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Title: ENDOXY – Endothelialization of a gas permeable membrane for the development of a biohybrid lung assist device

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Body: Introduction: Extracorporeal membrane oxygenation's (ECMO) limited hemocompatibility, the activation of the coagulation system and the complement system, plasma leakage and protein deposition hamper mid- to long-term use and have constrained the development of an implantable lung assist device. In a Tissue Engineering approach, lining the blood contact surfaces of an ECMO device with endothelial cells might overcome these limitations. Methods: ENDOXY - a multifunctional oxygenator test device was developed to endothelialize gas permeable membranes and to test the gas transfer through it.

Endothelial cells were preconditioned by applying shear stress in the test-system and monitored via a live cell imaging device. Cell coated membranes were incubated with blood and characterized by immunohistological staining. Results: Cells seeded on gas permeable membranes grew to confluence and showed characteristic endothelial morphology and aligned with shear stress without observable cell detachment. Fixed samples stained positive for endothelial markers. No corpuscular blood constituents resided on the endothelialized surfaces after static or dynamic incubation with blood, suggesting promising hemocompatibility. Conclusion: The development and initial application of the ENDOXY system is a first step toward the development of a biohybrid lung assist device.