

# Emerging Infectious Disease and Transfusion Medicine: Time to take Action with Proactive Measures

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## Opinion

One of the concerns throughout the history of transfusion medicine has been the transmission of infectious diseases through the transfusion of allogeneic blood. Since the identification of post transfusion hepatitis in the 1940s [1], the AIDS epidemic in the 1980s [2], the discovery of hepatitis C in 1989 and its role in blood donation and transmission of HCV [3], and most recently -between 1980 and 1996 the delivery of the variant of Creutzfeldt-Jakob disease by blood transfusion [4,5], transfusion medicine had to implement stronger and more secure measures in the selection of blood donors and in the diagnosis of Transfusion-transmissible diseases (TTE) in order to avoid post-transfusion transmission of infectious agents, mainly HBV, HCV and VIH.

A new scenario has arisen in recent years with the increase of emerging infectious agents (EIA), being possible by several factors [6,7]:

- i. **Ecological factors:** climate change, droughts and floods, local zoology, etc.
- ii. **Characteristics of the pathogen:** Viruses, protozoan, bacteria, etc.
- iii. **Vector characteristics:** migration, increase, competition between vectors and changes in its behavior, etc.
- iv. **Characteristics of the host:** native population, immune suppression, increase of the susceptible population, etc.
- v. **Human factors affecting the environment:** modification of the local geography, rise in the migratory pressure, changes in the hygienic-alimentary and / or sexual habits and others factors like wars and terrorism.

Emerging pathogens can be defined as new, reemerging, migratory or drug resistant infectious agents whose incidence have increased over the past two decades or threaten to increase in the near future. Climate change and globalization has created favorable conditions to the increased incidence of EAI, with different epidemics in different areas of the planet. Therefore, Europe through the ECDC has listed a range of 11 pathogens with potential

risk to the population and blood support (West Nile virus, Dengue, Leishmaniasis, Chikungunya fever, Malaria, Tick-borne encephalitis, Lyme disease, Crimean-congo hemorrhage fever, Usutu virus fever, Babesiosis and Chagas) [8].

Measures to avoid post-transfusion transmission of infectious agents include the adequate selection of donors based on international or local guidelines [9-11], distinguishing those who are in high risk, as well as the screening and testing of donated blood by serology and molecular biology for the TTE pathogens required by law [10] or in specific circumstances as epidemics. The increase of the TTE tests has augmented the cost of donated blood analysis [12], and it will increase even more in the future to the point of becoming a pressing problem for the different health services. With these strategies, it can take several months or years since the moment the transmission of a disease is known to occur via blood transfusion to the discovery of the causal agent and the development of adequate screening tests, possibly allowing it to spread without control. Therefore, it is necessary to take proactive measures. In fact, in the consensus conference of Toronto in 2007 [13] the emergence and risk of new emerging pathogens was recognized, concluding that this situation could undermine the trust of the safety of the blood supplied and determining the urgent need to take proactive measures, such as inactivation.

Methods of Pathogen Inactivation aim to prevent TTD by means of disruption of his DNA/RNA, making the infectious agent inactive or unable to replicate in the different components obtained from blood donation, avoiding its post-transfusion transmission. To date there are different methods approved to inactivate pathogens [14]:

- i. Plasma: detergent solvent (approved in 1998 for UK, in 2009 for EU, and in 2013 for USA), methylene blue (Theraflex<sup>®</sup>) (2001 in EU), amotosalen plus ultraviolet A (Intercept<sup>®</sup>) (2002 in EU, 2014 in USA) and riboflavin and ultraviolet B (Mirasol<sup>®</sup>) (2008 in EU);
- ii. Platelets: Intercept (2002 in EU, 2014 in USA) and Mirasol (2007 in EU)

iii. Inactivation with Intercept and Mirasol is underway for red blood cells concentrates and whole blood, respectively.

Inactivation has demonstrated its effectiveness for plasma and platelets over the years [14-18], leading to a new stage in transfusion safety. Inactivation may have an impact in terms of cost reduction despite the expensive technology required [19].

## Conclusion

In conclusion, based on the current situation of the EAI and since new epidemics of pathogens are emerging every year, it is imperative that governments establish an effective exchange of information on epidemiological alerts; that they establish protocols for vaccination of the susceptible populations and they need to prevent the EAI in travelers, assessing the risk of a traveler who donates blood with appropriate guidelines for selection of blood donors. In the other hand, it is necessary to implement more proactive measures to avoid the huge amount of analytical tests for the TTE diagnosis, with Pathogen Inactivation showing up as a new paradigm that could become the "solution" to get safer blood.

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