

Outbreak of acute respiratory syndrome associated with a novel coronavirus, Wuhan, China; first update

22 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) had been 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 20 January 2020, a total of 295 laboratory-confirmed cases infected with 2019-nCoV have been reported, 291 from Wuhan, China and four travel-associated from Thailand (2), Japan (1) and South Korea (1). Four deaths have been reported among the cases. Chinese health authorities have confirmed human-to-human transmission and 15 healthcare workers are reported to have been infected in Wuhan. The original source of the outbreak remains unknown and therefore further cases and deaths are expected in Wuhan, and in China. It is possible that further cases will also be detected among travellers from Wuhan to other countries.

There are considerable uncertainties in assessing the risk of this event, due to lack of detailed epidemiological analyses.

On the basis of the information currently available, ECDC considers that:

- the potential impact of 2019-nCoV outbreaks is high;
- further global spread is likely;
- there is currently a moderate likelihood of infection for EU/EEA travellers visiting Wuhan;
- there is a high likelihood of case importation into countries with the greatest volume of people travelling to and from Wuhan (i.e. countries in Asia);
- there is a moderate likelihood of detecting cases imported into EU/EEA countries;
- adherence to appropriate infection prevention and control practices, particularly in healthcare settings in EU/EEA countries with direct links to Wuhan, means that the likelihood of a case reported in the EU resulting in secondary cases within the EU/EEA is low.

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

This risk assessment is based on published information available as of 21 January 2020, 11:00 (referring to data as of 20 January 2020).

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. At that time, Chinese authorities reported no significant human-to-human transmission and no cases among healthcare workers.

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 [2]. On 10 January 2020, the first novel coronavirus genome sequence was made publicly available [3]. The sequence was deposited in the GenBank database (accession number MN908947) [4] 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 CoVs.

Since 31 December 2019 and as of 20 January 2020, 295 laboratory-confirmed cases of novel coronavirus 2019-nCoV infection, including four deaths, have been reported [5] (Table 1, Figure 1). Of the reported cases in Wuhan, 15 were healthcare workers [6]. Of the 295 laboratory confirmed cases, 291 were reported by China: 270 cases in Wuhan City, five cases in Beijing, 14 cases in Guangdong, and two in Shanghai [5]. Wuhan City reports that 169 cases are still hospitalised, of which 35 are seriously and nine are critically ill [7]. It is not clear to ECDC if cases have been hospitalised only due to medical needs, or also for isolation purposes for milder cases. In Guangdong, two of the reported 14 cases had not travelled to Wuhan, China, but had a history of contact with confirmed cases [8]. The other four laboratory-confirmed cases are travel-related: two reported from Thailand, one from Japan, and one from South Korea [9-11].

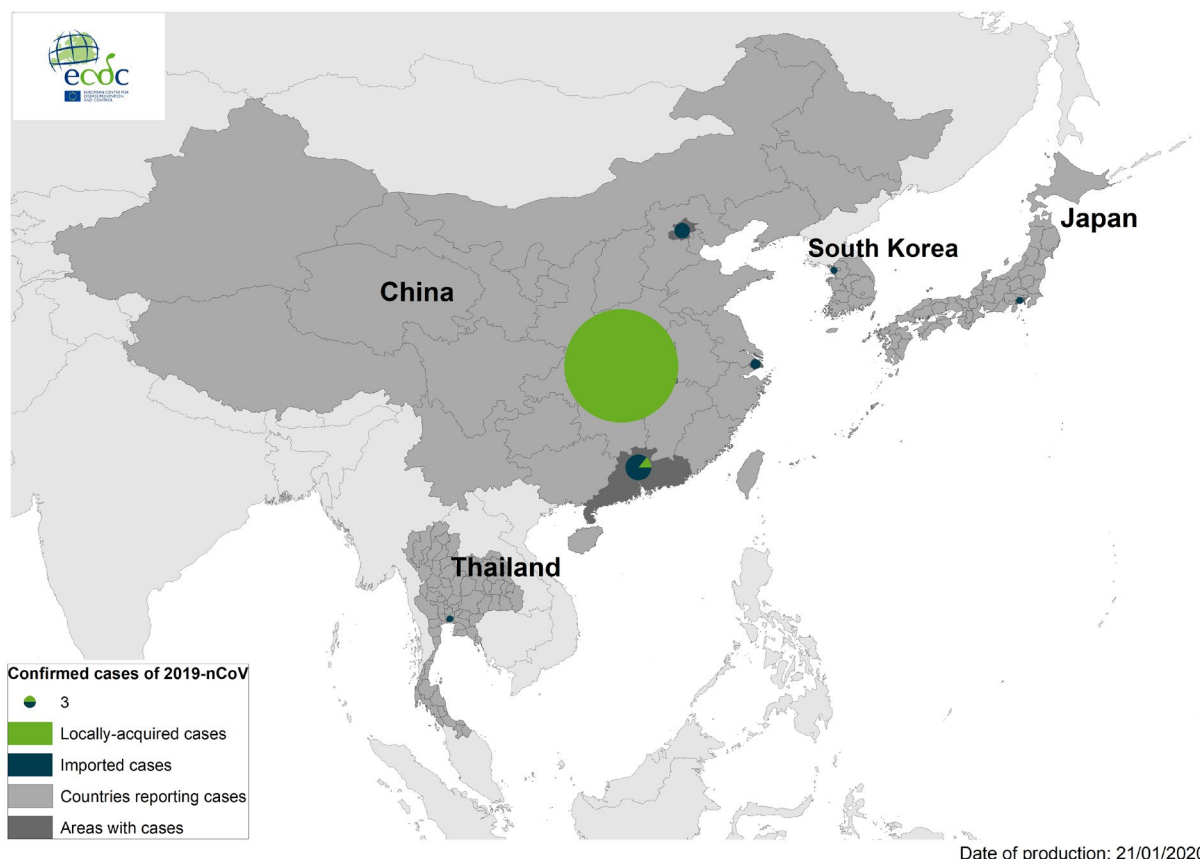
Of the four reported deaths, all in China, the first death occurred on 9 January 2020 in a 61-year-old patient with severe underlying conditions, who reportedly visited the Wuhan's Huanan Seafood Wholesale market all year round [12]. A second death occurred in a 69-year-old case on 15 January 2020 with multiple organ failure [9]. The third death was reported on 18 January 2020 [13], and the fourth death occurred in an 89-year-old with pre-existing medical conditions on 19 January 2020 [7].

The onset of symptoms of the laboratory confirmed cases ranges from 8 December 2019 to 18 January 2020, including the travel-related cases. Over half of the confirmed cases were male. Among the reported cases the age range is from 10 to 89 years [8]. The history of exposure to the Wuhan's Huanan Seafood Wholesale Market or other live markets is unknown for the majority of the recently reported cases [11].

In China, 1 739 close contacts have been identified and monitored. Of these, 817 have completed the observation period, while 922 remain under medical observation [9,14].

Table 1. Distribution of laboratory-confirmed cases and deaths of 2019-nCoV by reporting country and province, as of 20 January 2020

Reporting Country	Reporting province	Number of confirmed cases	Number of deaths
China	Hubei Sheng	270	4
	Guangdong Sheng	14	0
	Beijing Shi	5	0
	Shanghai Shi	2	0
Japan	Kanagawa	1	0
Republic of Korea	Inchon	1	0
Thailand	Bangkok	2	0
	Grand total	295	4

Figure 1. Geographical distribution of laboratory confirmed cases (n=295) of 2019-nCoV, as of 20 January 2020

According to media reports, in addition to the exit screening at the Wuhan Tianhe International Airport [15], Wuhan authorities have strengthened screening measures in other airports, railway stations, and long-distance bus stations for entering and exiting the city. Private vehicles are also checked for live birds and wild animals and people are advised not to walk in groups. Passengers with fever are registered, provided with brochures and masks and referred to medical institutions. Public transport is disinfected on a daily basis [16]. A list of medical institutions designated for the management of suspected cases in Wuhan has been published by the Wuhan authorities [17].

According to the International Air Transport Association (IATA) data from 2018, the five destination countries receiving most passengers from Wuhan in decreasing order are: Thailand, Hong Kong Special Administrative Region, Japan, Taiwan and South Korea [18]. To our knowledge, entry-screening activities for all incoming travellers from Wuhan have been implemented in Hong Kong [19], India [20], Indonesia [21], Malaysia [22], Myanmar [23], the Philippines [24], Singapore [25], Taiwan [26], Thailand [27], the United States [28], Russia [29] and Vietnam [30].

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. Italian health authorities are checking for the presence of suspected cases on-board direct flights arriving from Wuhan, China into Rome Fiumicino Airport.

Disease background

Coronavirus infections (including SARS and MERS)

Coronaviruses were identified in the mid-1960s 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. Viral shedding therefore occurs via these systems and transmission can be through a variety of routes: respiratory droplets, airborne, fomites 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 [31].

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, although this is more likely in immunocompromised individuals, people with underlying cardiopulmonary conditions, the elderly and young children. Only very rarely do the human viruses cause severe disease.

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%) [32,33]. 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- transmission, particularly in healthcare settings, has been the main route of transmission in 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% [34,35].

Novel coronavirus (2019-nCoV) infections

The novel coronavirus (2019-nCoV) was first isolated from a patient with pneumonia, connected to the cluster of acute respiratory illness cases from Wuhan, China. Genetic analysis revealed that it is closely related to SARS-CoV and genetically clusters within the genus *Betacoronavirus*, subgenus *Sarbecovirus*. [36].

There is currently limited information on the epidemiological and clinical characteristics of the infection caused by 2019-nCoV. A media statement by a senior expert in China suggests that the mean incubation period observed in the current outbreak is seven days, with a range between 2–12 [37]. Based on the epidemiological characteristics of respiratory infections caused by SARS-CoV and MERS-CoV, an incubation period of two to seven days and up to 14 days is plausible. So far, among the laboratory-confirmed cases, about 20% are seriously or critically ill and four confirmed cases have died.

A global case definition is available from WHO [38]. Case definitions for the European Region are currently under review by ECDC and WHO Regional Office for Europe.

ECDC risk assessment for the EU/EEA

The outbreak is linked to a novel coronavirus, but there are many unknowns such as virulence/pathogenicity of the virus, mode of transmission, reservoir and source of infection. So far, the epidemiological data available are limited and therefore there are significant uncertainties in this risk assessment.

It is likely that bats or related mammals are the host species of this virus. Some of the closest genetic relatives of this virus have been isolated in bats from China, as was also the case for SARS-CoV. SARS-CoV had intermediate hosts, through which initial human infections occurred, and this is also possible for the 2019-nCoV. Chinese authorities quoted by media have suggested that most infections in Wuhan are concentrated around two districts of the city hosting large seafood markets [37].

On 20 January 2020, Chinese authorities informed local press that human-to-human transmission is occurring in this outbreak, based on the number of cases, a cluster of family transmission in Guangdong and infection cases among 15 healthcare workers [8,37]. Further evidence of human-to-human transmission are the reports that none of the cases detected outside of China have apparent direct exposure to the Wuhan Huanan seafood market, 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, non-laboratory-confirmed, respiratory infection in Wuhan).

In the absence of detailed information from the ongoing outbreak investigations in China, it is not possible to quantify the extent of human-to-human transmission.

Preliminary modelling work has estimated the number of moderately severe cases in Wuhan and the importation risk to cities within and outside China [39,40]. Data availability are limited and, to date, the analysis has focused on mobility patterns, not taking into account human-to-human transmission. Phylogenetic analysis (University of Edinburgh) implies that the most recent common ancestor was from early December 2019, indicating that historical sustained transmission in the human population is unlikely [41].

ECDC does not have access to the algorithm used in China to identify novel coronavirus cases, however we assume that testing was initially done mainly for patients diagnosed with 'pneumonia of unknown origin' and close symptomatic contacts of confirmed 2019-nCoV cases. This may have changed following the introduction of a specific PCR assay targeting nCoV-2019. Therefore, it is difficult to assess the severity of the disease, but likely that a substantial proportion of the cases were only tested after a diagnosis of pneumonia.

The rather small number of fatalities reported as of 21 January 2020 should not be interpreted as a low severity indicator as the numbers are expected to change frequently. In addition, it is not clear if all pneumonia associated deaths in Wuhan were appropriately tested prior to the use of the 2019-nCoV specific RT-PCR assay. Moreover, progression to severe illness is delayed and it is unclear how many severe cases have been hospitalised in the last week. In the absence of results from ongoing epidemiological investigations, it is also not possible to assess whether there are population groups at higher risk of severe illness.

Risk of global spread

Based on the genetic similarities between 2019-nCoV and SARS-CoV, the limited epidemiological information available from China and the detection of cases through entry screening outside of China, it is possible that new cases will be detected among travellers from Wuhan. Without implementation of appropriate infection prevention and control measures at the point of care for persons under investigation, there is a moderate likelihood of outbreaks in destination countries. In the past, systematic implementation of infection prevention and control measures were effective in controlling both SARS-CoV and MERS-CoV.

Risk for travellers, importation and further spread in the EU/EEA

Three EU airports have direct flight connections to Wuhan and there are indirect flight connections to other EU airports. More than 300 000 arrivals from cities in China are expected in EU Member States during the month of January, a similar volume to that during other months of the year. An important proportion of these arrivals will occur during the week before and after the Chinese New Year on 25 January 2020. So far, a limited number of 2019-nCoV infection cases have been reported outside of China. All of these cases were visiting friends and family, who were likely to have had a different type of exposure to business travellers or tourists.

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. For the same reasons and due to the fact that human-to-human transmission is occurring, the likelihood of infection for travellers visiting Wuhan who have close contact with individuals who are sick or coughing is considered moderate.

Consequently, the likelihood of cases of 2019-nCoV being imported to the EU/EEA by travellers from Wuhan is considered to be moderate. This likelihood may be decreased by the implementation of exit screening by the local authorities in Wuhan [16].

Assuming that human-to-human transmission is limited and that timely and rigorous infection prevention and control measures (IPC) are applied to potential imported cases detected in the EU/EEA, the likelihood of further spread in a community setting within the EU/EEA is considered very low. However, both SARS-CoV and MERS-CoV have been linked to nosocomial outbreaks or super-spreading events, therefore strict infection prevention and control measures should be applied for the management of persons under investigation and confirmed cases.

The impact of an imported case of 2019-nCoV in an EU/EEA country without the application of appropriate IPC measures is potentially high, therefore in such a scenario the risk is estimated to be high.

Risk of transmission on aircrafts

So far, no cases have been reported as infected on-board aircrafts, however information on the extent of contact tracing for identified cases who were on aeroplanes is not available to ECDC. Peer-reviewed literature has reported four events which took place during the 2003 SARS outbreaks, including 26 passengers who were infected during a flight [42-44]. For 21 MERS-CoV cases identified boarding 31 flights, no secondary cases were reported.

Based on the limited evidence documented during the 2003 SARS outbreaks and the MERS-CoV outbreaks, it is suggested that contacts seated two seats in either direction of a confirmed 2019-nCoV case, and crew members servicing the relevant compartment should be contact traced and actively followed up for 14 days [45]. All such incidents should be assessed on a case-by-case basis as severity or type of symptoms may warrant a more comprehensive strategy.

Risk of healthcare-associated transmission

Chinese authorities have reported 2019-nCoV infection among 15 healthcare workers in Wuhan to local media in connection with this outbreak. Without further information, we assume that these healthcare workers did not have other exposure and that these are cases of healthcare-associated infections. Based on the evidence from SARS and MERS outbreaks, the likelihood of healthcare-associated transmission, following management of a confirmed case is considered low, provided that appropriate IPC measures are applied for staff patients and visitors [46]. Risk of infection for healthcare staff involved in aerosol-generating procedures without appropriate personal protection equipment (PPE) is considered high [45].

Options for response

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

Testing guidance for 2019-nCoV in the EU/EEA

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 [47].

Preliminary analysis indicated that dedicated novel coronavirus tests are preferable to pan-coronavirus tests [48]. 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 RT-PCR test developed at the Institute of Virology, Charité, Berlin (Victor Corman, Christian Drosten) and published on WHO's webpage [49,50] or the RT-PCR test developed at the School of Public Health, Hong Kong University, China (Leo Poon, Daniel Chu and Malik Peiris) [51]. Extensive validation for specificity and robustness of use is currently ongoing. Synthetic positive controls can be obtained via the European Virus Archive global (EVAg) catalogue [52]. ECDC will launch an online laboratory capacity survey on Member State laboratory detection capacities through EVD-LabNet and ERLI-Net and plans to support the participation in an external quality assessment that will be offered through EVAg.

Any positive test should be confirmed by a second RT-PCR test targeting a different 2019-nCoV gene [49,53]. A positive test result for another respiratory pathogen does not rule out a 2019-nCoV infection, as little is currently known about co-infections. 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.

Member States should review the national laboratory diagnostic capacity for coronaviruses and the procedures for transporting samples [54].

Surveillance

Confirmed cases of 2019-nCoV infection 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) [55,56].

Case definitions for the European Region, based on WHO's global case definition, are currently under review by ECDC and WHO Regional Office for Europe [38].

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. As of 20 January 2020, there is information on 2019-nCoV cases in at least three other provinces in China (Beijing, Shanghai, Guangdong).

EU/EEA countries should therefore review procedures for informing incoming and outgoing passengers from/to Wuhan, China of the situation concerning 2019-nCoV at their Points of Entry (PoE), particularly in countries where there are direct flights, in accordance with national procedures for contact tracing and contact follow-up for at least 14 days [54,57]. In general, evidence does not support entry screening as an efficient 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 and China [58-62]. However, three of the four cases of nCoV-2019 detected outside of China were found using entry screening procedures at destination airports. Therefore, a targeted approach focussing on passengers from direct incoming flights from Wuhan may be considered in the respective countries to facilitate early identification.

Official Chinese sources advise against travelling out of Wuhan with symptoms and media report there are ongoing monitoring activities at the Wuhan Tianhe International Airport which could further decrease the possibility of an 2019-nCoV case being imported to the EU/EEA [15].

In addition, Member States are urged to review their procedures for in-country transportation, isolation and management of high consequence infectious disease cases, including staffing and laboratory support [54].

Travellers planning to visit Wuhan, China for the Chinese New Year celebrations should be advised to avoid visiting wet markets or places where live or dead animals are handled and to avoid contact with sick persons, in particular those 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, should be advised to seek medical attention and indicate their travel history to Wuhan to the healthcare specialist. Member States may consider guiding these

cases to a particular call centre or healthcare facility, depending on their planning. National authorities in China are advising against non-essential travel to Wuhan.

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 influenza disease, in accordance with the respective national recommendations.

Healthcare providers should be informed of the ongoing outbreak. According to current knowledge, the clinical signs and symptoms of disease include fever, coughing and difficulty breathing with the radiological findings of pneumonia [53]. Patients can present with mild, moderate, or severe illness including severe pneumonia, ARDS, sepsis and septic shock. 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 public health authorities [47].

There is limited information available at present to provide detailed guidance on appropriate infection prevention and control practices. However, the emerging evidence of human-to-human transmission and the report of infections among healthcare staff in Wuhan reinforces the recommendation for rigorous compliance with IPC measures, as specified in [WHO interim guidance](#). These include placement of suspected and confirmed cases in single rooms, implementation of contact and droplet precautions, and airborne precautions when performing aerosol generating procedures or interventions [53,63,64].

Novel coronavirus and substances of human origin (SoHO) safety

The potential for transmission of the 2019-nCoV through substances of human origin (SoHO) is unknown. 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 [65,66].

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 [67,68].

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

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

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, extent of 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 risk assessment as soon as more information becomes available.

Source and date of request

ECDC internal decision, 20 January 2020.

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 853/2004 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.

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