12-14-2023

Extracorporeal Pathogen Removal: A New Anti-Microbial Strategy to Combat Sepsis

Troy Mohamed

Emily Terrebonne

Susan Kartiko

Extracorporeal Pathogen Removal: A New Anti-Microbial Strategy to Combat Sepsis

Troy Mohamed, Emily Terrebonne & Susan Kartiko, MD, PhD, FACS

12/14/2023

Sepsis is a common presentation in both the emergency department (ED) and intensive care unit (ICU). Most commonly, sepsis is caused by a variety of severe infections imposing life-threatening and widespread autonomic dysfunction, resulting in a lack of perfusion to end-organs. According to some reports, sepsis mortality ranges between 20% and 50% and represents as much as 10% of all ICU admissions.

Current guidelines include recommendations for broad-spectrum antibiotics. However, the use of broad-spectrum antibiotics has a significant drawback: the promotion of antibiotic resistance among pathogens. According to a 2019 report released by *The Lancet*, in the US alone, nearly 3 million antimicrobial-resistant infections occur each year, resulting in over 35,000 deaths. From an economic standpoint, the estimated cost to combat multi-drug-resistant strains in healthcare is $5 billion annually. Additionally, high doses of empiric antibiotics may also cause drug toxicity in an already frail body. As a result, there is a need to develop new antimicrobial solutions for the treatment of patients with sepsis.

Prior attempts at advancing new non-antibiotic, anti-microbial therapies to treat sepsis, such as activated protein C and cytokine cascade interrupters, have failed. More recently, technological breakthroughs have paved the way for a new anti-microbial solution: extracorporeal pathogen removal. Extracorporeal pathogen removal effectively eliminates the problem of antibiotic resistance by physically removing the pathogen from the circulatory system. Like Extracorporeal Membrane Oxygenation (ECMO), blood is removed from the body and filtered, then returned to the body. Sepsis is frequently marked by an overwhelming burden

of pathogens and toxins leading to a dysregulated host response. With the use of extracorporeal pathogen removal, a filter also known as a "hemadsorber" is used to filter out such pathogenic molecules, leading to blood purification, decreased bacterial load, and hopefully, a faster recovery with lower morbidity.

One option is California-based ExThera Medical's Seraph 100. Researchers at ExThera have found that by changing the filter coating, removal devices can target bacteria, fungi, or even viruses and tumor cells. Correspondingly, in light of the COVID-19 pandemic, the Seraph 100 recently became the first and only extracorporeal pathogen removal device for COVID-19 and was tested in multiple studies. This device has now received certification for the Medical Device Single Audit Program and Recertification for the International Organization for Standardization for Medical Devices. According to Sallie Coviello, Head of Quality and COO at ExThera Medical, this is "an important milestone in our global development strategy," and that "with these approvals, ExThera is well-positioned to move forward with its plan toward global commercialization."

Innovation is critical to our pursuit of improving sepsis care, and the prospect of extracorporeal pathogen removal devices may be an important step in this global effort.

The authors have no conflicts to report.