

Is COVID-19 able to be transmitted across the membranes of our oxygenators in the exhaust gases during CPB or ECMO?

A common question over the last few months has been **“Is COVID-19 able to be transmitted across the membranes of our oxygenators in the exhaust gases during CPB or ECMO?”**

To date there has been limited literature to support a categorical position on this topic. Discussion has focussed on the size of the virus and the pore size of different oxygenator materials. In our region polypropylene (PP) membranes are most commonly used for CPB and poly-4-methylpentene (PMP) for ECMO. Each membrane has contrasting characteristics which suggest that under some conditions transmission may occur. Evidence to support this statement is limited.

Attached to this post is an article from ASAIO Journal, published ahead of release, by Squicciarro and colleagues from centres in Italy and the Netherlands which provides a good summary of current knowledge on the 7th May. The article discusses the current evidence for the presence of SARS-CoV-2 (COVID-19) in the blood and the possibility of systemic infection. They also discuss the theoretical implausibility of transmission of the virus across an intact PMP membrane, however highlight that although rare, cases of plasma leakage have been reported and this may provide a pathway for transmission. Plasma leakage or fibre damage, although uncommon has been frequently reported in PP membranes. The authors concluded “We concluded that it is possible for SARS-CoV-2 to cross the membrane and aerosolize through the gas-exit port of the membrane lung. This phenomenon might be dependent on the presence of viral traces in the bloodstream and on the occurrence of fibers damage, which are both considered rare scenarios.” https://journals.lww.com/asaiojournal/Citation/9000/Extracorporeal_oxygenation_and_COVID_19_epidemic_.98524.aspx (accessed 19_05_2020)

In an ELSO webinar held on the 30th March Dr In the recent ELSO webinar on Japans response to COVID-19 held on 30th March Dr. Keibun Liyu of The Prince Charles Hospital and Saiseikai Utsunomiya Hospital presented a paper titled “An assessment of aerosolization via membranous oxygenator and coagulopathy in COVID-19”. The Japanese use the MERA oxygenator, this is an oxygenator that has siloxane coated fibres. They took sputum samples from the patient and also swabbed the gas exhaust. They did not detect the virus in the exhaust, however in the failing oxygenator, one where Plasma leak had started the virus DOES cross the membrane eventually and they confirmed this by positive PCR in samples of oxygenator exhaust plasma leak. The mechanism for this was postulated as being that as the membrane ages, it loses its positive charge and the pore size expands - both are conditions favorable for plasma leak, which contains the virus. They have no data at this time on how long before the virus breaks across the membrane. Dr. Liyu recommended that we should assume condensate from oxygenator exhaust is infected. All oxygenator exhaust should be scavenged through a HEPA filter. The OR Waste anaesthetic gas should suffice.

Getinge published the following information in relation to this topic in their notification to customers “Use of Getinge oxygenators and cardiopulmonary products in COVID-19 /Sars-CoV-2 patients” https://www.getinge.com/dam/hospital/documents/marketing-sales/customer-letters/english/mcp0477_el_qa_covid-19_mcp_products_20200327_us_final-en-us.pdf

The current ANZCP Regulations and Standard 9.4.2 Heart-Lung Machine – Gas Supply system states “8. Provision should exist for scavenging waste anaesthetic gases from the oxygenating device.”

Based upon the limited information available it would appear the **current recommendation for scavenging waste gases from the oxygenator should be adhered to in all clinical settings**. Consideration may be given to the inclusion of a vapour trap in the scavenger line. Similarly, knowledge of hospital filtration systems is important as not all hospitals theatre and ICCU suction will be HEPA filtered and consideration for inclusion of a suitable filter may be necessary.

Response prepared by Rob Baker, Arthur Prevolos