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Introduction:

Systemic inflammation and endotoxemia drive organ dysfunction in critical illness. Hemoperfusion devices are used to reduce circulating inflammatory mediators. We hypothesized that commonly used adsorbers differ markedly in their ability to remove inflammatory cytokines and endotoxin from human whole blood.

Methods:

Three adsorbers with different marketed claims were tested: CytoSorb300 and Jafron HA380 (cytokine removal) and Efferon LPS (cytokine + endotoxin removal). Fresh heparinized whole blood was spiked with LPS (10 EU/mL) and incubated for 6 h at 37 °C to induce inflammation; IL-10 and PCT were added exogenously. Batch experiments (n=6) ran for 2 h with an adsorber-to-blood ratio of 1:10, dynamic experiments for 6 h in a miniaturized extracorporeal circuit. Pre- and post-treatment levels of IL-6, IL-1 β , IL-10, IL-18, TNF- α , PCT and LPS were measured using multiplex ELISA and an adapted limulus amoebocyte lysate assay [1].

Results:

None of the devices removed endotoxin. All systems reduced PCT. CytoSorb300 achieved the strongest cytokine reduction across IL-6, IL-10, TNF- α , IL-18 and IL-1 β . Jafron HA380 showed only modest cytokine decreases. In contrast, the Efferon LPS adsorber, despite being marketed for LPS and cytokine removal, caused a marked increase in IL-1 β and IL-18 in both models – indicative of NLRP3 inflammasome activation – and failed to remove endotoxin.

Conclusion:

In our in-vitro whole blood setup, CytoSorb300 showed the most effective reduction of inflammatory mediators, Jafron HA380 demonstrated limited efficacy, and the Efferon LPS cartridge removed neither cytokines nor endotoxin while increasing inflammasome-related cytokines. These findings reveal substantial performance differences between hemoperfusion systems and support the need for rigorous preclinical testing prior to clinical application.

References:

1. Harm S et al. Sci Rep. 14(1):2410.

Image :

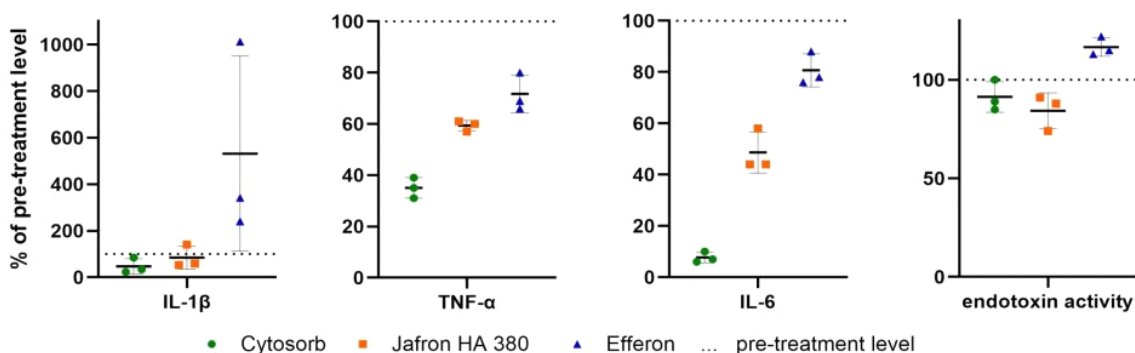


Fig. 1: Blood levels of IL-1 β , TNF- α , IL-6 and endotoxin activity after 6-hour hemoperfusion in the dynamic extracorporeal circuit.

Blood levels of IL-1 β , TNF- α , IL-6 and endotoxin activity after 6-hour hemoperfusion in the dynamic extracorporeal

circuit