

HYDROGEN PEROXIDE TRANSFER IN MEMBRANE OXYGENATORS: OBSERVATIONAL EVALUATION

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Abstract

In recent years, Non-tuberculosis *Mycobacterium chimaera* have been widely found in Heater Cooler Units (HCUs) used for the operation of the Heart Lung Machine. These bacteria can give rise to patient infections via the aerosolized air in patients undergoing cardiothoracic surgery with an exposed chest cavity in the operating room.

Throughout Europe, infections have been associated and recorded with HCUs (1,2) used during cardiac surgery. The role of the HCU is to regulate temperatures of the blood during bypass by using tap water as a source of heat exchange. In an original study done in Switzerland, microbiological sampling of the air showed *M. chimaera* and water cultures demonstrated it was present in the water reservoirs. In response to this realization, manufacturers of the heater-cooler units have re-established the disinfection protocol. A major aspect of this protocol is the use of hydrogen peroxide and bleach.

The objective of this experimental technique was to test and quantify the diffusion of hydrogen peroxide across plastic heat exchanger membranes of various integrated membrane oxygenators. To assess the permeability of hydrogen peroxide (H₂O₂) across heat exchanger, three oxygenator manufacturers were evaluated: Quadrox-I (MAQUET Cardiovascular, LLC. 45 Barbour Pond Drive Wayne, NJ 07470. United States), Fusion (Medtronic Canada 99 Hereford Street, Brampton, Ontario L6Y 0R3 Canada) LivaNova Inspire 8F (LivaNova PLC 20 Eastbourne Terrace London, W2 6LG United Kingdom) all of which utilize a plastic heat exchanger material; no stainless-steel heat exchangers were evaluated.

Results showed that hydrogen peroxide did in fact diffuse from the water side of the heater/cooler units into the blood side. Maquet Quadrox-i and the LivaNova Inspire 8 were positive while the Medtronic Fusion did not show signs of peroxide diffusion.

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