Researchers design model for automated, wearable artificial kidney

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Two researchers from UCLA and the Veterans Affairs Greater Los Angeles Healthcare System have developed a design for an automated, wearable artificial kidney, or AWAK, that avoids the complications patients often suffer with traditional dialysis.

The design for the peritoneal-based artificial kidney — which is "bloodless" and reduces or even eliminates protein loss and other dialysis-related problems — is summarized in an article published in the current issue of the journal *Clinical and Experimental Nephrology,* available online at http://dx.doi.org/10.1007/s10157-008-0050-9.

UCLA–VA has also signed an exclusive licensing agreement with the Singapore-based company AWAK Technologies Pte. Ltd. to develop a commercial wearable kidney based on the design by Martin Roberts, an assistant professor of clinical medicine at the David Geffen School of Medicine at UCLA and a dialysis consultant with the VA Healthcare System, and David B.N. Lee, a professor of medicine at the Geffen School and a consultant nephrologist at the VA.

Around 1980, an artificial kidney machine was built that incorporated many of the principles on which the new technology relies, according to Roberts. But that machine, while portable, was not wearable. The new technology would allow patients to go about their regular business while undergoing dialysis.

"What's really new about it is the patient's freedom," Roberts said. "To

me, as the inventor, the most important thing for the patients is their freedom. The next important thing is that because it's working all the time instead of intermittently, you can do a much better job of treating the patient. So we expect the patient to feel better and live longer."

Kidneys remove metabolic wastes from the body and regulate fluid volume and distribution on a continuous, around-the-clock basis. With traditional hemodialysis, patients are hooked up to a machine for four hours, three times a week. Their blood is filtered through the machine to remove toxins and is then pumped back into the body. What hemodialysis can't do, however, is provide cleansing and fluid balance on a continuous basis; therefore, toxin levels and fluid volume tend to fluctuate, causing "shocks" to the patient's system. The same is true of standard peritoneal-based dialysis.

In addition, hemodialysis uses anticoagulants to prevent the blood circulating outside the body from clotting. But this, too, can cause complications. Work on other wearable kidneys has been based on this hemodialysis or hemofiltration model.

The AWAK, on the other hand, would function continuously, as natural kidneys do, eliminating patient "shocks." And because it does not involve blood circulation outside the body, it is "bloodless." It also regenerates and reuses fluid and protein components in the spent dialysate — the fluid that has abstracted toxins from the patient's blood and which is discarded in current practice — making it waterless and minimizing or eliminating protein loss.

"Dialysis-on-the-go, made possible by AWAK's 'wearability' and automation, frees end-stage renal failure patients from the servitude that is demanded by the current dialytic regimentations," Roberts and Lee write in the journal article.

Source: University of California - Los Angeles