Dialysers

- Dialysis machines are artificial kidney that perform most, but not all, kidney function for patients who have permanent or temporary renal failure
- The machine use HEMODIALYSIS to cleanse the blood and balance its constituents.

In HEMO DIALYSIS, blood is removing from the body and filtered through a manmade membrane called a dialyzer or artificial kidney and then the filtered blood is returned on the body. The average person has about 10 to 12 pints of blood during dialysis only one pint (about two cups) is outside of the body at a time High clearance of small and medium MW

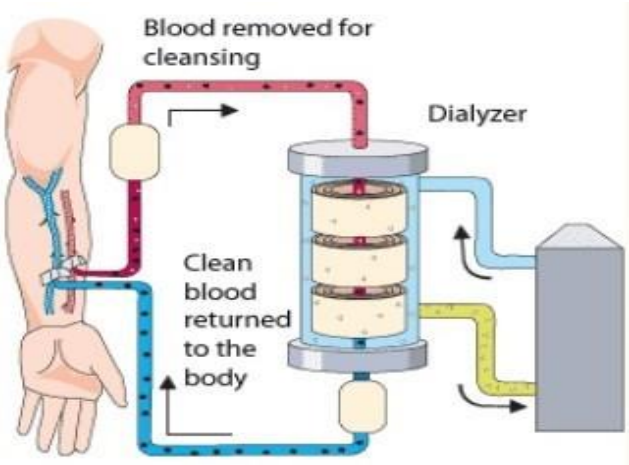
- Properly functioning kidneys prevent extra water, waste, and other impurities from accumulating in your body. They also help control blood pressure and regulate the levels of chemical elements in the blood. These elements may include sodium and potassium. Your kidneys even activate a form of **vitamin D** that improves the absorption of calcium.
- When your kidneys can't perform these functions due to disease or injury, dialysis can help keep the body running as normally as possible. Without dialysis, salts and other waste products will accumulate in the blood, poison the body, and damage other organs.

A dialyzer is composed of a dialysis membrane and supporting structure three or four components. Blood compartment.

- Dialysate compartment.
- Semi permeable membrane separating
- Membrane support structure.

Working

- Dialysis work on the principle of the diffusion of solutes and ultra-filtration of fluid across a Semi Permeable Membrane.
- The dialysis machine mixes and monitors the Dialysate. Dialysate is the fluid that helps remove the unwanted waste products from your blood.
- It also helps get your electrolytes and minerals to their proper levels in your body.
- The machine also monitors the flow of your blood while it outside of your body.



Dialyzer Membrane Cellulose

Obtained from processed cotton (regenerated cellulose, cuprammonium cellulose, cuprammonium rayon and saponified cellulose) Substituted cellulose:

- Cellulose polymer has a large number of free hydroxyl group at its surface

- Free hydroxyl group are responsible for blood cell activation causing bio-incompatibility of the dialyzer (cellulose acetate, cellulose diacetate, triacetate)

Dialyzer Membrane Cellulosynthetic

A synthetic material (a tertiary amino compound) is added to liquefied cellulose during formation of the membrane as result the surface of the membrane is altered and biocompatibility is increased (cellosyn or hemphan) Synthetics:

- Not cellulose based but are synthetic plastics and materials used include polyacrylonitrile (PAN) polysulfone, polycarbonate, polyamide and polymethyl-methacrylate (PMMA).

- The dialyzer, or filter, has two parts, one for your blood and one for a washing fluid called dialysate. A thin membrane separates these two parts. Blood cells, protein and other important things remain in your blood because they are too big to pass through the membrane. Smaller waste products in the blood, such as urea, creatinine, potassium and extra fluid pass through the membrane and are washed away.

Dialyzer Types

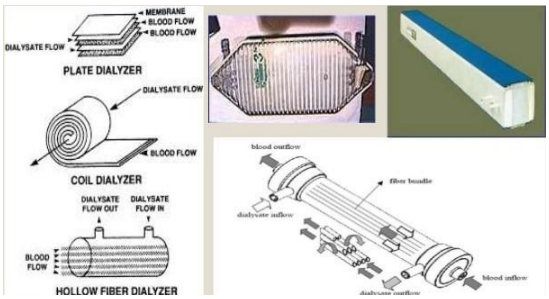
COIL DIALYZER:

- Flattened cellulose tubing wrapped as a coil and through which patients' blood flow during dialysis.
- The blood channels were long to obtain the needed surface area, and resistance was high
- UF was unpredictable and blood leak were frequent.

PARALLEL PLATE DIALYZER

Sheets of membrane are placed between supporting plates.

The plates have ridges and grooves to support the membrane and allow flow of dialysate along it Resistance to blood flow is low. The surface area varies from 0.25 to 1.5 msq.



Advantage:

- Blood volume is about 50-100 ml at 100 mmHg increase with high TMP
- Heparin requirement usually low, minimal clotting in the blood compartment
- Ultrafiltration is reasonably predictable and controllable

Disadvantage:

- Formation of local thrombi around inlet and outlet ports and corners
- May lead to bacterial growth and endotoxin formation therefore plates are not often reused

HOLLOW FIBER DIALYZER

Numerous hollow fiber

Hollow fiber are tiny its diameter 150-250um

Number of fiber20000 or more, depending upon length, kind of membrane and surface area of dialyzer **Advantage:**

- Low blood volume 60-90ml
- Resistance to blood flow is low
- Ultrafiltration can be precisely controlled
- Well adapted to reuse

Disadvantage:

- Deaeration of fiber predialysis is necessary to prevent air lock of the fibers

- More heparin is required for most of the patients

REACTION TO MEMBRANES

Type A reaction

- Within minutes of starting dialysis with
- Dyspnoea, wheeze
- A feeling of warmth, urticaria
- Cough, hypotension
- Collapse or cardiac arrest

Type B reaction

- More common but much milder often occur 20-40 min after starting dialysis
- Usually cause back and chest pain

Advantages

- Easy to cleaning and disinfecting
- The device has flow rate of blood UPTO 600 ml/min .
- Fluid exchanges batteries because to provide uninterruptable power supply

You need dialysis if your kidneys no longer remove enough wastes and fluid from your blood to keep you healthy. This usually happens when you have only 10 to 15 percent of your kidney function left. You may have symptoms such as nausea, vomiting, swelling and fatigue. However, even if you don't have these symptoms yet, you can still have a high level of wastes in your blood that may be toxic to your body. Your doctor is the best person to tell you when you should start dialysis.