The risk of transmission of Ebola virus via donated blood and other substances of human origin in the EU

Background

The massive outbreak of Ebola virus disease (EVD) in West Africa in 2014 has increased the risk of Ebola virus transmission via donated blood and blood components, cells, tissues and organs (substances of human origin - SoHO). There are no specific EU regulations or recommendations for the safety of SoHO donated by: a) patients who have recovered from EVD; b) people exposed to Ebola virus; or c) people who have visited or reside in EVD-affected areas. Ebola virus infections transmitted via transfusions have not been described, nor has Ebola virus transmission through donated tissues or organs been documented. Asymptomatic replicative infections with Ebola virus have been described [1,2]. Travellers from Ebola-affected areas are deferred for donation because malaria risk areas overlap with the current Ebola risk areas in Africa [3]. However, there is a need for specific guidelines to maintain the safety of SoHO donation by people who have been exposed to Ebola virus. There is a possibility that the current outbreaks in West Africa and the Democratic Republic of Congo will spread to areas with no malaria risk.

Risk assessment

The risk of Ebola virus transmission through SoHO is related to the presence of Ebola virus in the donor's blood, tissues and organs. The presence and concentration of virus in organs, tissues, blood and other bodily fluids changes over the course of the infection. The virus concentration peaks when the patient is most sick, and viruses can be detected and isolated from bodily fluids weeks and months after recovery [4]. There are limited data on when patients become viraemic and infectious during the incubation period. The assumption is that virus replication and excretion into bodily fluids is not high enough in the pre-symptomatic phase to result in person-to-person transmission through day-to-day contacts in the community. However, there are no data on when viraemia starts during the incubation period. During the symptomatic phase of EVD, the virus is present in high concentrations in all bodily fluids, tissues and organs [5]. When the disease is fatal, the dead body remains highly contagious for days and weeks. After recovery from the acute phase, a patient may continue to excrete live and infective viruses for long periods [4].

There are currently insufficient data on which to base recommendations for deferral periods for: recovered EVD patients, contacts of EVD cases and people who have visited the EVD-affected countries, but do not have a documented exposure. EVD has an acute onset of prominent symptoms that is believed to be temporally related to the viraemia. This makes it unlikely that patients in the viraemic phase would be accepted for donation of SoHO, because they would be overtly ill.

Recommendations for the safety of SoHO donations

Travellers or residents returning from EVD-affected areas

It is expected that a deferral of donation for two incubation periods will provide a reasonable margin of safety for asymptomatic donors returning from EVD-affected areas. The longest incubation period for EVD has been estimated at 21 days. However, a recent study has proposed to extend the longest possible incubation period to 25 days [6]. Thus, asymptomatic travellers or residents returning from EVD-affected areas should be temporarily deferred from donation of SoHO for 7 weeks (49 days) after leaving an area affected by EVD.

It should be noted that all Ebola outbreaks to date have occurred in malaria-endemic areas in Africa, and that asymptomatic blood donors returning from malaria risk areas are deferred for blood donation for at least four months according to EU Directive [3].

Criteria for donation of organs, tissues and cells in the EU require laboratory testing for malaria of potential donors returning from malaria-endemic areas, but the deferral period is not specified [7,8]. Moreover, malaria is not an absolute contraindication for the donation of organs. Therefore, asymptomatic donors of cells, tissues and organs should be deferred from donation for 7 weeks after returning from an EVD-affected area.

Individuals monitored after exposure to Ebola virus

Individuals who are being monitored due to history of contact with an EVD patient or other exposure to Ebola virus (high-risk or low-risk exposure) should be excluded from donating SoHO for 7 weeks from the beginning of the monitoring period.

Individuals infected with Ebola virus

Individuals infected with Ebola virus should be excluded from live or deceased donation of SoHO.

Individuals recovered from EVD

Convalescence from EVD is long and often associated with sequelae such as myelitis, recurrent hepatitis, psychosis, or uveitis. Data on the post-recovery viraemic period are limited. Shedding of Ebola virus in breast milk and semen after the virus has been cleared from blood has been reported [4]. Viable virus has been isolated from semen up to 7 weeks after recovery, and spermatogenic transmission of Marburg virus has been documented [9]. There is paucity of data about Ebola virus in human eggs. The risk of Ebola transmission should be considered for reproductive cell donations, both for "partner" and for "other than by partner" donations.

However, the evidence that Ebola virus may persist for some time in the human body after recovery from EVD is not sufficient to define a specific deferral period for donors who have recovered from EVD. The current guidance stipulates deferral for 12 months following recovery from a viral haemorrhagic fever [10] and this recommendation also applies to donors who have recovered from EVD.

Donations of tissues which can be sterilized and the donation of plasma for fractionation that includes at least two viral inactivation steps can be accepted 7 weeks after the donor has recovered on the condition that laboratory confirmation tests for Ebola virus are negative.

What is said above does not apply to donations of convalescent whole blood (CWB) and plasma (CP) from EVD survivors for the preparation of anti-Ebola-virus-specific plasma for post-exposure treatment. WHO has recently issued guidance for such donations for empirical treatments [11]. WHO recommends that only those EVD patients who have been discharged according to the WHO criteria (i.e. clinically asymptomatic and twice tested negative for *Zaire ebolavirus* by molecular techniques) should be eligible for such donations.

Importation of SoHO to the EU

SoHO should not be imported from EVD-affected countries due to increased risk of infection with Ebola virus.

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