane

There are no specific guidelines for assessing the risk of 2019-nCoV transmission during a flight. Taking SARS as a proxy, according to the ECDC RAGIDA guides, assessment should be made on a case-by-case basis. As the current level of uncertainty regarding transmission of 2019-nCoV is high, comprehensive contact tracing of confirmed cases should be considered and if this is not possible, efforts should be made to at least trace passengers seated in the same row and passengers seated two rows in front or behind the index case [41]. In addition, ECDC will shortly be publishing an updated guide on MERS-CoV infections during a flight.



## Options for response

Options for response might change when more epidemiological and clinical data become available.

### Preparedness

Travellers between Wuhan, China and EU/EEA countries are limited in numbers, however, there are direct flights to at least three EU capital cities and there may also be indirect flights and maritime traffic, as this particular area of China is considered a railway and river transport hub. EU/EEA countries should therefore consider reviewing procedures for informing incoming and outgoing passengers from/to Wuhan, China of infectious diseases at their various Points of Entry (PoE), particularly in countries where there are direct flights to and from Wuhan, along with procedures for contact tracing and contact follow up [42,43]. In general, entry screening is not considered an effective measure for detecting incoming travellers with infectious diseases, especially in this case where the symptoms of the disease are very common and the timeline coincides with the increased activity of seasonal influenza in Europe [44,45]. However, a targeted approach focussing on passengers from direct incoming flights may be considered in the respective countries to initiate early identification.

According to media reports there may be some monitoring activities ongoing at the Wuhan Tianhe International Airport which could further decrease the possibility of an 2019-nCoV case being imported to the EU/EEA [14].

In addition, it would be advisable for Member States to review the national laboratory diagnostic capacity for coronaviruses and the procedures for transporting samples [42].

Travellers planning to visit Wuhan, China should be advised to avoid visiting wet markets or places where live or dead animals are handled and to avoid contact with those who are sick, in particular with respiratory symptoms. They should also be advised to adhere to good hand and food hygiene, and avoid contact with animals, their excretions or droppings. Travellers with acute respiratory symptoms returning from Wuhan or travelling in China with a scheduled stay in Wuhan are advised to seek medical attention and indicate their travel history to Wuhan to the healthcare specialist.

In addition, due to the currently high activity of the seasonal influenza epidemic in China, travellers should receive seasonal influenza vaccination at least two weeks prior to travel to prevent severe disease, in accordance with the respective national recommendations.

Healthcare providers should be aware of the ongoing event and keep abreast of the new information on the novel coronavirus 2019-nCoV. According to our current knowledge, the clinical signs and symptoms of disease include fever, cough and difficulty breathing with the radiological findings of viral pneumonia in chest radiographs [46]. Travellers returning from China with a stay in Wuhan and symptoms of acute respiratory infection should be identified for testing and reported promptly to the respective healthcare authorities [36].

There is limited information available at present to provide detailed guidance on appropriate infection prevention and control practices. Until more such information becomes available, countries should apply WHO guidelines on prevention of acute respiratory infections in healthcare settings [46,47]. As a precaution, IPC measures for airborne transmission and isolation of confirmed cases should be considered to minimise the risk of nosocomial transmission, particularly if performing aerosol generating procedures or interventions.

The ongoing seasonal influenza epidemic in China with high activity might increase the number of returning travellers with respiratory illness and/or pneumonia not related to the event. It is important to further investigate patients with pneumonia and travel history to Wuhan and to perform diagnostic laboratory testing to rule out other respiratory pathogens as aetiological agent.

### Novel coronavirus and substances of human origin (SoHO) safety

The potential for transmission of the 2019-nCoV through substances of human origin (SoHO) is not known. Possible viraemia during the disease incubation period, during possible asymptomatic course of infection, or after symptom resolution are also unknown and remain a concern in relation to the safety of SoHO. Therefore, until more information is available on the epidemiology and pathogenesis of this infection, SoHo safety authorities in the EU/EEA countries may follow the recommendation used for SARS-CoV and MERS-CoV. This implies a precautionary deferral from donation of blood, cells and tissues donors for 21 days after possible exposure to a confirmed case or after returning from Wuhan, China [48,49].

Additionally, recovering confirmed cases of 2019-nCoV should be deferred as donors for at least 28 days after symptom resolution and completion of therapy, due to the present uncertainty regarding possible persistence of viremia and/or viral shedding in body fluids. Potential organ donors at risk of being infected should be laboratory tested for the presence of the virus. Lipid-enveloped RNA viruses such as the novel coronavirus (2019-nCoV) should be readily removed and/or inactivated during manufacturing of plasma derivatives [50,51].

## Limitations

This assessment is undertaken based on facts known to ECDC at the time of publication. There is a substantial level of uncertainty regarding the epidemiological characteristics of the nCoV-2019. There is limited epidemiological and clinical information on the cases of 2019nCoV identified so far (e.g. infection sources, aetiological agent, risk factors for infection, risk factors for severe illness, potential person-to-person transmissibility, transmission modes, effective preventive measures, and clinical presentation and evolution.) Therefore, the level of uncertainty of this risk assessment is high.

Given these limitations, ECDC will revise the current RRA as soon as more information becomes available.

## Source and date of request

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## Consulted experts

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## Disclaimer

ECDC issues this risk assessment document based on an internal decision and in accordance with Article 10 of Decision No 1082/13/EC and Article 7(1) of Regulation (EC) No 851/2004 establishing a European centre for disease prevention and control (ECDC). In the framework of ECDC's mandate, the specific purpose of an ECDC risk assessment is to present different options on a certain matter. 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 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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