

Treating Kidney Failure: Dialysis

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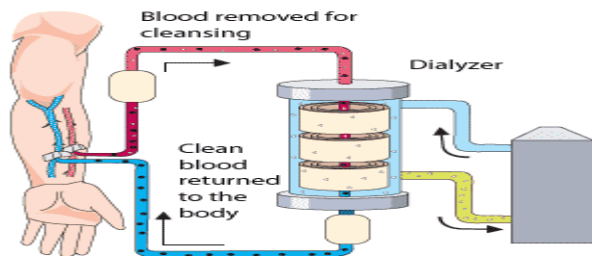
Abstract— Kidney failure, also called End Stage Renal Disease (ESRD) is a problem that affects hundreds of thousands of people in the United States alone. The three major ways of treating Kidney Failure are hemodialysis, peritoneal dialysis, and kidney transplant. All three have problems. A Wearable Artificial Kidney is being created.

I. INTRODUCTION

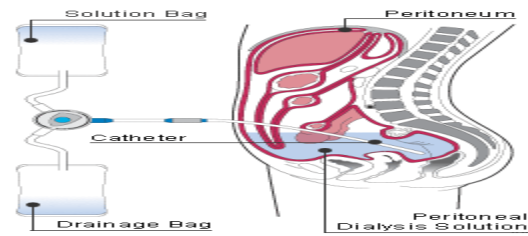
KIDNEYS are a major organ in the human body. They play a major part in both the Endocrine, and Renal/Urinary systems. The kidneys produce three hormones which are calcitriol, erythropoietin, and renin. The kidneys also help in eliminating wastes from the body, regulating blood volume and pressure, controlling levels of electrolytes and metabolites, and regulating blood pH. The kidney's fail most often due to diabetes and high blood pressure, but can also be caused by a plethora of other health issues. According to the Center for Disease Control and Prevention, Chronic Kidney Disease (CKD), which leads to Kidney Failure, may affect more than 10% of adults in the United States, which is over 20 million people.

II. METHODS

The three major ways of treating Kidney Failure that are presently commercially available are hemodialysis, peritoneal dialysis, and kidney transplant. Hemodialysis is the most common way that kidney failure is treated. It works through a complex process in which blood is pumped through a dialyzer, which in short, is a pressurized filter that takes in the patient's blood and cleans it with the help of a liquid dialysis solution. The clean blood, removed of waste and some is then pumped back in to the patient. Hemodialysis has to be done in 4 hour periods 3 days a week, and most often is done in a hospital or a separate dialysis clinic.



Peritoneal dialysis is another method that is used to treat kidney failure. Peritoneal dialysis works by running a glucose solution and the peritoneal membrane to filter. Diffusion and osmosis lead to the excess liquid, and waste being removed. The new liquid containing the waste is then pumped out of the body. Peritoneal dialysis needs to occur 4 to 5 times daily.



The third major way of treating kidney failure is a kidney transplant which is a surgery, and isn't a biomedical engineering topic. However, right now it is needed, and wanted from many people suffering from kidney failure because it eliminates the need for dialysis.

III. DISCUSSION

Dialysis treatments are amongst the most common procedures done in hospitals. They are miraculous advancements in the field of biomedical engineering that can keep people with kidney failure alive for up to 30 years. However, dialysis does have its disadvantages. Dialysis is very expensive, has an average life expectancy for patients using it of 5 to 10 years, and takes a lot of time out of patients' lives over the course of their entire life if they do not get a kidney transplant. Also, dialysis can be very uncomfortable for many people, have different side effects, and require a special diet depending on the type of dialysis.

The near future for people with kidney failure can be found in the wearable artificial kidney. It is currently being developed and works similarly to Hemodialysis. The wearable artificial kidney is now in human trials. This device still has problems though, and the ultimate goal is either a cure to kidney failure, or a tissue-engineered kidney which is currently being researched but still remains in the distant future.

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