MECS Dialyzer

Kay Altman, David Browning, Michael Baker
Home Dialysis Plus
Portland, OR

Kidney dialysis has been used to treat chronic kidney failure since the 1960s. As our population ages, more patients will need to use long-standing hemodialysis. The current clinical model for hemodialysis uses hollow-fiber tube dialyzers and is a 20-year old technology. Research continues to improve flow efficiency, but the maldistribution inherent to this dialyzer limits improvement. Successful development of our dialyzer will dramatically change hemodialysis. Improved access and convenience will significantly alter treatment for end-stage renal disease.

The objective of our research is to develop a dialyzer that improves the efficiency of mass transfer across a dialysis membrane using microchannel separation devices. These devices have been shown to be highly efficient in mass flow and chemical reactors but have not been applied to dialyzers. Unlike conventional dialyzers, our design will maintain microscale dimensions evenly on both sides of the membrane. Microchannel geometry and microlamination allow for accurately engineered flow on both sides of the dialyzer membrane. Research demonstrates that microscale devices can radically reduce the contact time, which improves the efficiency of the dialyzer required for mass transfer in separation devices.

Nanotechnology has tremendous potential to improve therapies in medicine. Our microscale technology is setting the platform for nanotechnology in dialysis therapies, allowing miniaturization of the dialyzer and improvement of the dialysate delivery system. This will enhance the portability of the dialysis machine and set the stage for wearable and implantable devices that promote longer, slower therapies more convenient to the patient.