From the Editor

This issue of the *Journal of ExtraCorporeal Technology* contains four original articles, two technical papers, one case report, and three review articles. The review articles focus on the physiology/pathophysiology of perfusion, specifically cerebral perfusion, and a functional structure of the microcirculation. The focus on the physiology/pathophysiology represents an important perspective of what happens at the tissue level ultimately determines patient outcome. In my opinion, this perspective has always been present and the questions have been asked before. What has, and is changing, is the ability to better monitor what happens at the tissue level. Although the tools required to continuously monitor at the tissue or local level are still not available, there are now tools that allow continuous monitoring at the regional level, an improvement from global monitoring. Continuous monitoring allows one to observe the consequences of systemic interventions at the regional level and more specifically, gain insight into the systemic interventions required to maintain the function of the tissue being monitored. A second point associated with the circulation is related to the concept of hemodynamic coherence, which is the coupling between macrocirculation and microcirculation (1). The loss of hemodynamic coherence has been associated with the adverse outcomes that occur in critically ill patients, including patients exposed to cardiopulmonary bypass (2,3). The importance of maintaining coherence between the macro- and microcirculation puts a spotlight on the necessity to continuously monitor tissue responses vs. systemic hemodynamic responses to improve outcomes (1,4).

The review by Vranken provides a comprehensive overview of cerebral oximetry and cerebral autoregulation during cardiopulmonary bypass (CPB) (5). Cerebral oximetry is used to detect alterations in cerebral tissue saturation during different clinical states, such as CPB. One take-home point for me from this review was the large variability in the relationship between cerebral perfusion levels and neurological outcomes of the patient. Further research and refinement of the technology will be required to fully visualize this relationship and to determine the types of interventions under different conditions that will optimize outcomes. Another topic covered in the review was the role of cerebral autoregulation in maintaining cerebral perfusion. Cerebral autoregulation ensures that cerebral blood flow will be maintained at the expense of other tissues or organs, such as the kidney or the gut. In essence, this means that monitoring the perfusion of just one organ (the brain) may be insufficient to achieve optimal perfusion in all organs (6). Expanding monitoring to include both cerebral and renal perfusion may help to unravel further the impact of CPB on both neurological and renal injury.

The other two reviews focus on the glycocalyx, a component of the endothelium essential to the function of the endothelium, especially within the microvasculature (7,8). Both reviews demonstrate how CPB influences the structure and function of the glycocalyx, which in turn, influences the microcirculation and ultimately patient outcomes. Similar to cerebral perfusion monitoring, the relationships between changes in the glycocalyx during CPB and clinical outcomes are still being determined, so more research is required. But, interest in the glycocalyx as a therapeutic target is growing in all areas of medicine. What is apparent from the research of the glycocalyx is the recognition that achieving a better understanding of how CPB alters the microcirculation will be at the epicenter of future improvements in the conduct of perfusion. Step one is awareness which is achieved through these two review articles. I hope you enjoy a look into your future provided by these two reviews.

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**REFERENCES**

2. Koning NJ, Atasever B, Vonk AB, et al. Changes in microcirculatory perfusion and oxygenation during cardiac surgery with or without


