Elimination methods

Definition

Elimination methods are used to remove damaging endogenous and exogenous molecules from the body.

plasmapheresis

therapeutic apheresis

renal replacement therapy

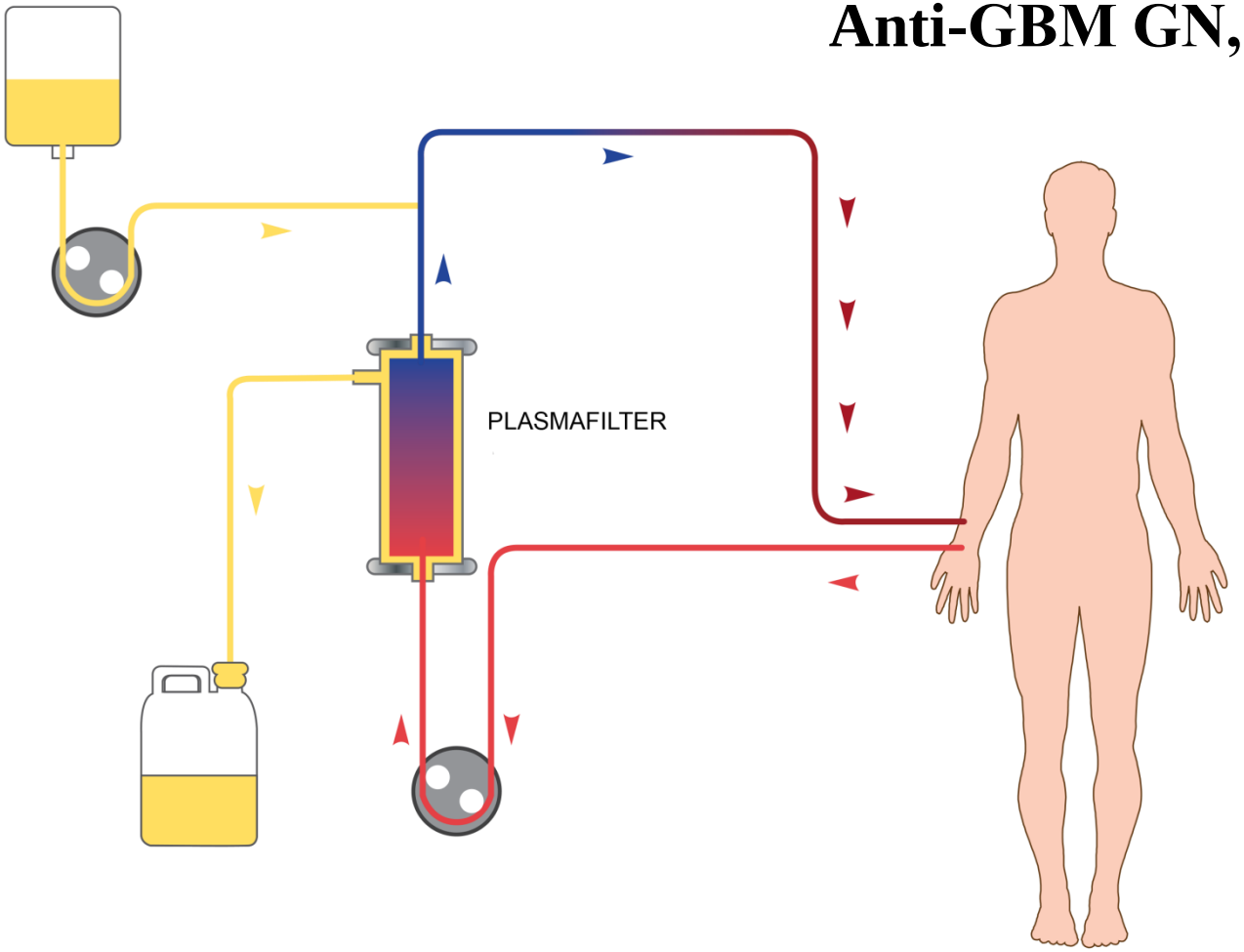
immunoadsorption

Endotoxin- adsorption

Plasmapheresis

Indication:

Polyradiculoneuropathy
Myasthenia gravis
Cryoglobuminemia
Anti-GBM GN,…….

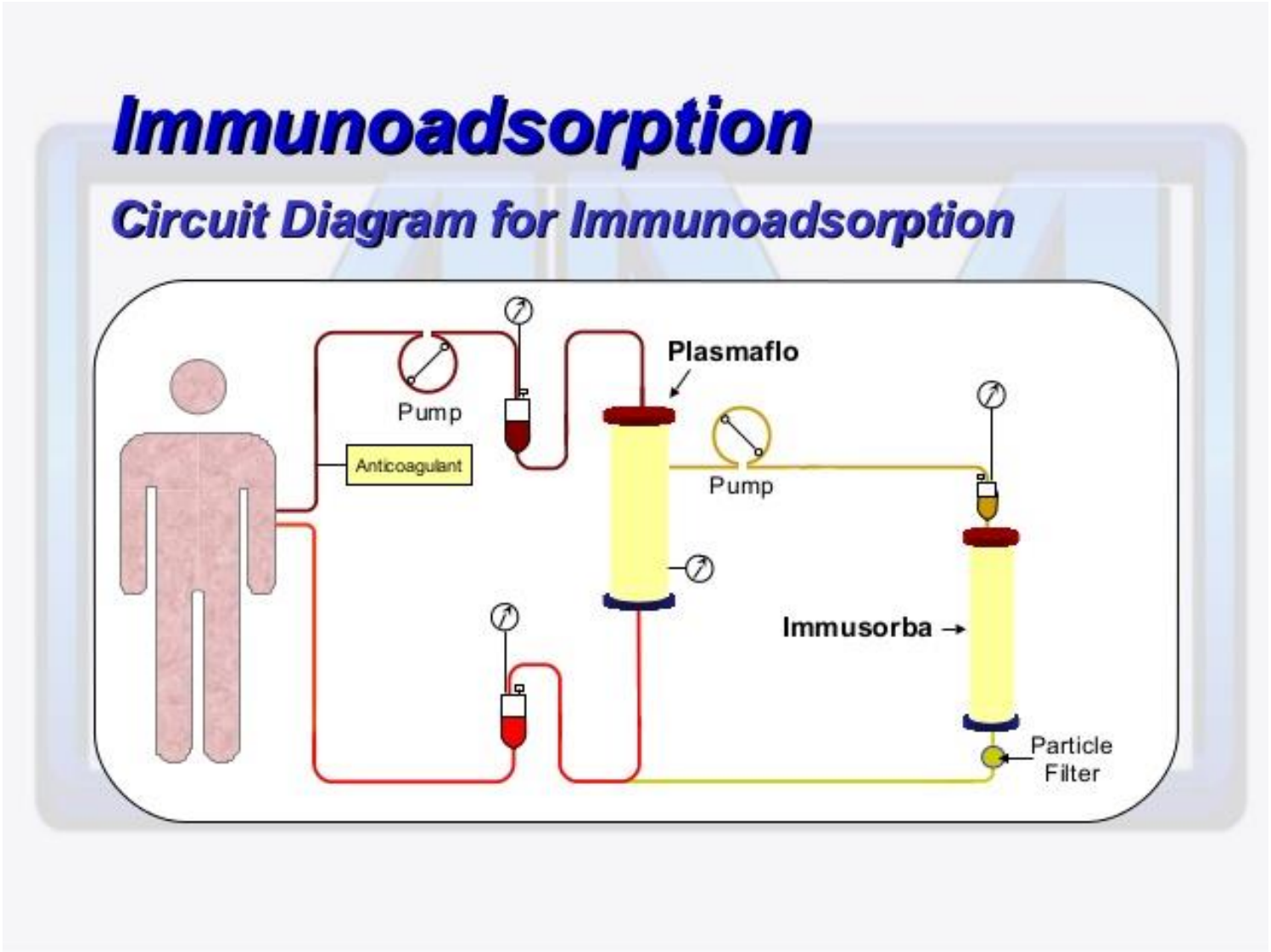


Indication

Preatreatmnet before ABO-incompatible kidney transplantation

Treatment of antibody-mediated allograft rejection

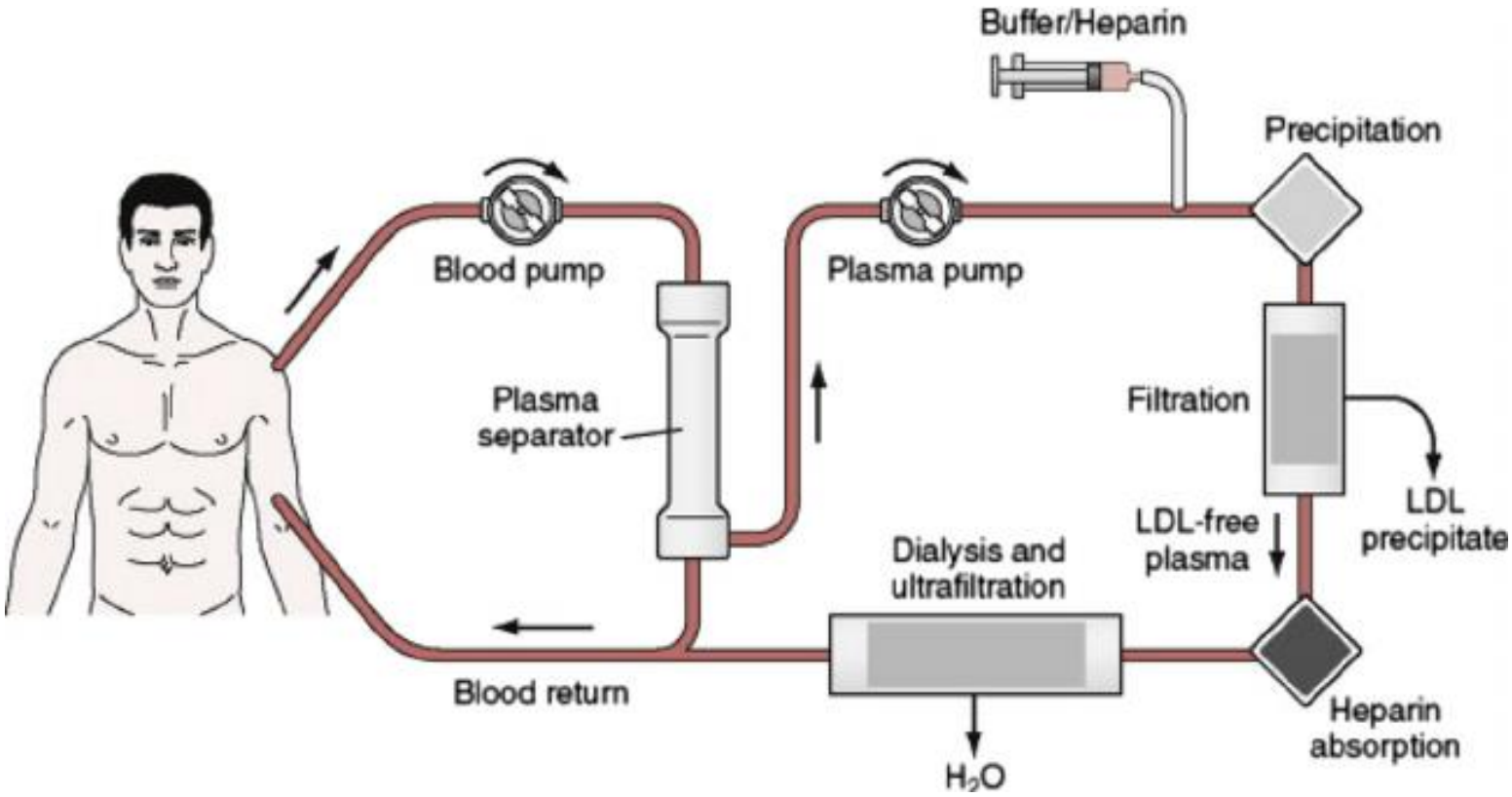
Treatment of highly sensitized kidney transplant recipient



Therapeutic apheresis

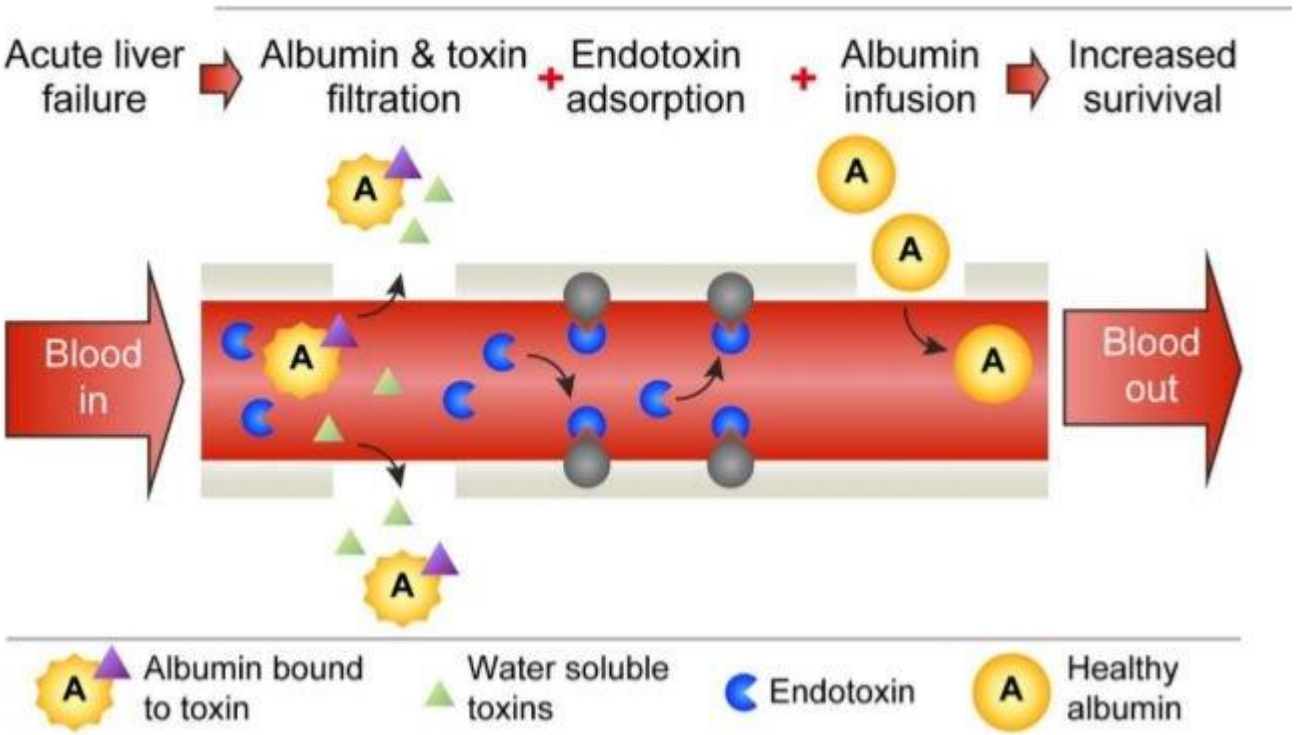
lipid -apheresis, rheopheresis

<u>Indication</u>
Familial hyperlipidemia



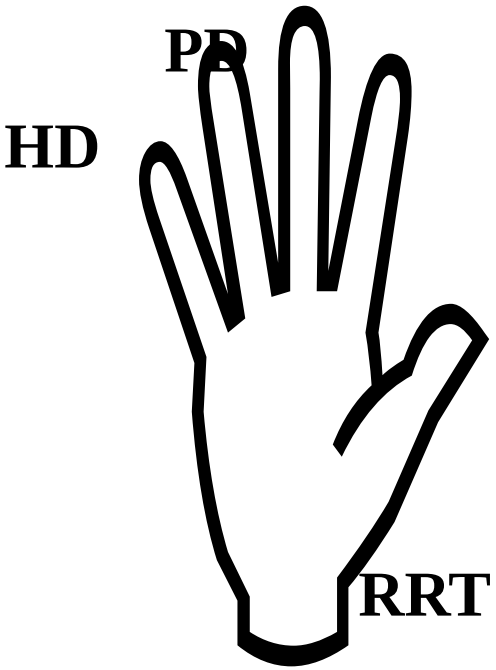
Endotoxin- adsorption

liver support system in which albumin-bound substances are directly removed from blood by special adsorber. In a simultaneous step, high-flux hemodialysis is performed



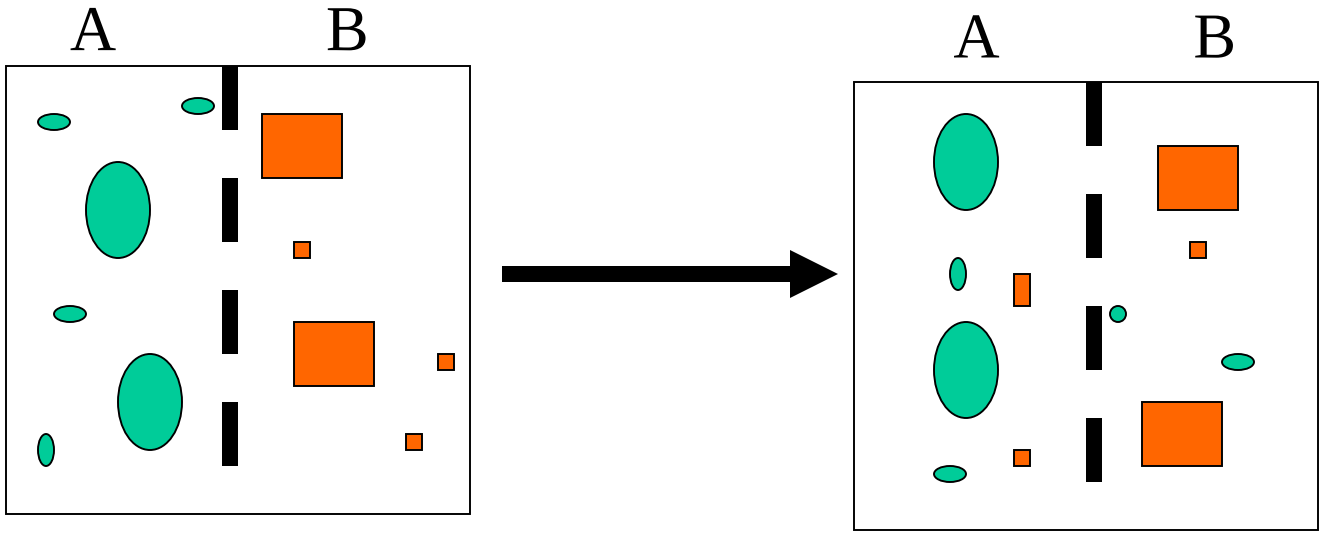
Renal replacement therapy

RRT (Renal Replacement Therapy)



Hemodialysis

Diffusion

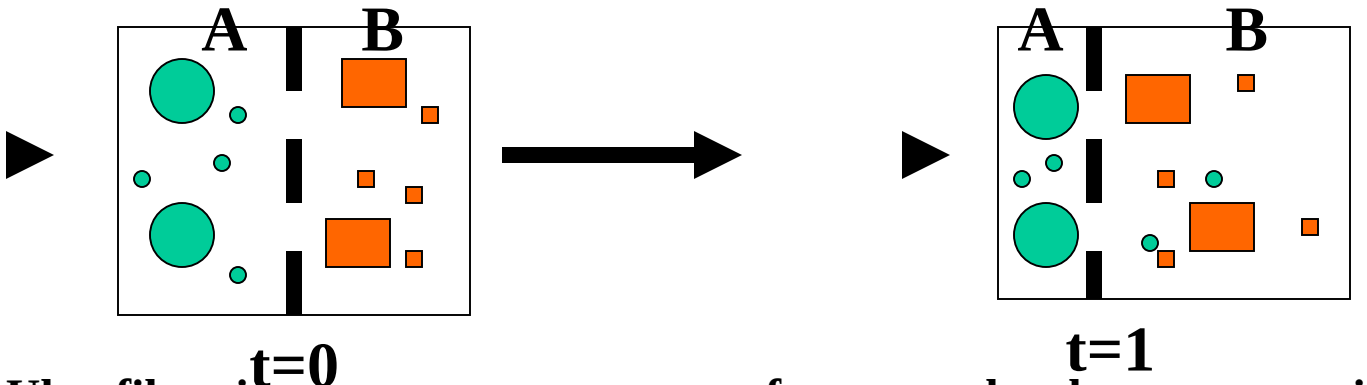


Factors affecting diffusion :

1) Concentration gradient
2) Molecular weight
3) Membrane resistance (membrane thickness, number of pores)

Hemodialysis

<u>Ultrafiltration</u> (convective transport)

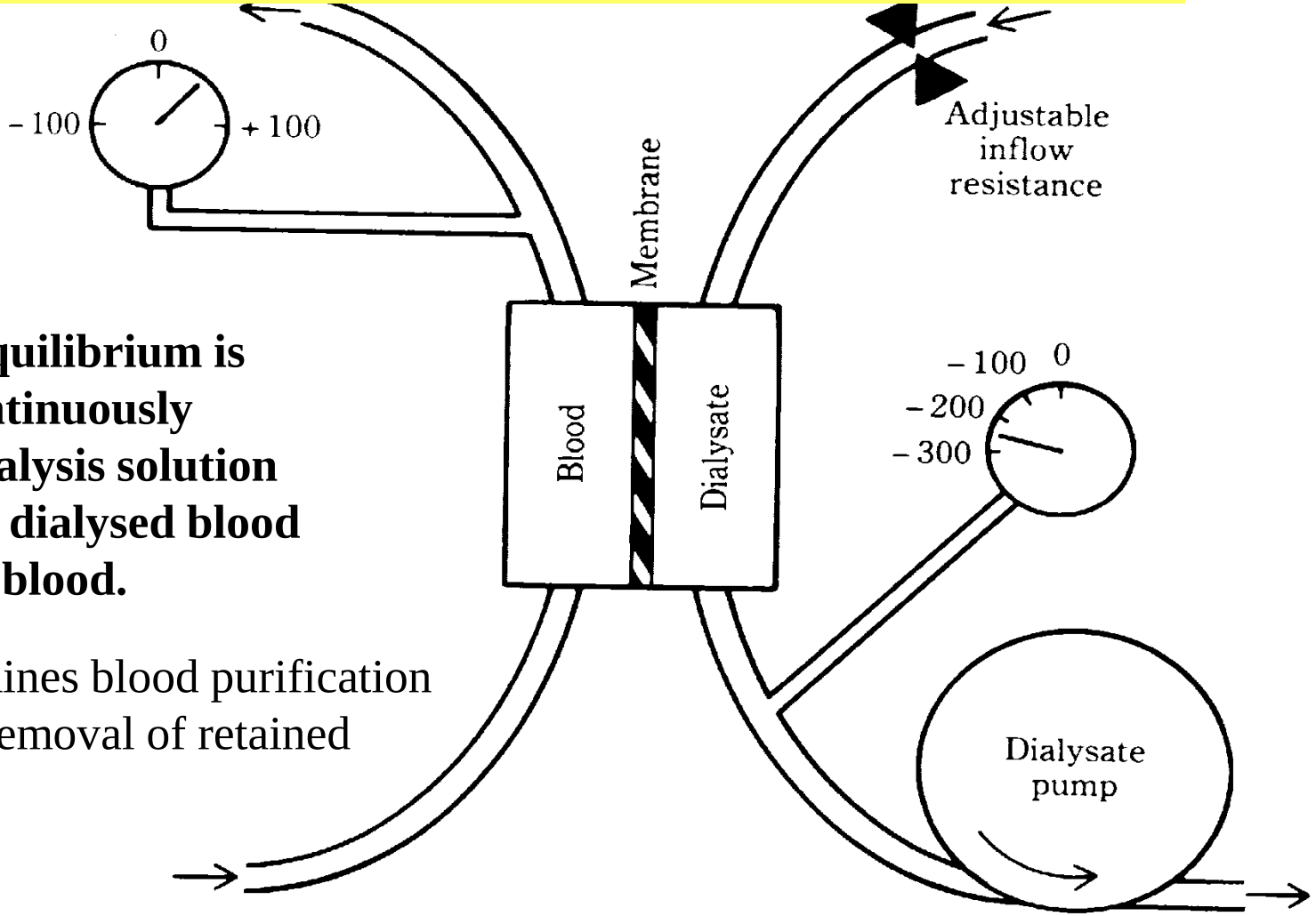


Ultrafiltration represents transport of water molecules across semipermeable membrane. Ultrafiltration occurs when water (accomppanied by solvent molecules) is pushed trough the membrane by hydrostatic force.

Factors affecting hydrostatic ultrafiltration:

1) Transmembrane pressure (hydrostatic pressure gradient)
2) Ultrafiltration coefficient -KUf (ml/hour/mmHg) –membrane thickness, pore size

Clinical application of diffusion and ultrafiltration (HD circuit)

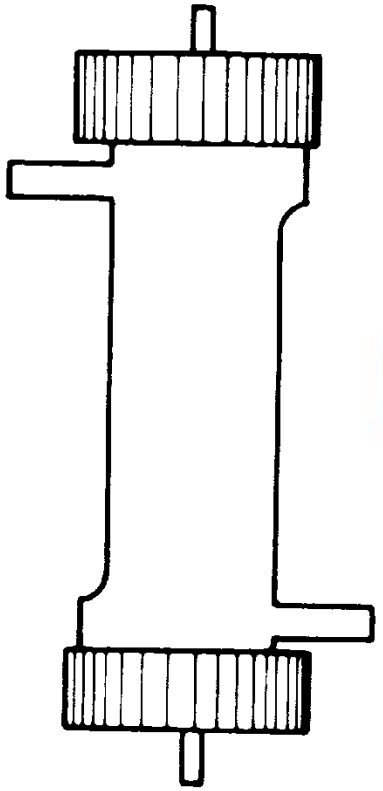


Concentration equilibrium is prevented by continuously refilling fresh dialysis solution and by replacing dialysed blood with undialysed blood.

Diffusion: determines blood purification
UF: determines removal of retained water and salt

Countercurrent flow maximize concentration gradient of waste product betwen blood and dialysate

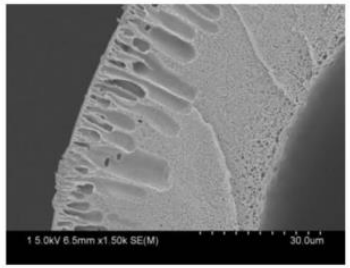
Capillary dialyser



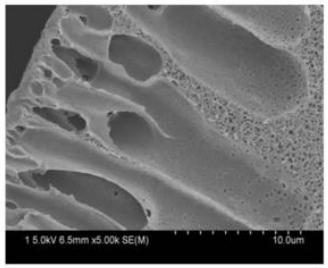
Surface of all capillaries 0.8-2 m^2

Hollow-fiber dialyzer

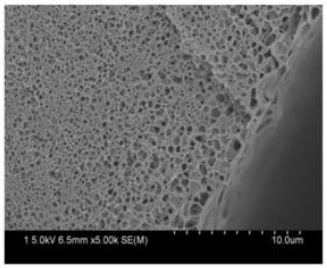
F24-a



Cross section (1500×)

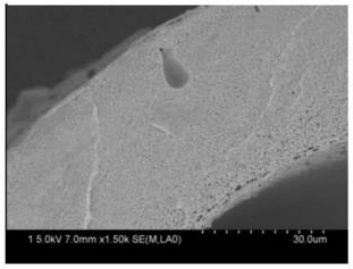


External cross section (5000×)

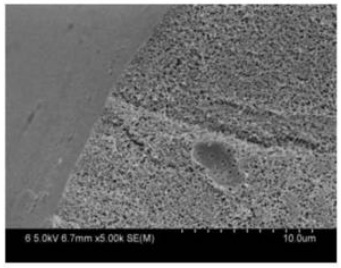


Internal cross section (5000×)

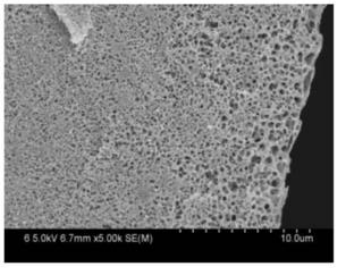
F24-b



Cross section (1500×)

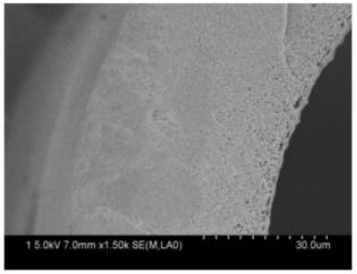


External cross section (5000×)

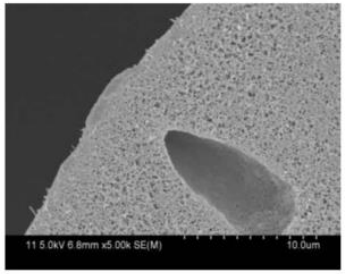


Internal cross section (5000×)

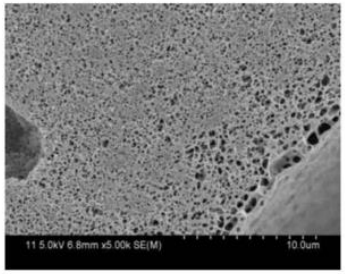
F24-c



Cross section (1500 ×)



External cross section (5000×)



Internal cross section (5000×)

Membrane material:

<u>synthetic material</u>: polysulfon polycarobonate polyamid

<u>Guarantee of biocompatibility:</u> much lesser extent of complement activation

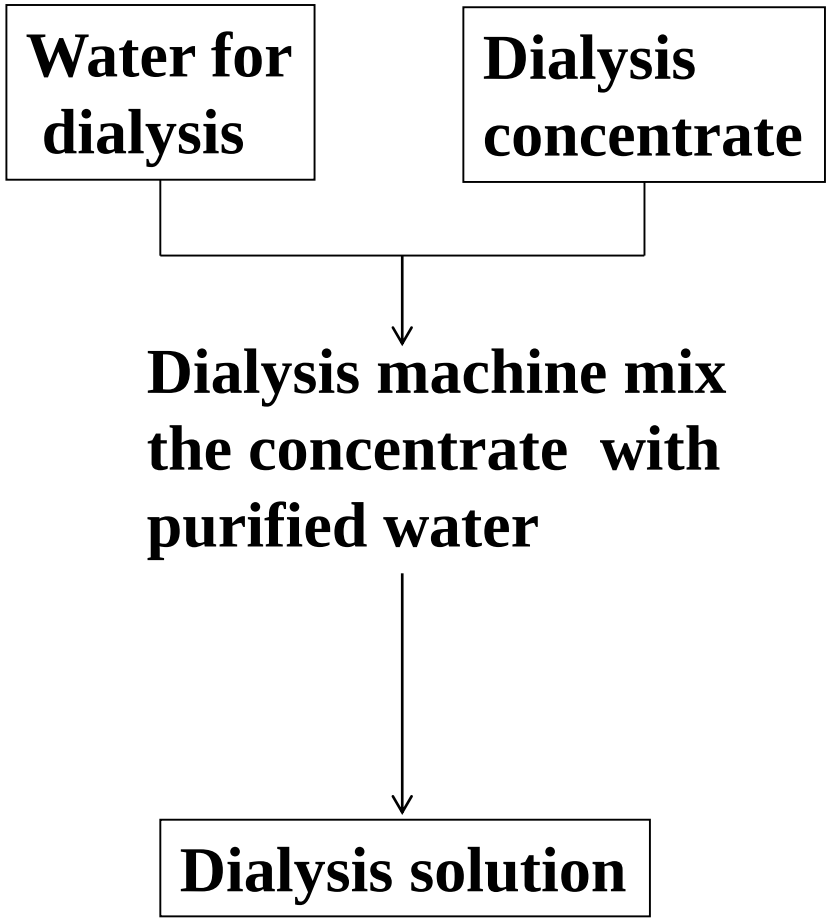
<u>Sterility</u>

Sterilization by gamma irradiation (or steam)

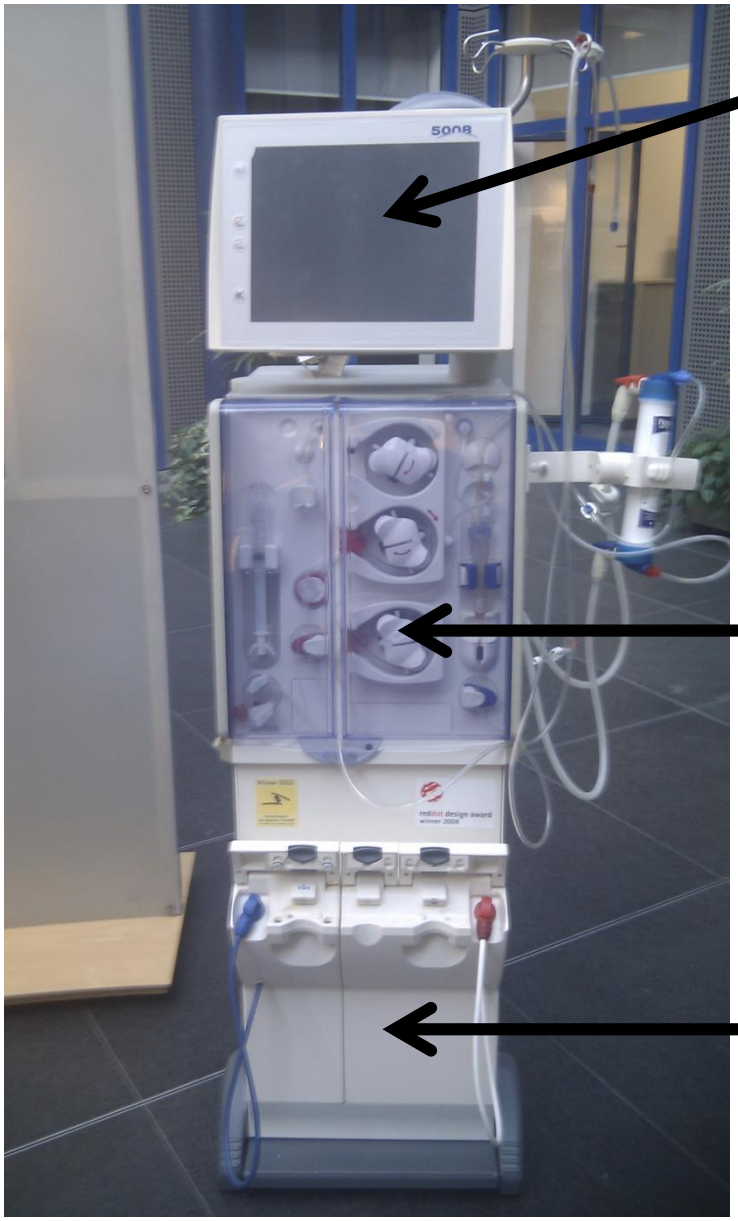
Dialysis solution

Bicarbonat dialysis solution

Component	Mmol/L
Sodium	135-145
Potassium	0-4.0
Calcium	2.5-3.5
Magnesium	0.5-1.0
Chloride	100-124
Bicarbonate	30-38
Dextrose	11
PCO2 (mmHg)	40-100
pH	7.1-7.3



Dialysis machine



Monitoring devices and

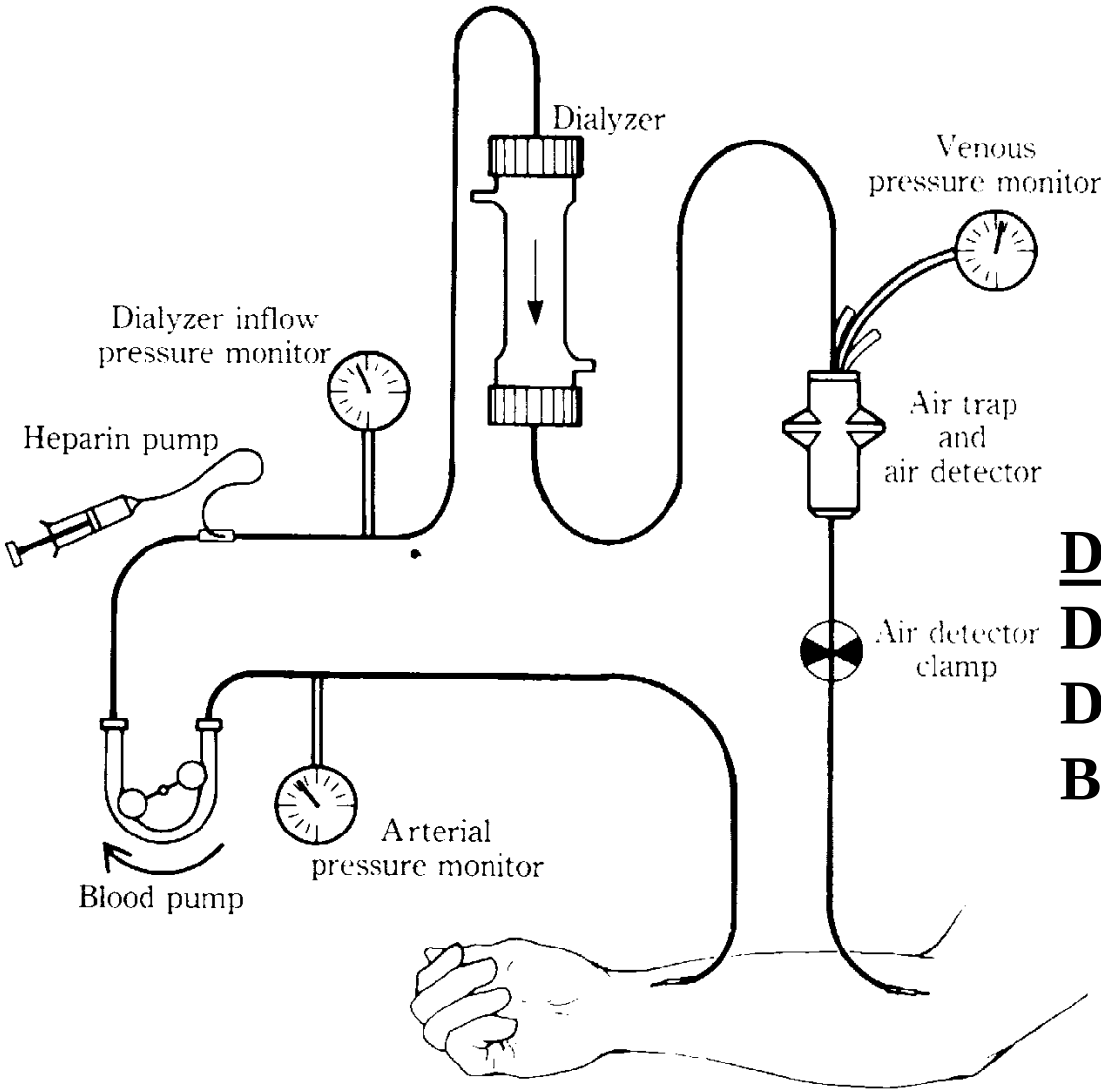
Settings of

Blood flow rate (250-300 mL/min)
Dialysis fluid flow rate (500 mL/min)
Ultrafiltration rate
Temperature of dialysis fluid
Conductivity (Na^+ concentration)
$HCO3^-$ concentration

Blood pump

Mixing
Heating (34-39°C)
Degasing
modul

Monitoring devices



<u>Blood circuit</u>

Pressure monitors

Venous air detector

<u>Dialysis solution circuit</u>

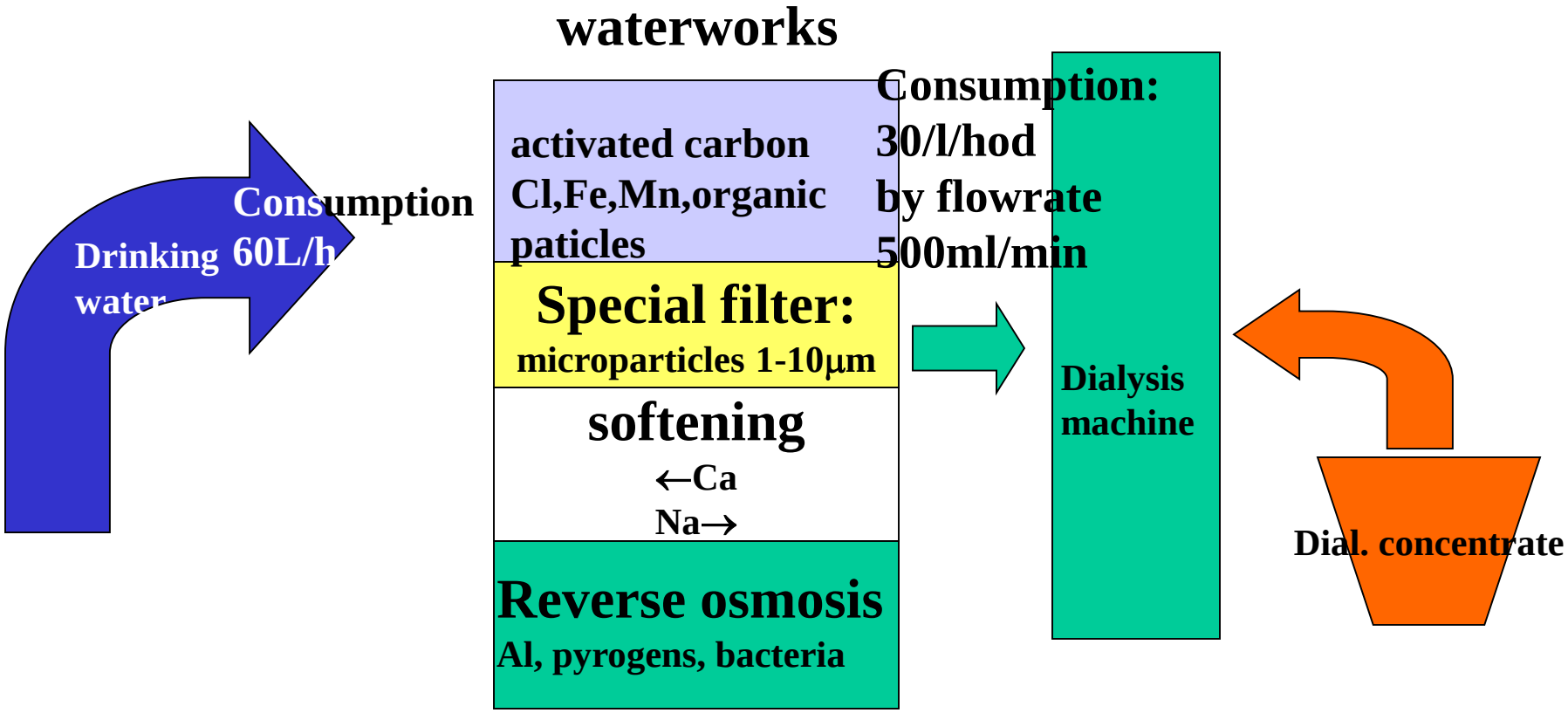
Dialysis solution conductivity

Dialysis solution temperature

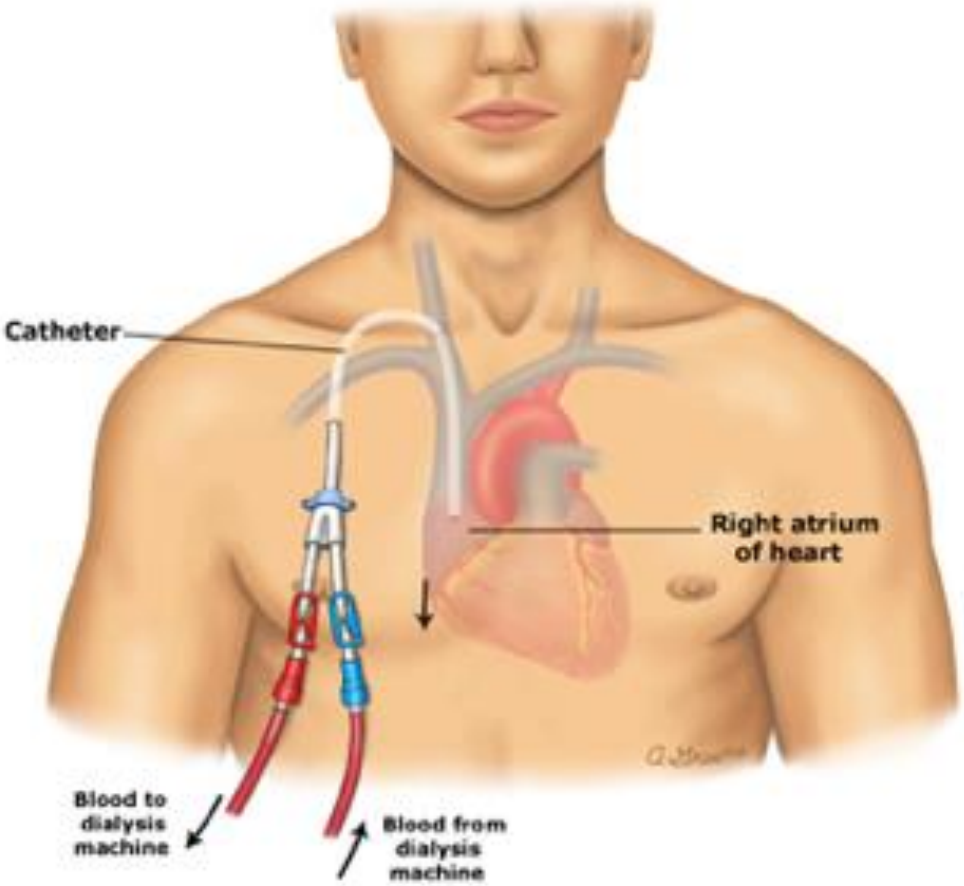
Blood leak detector

Water for dialysis treatment

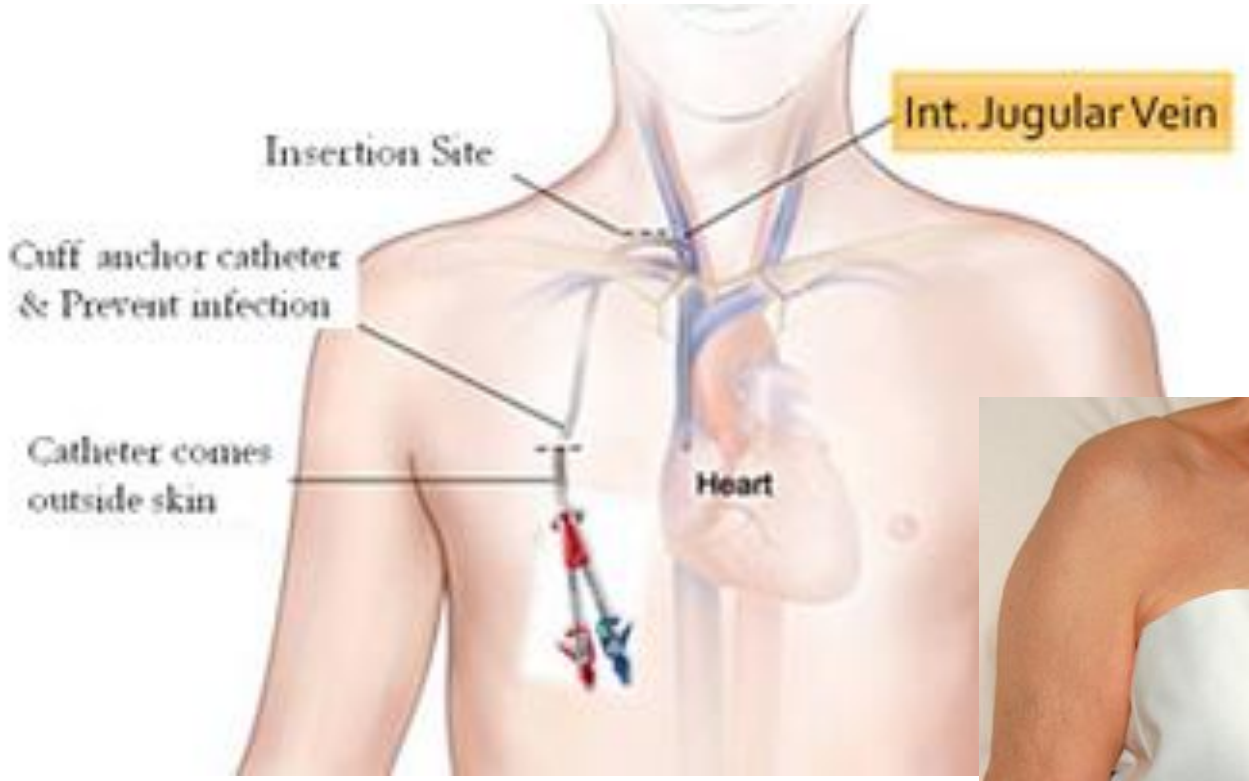
Adjusment of water

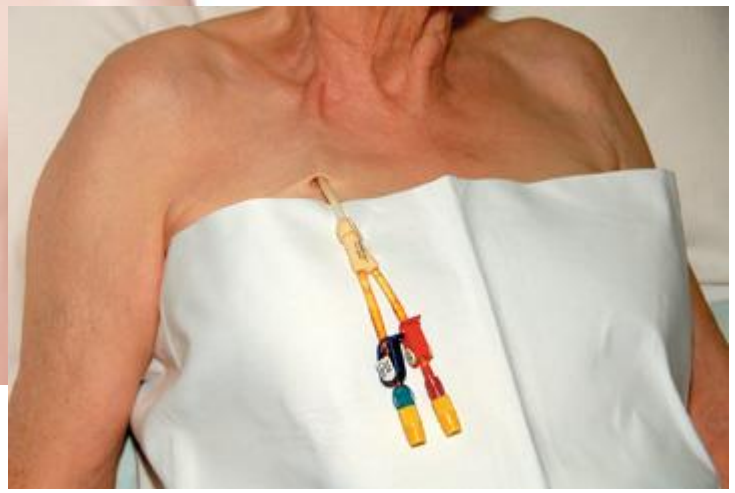


Vascular access for hemodialysis
- temporary percutaneous insertion into a large vein

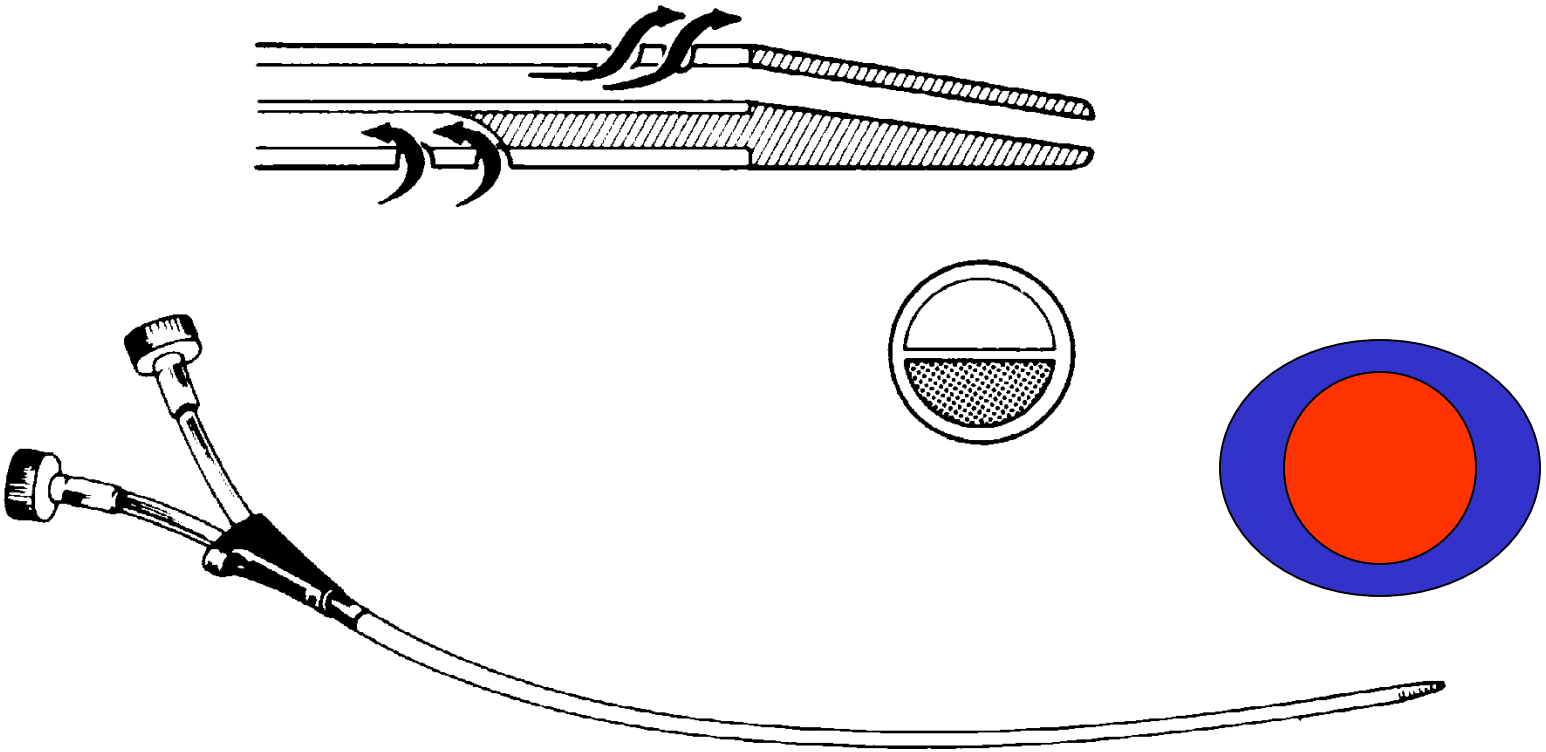


Vascular access for hemodialysis
- Permanent percutaneous insertion into a large vein

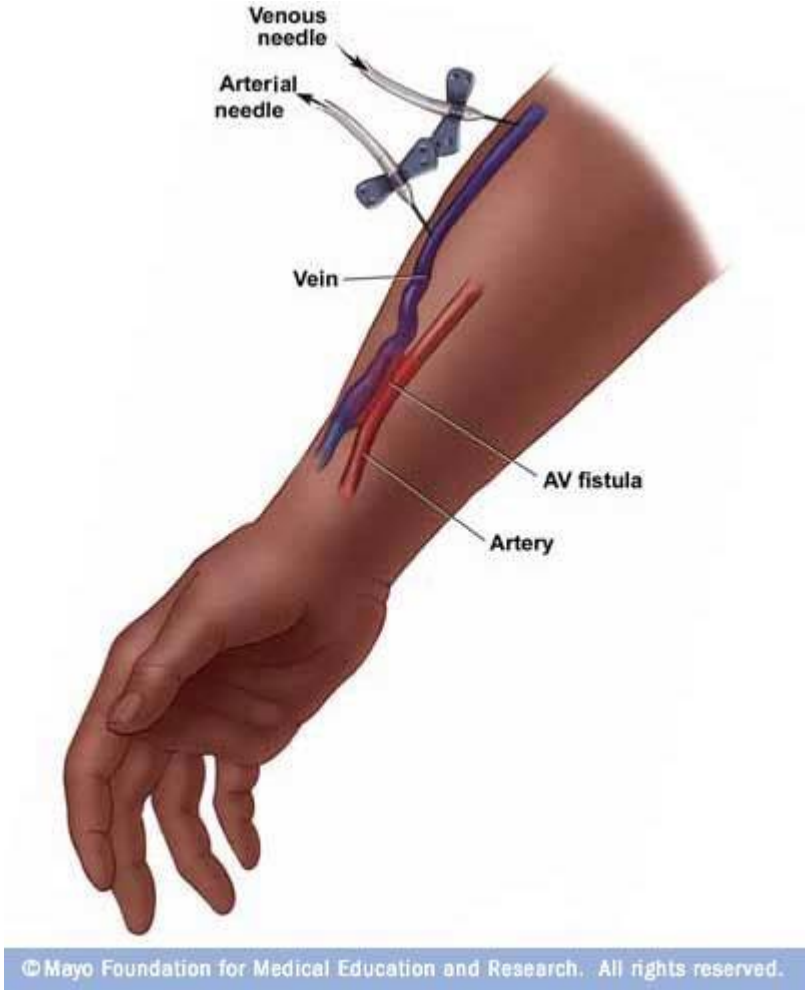


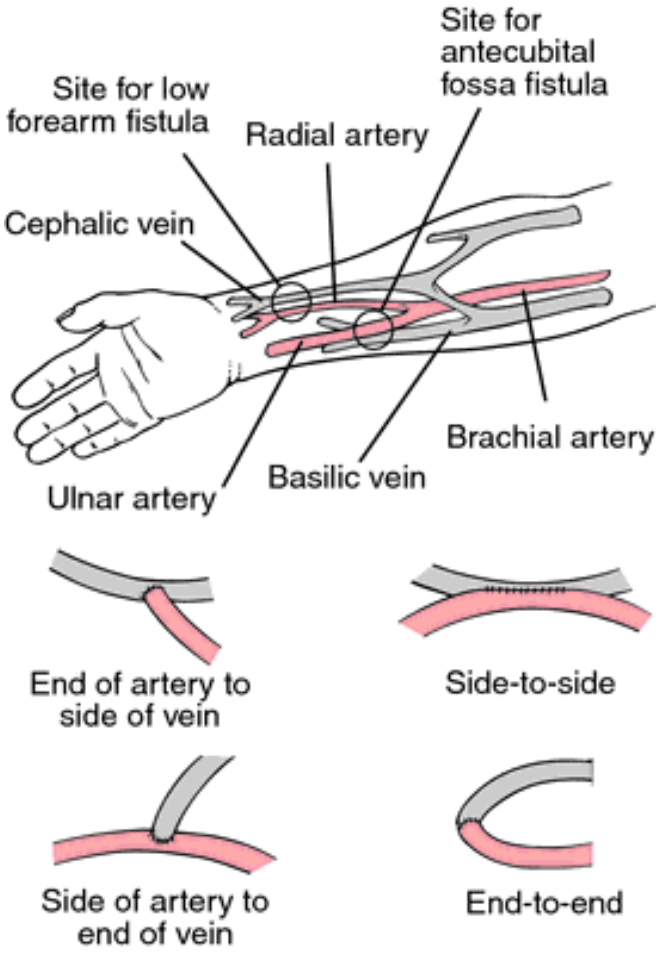


Hemodialysis catheters

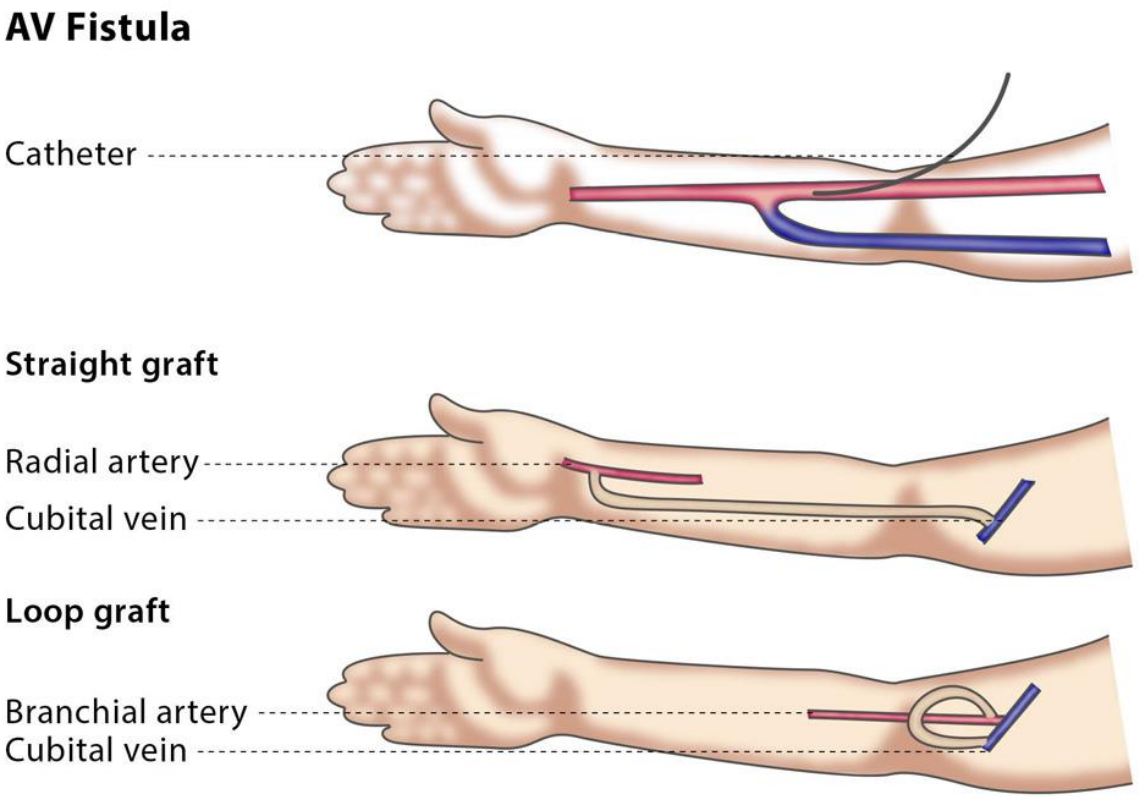


Arteriovenous fistula

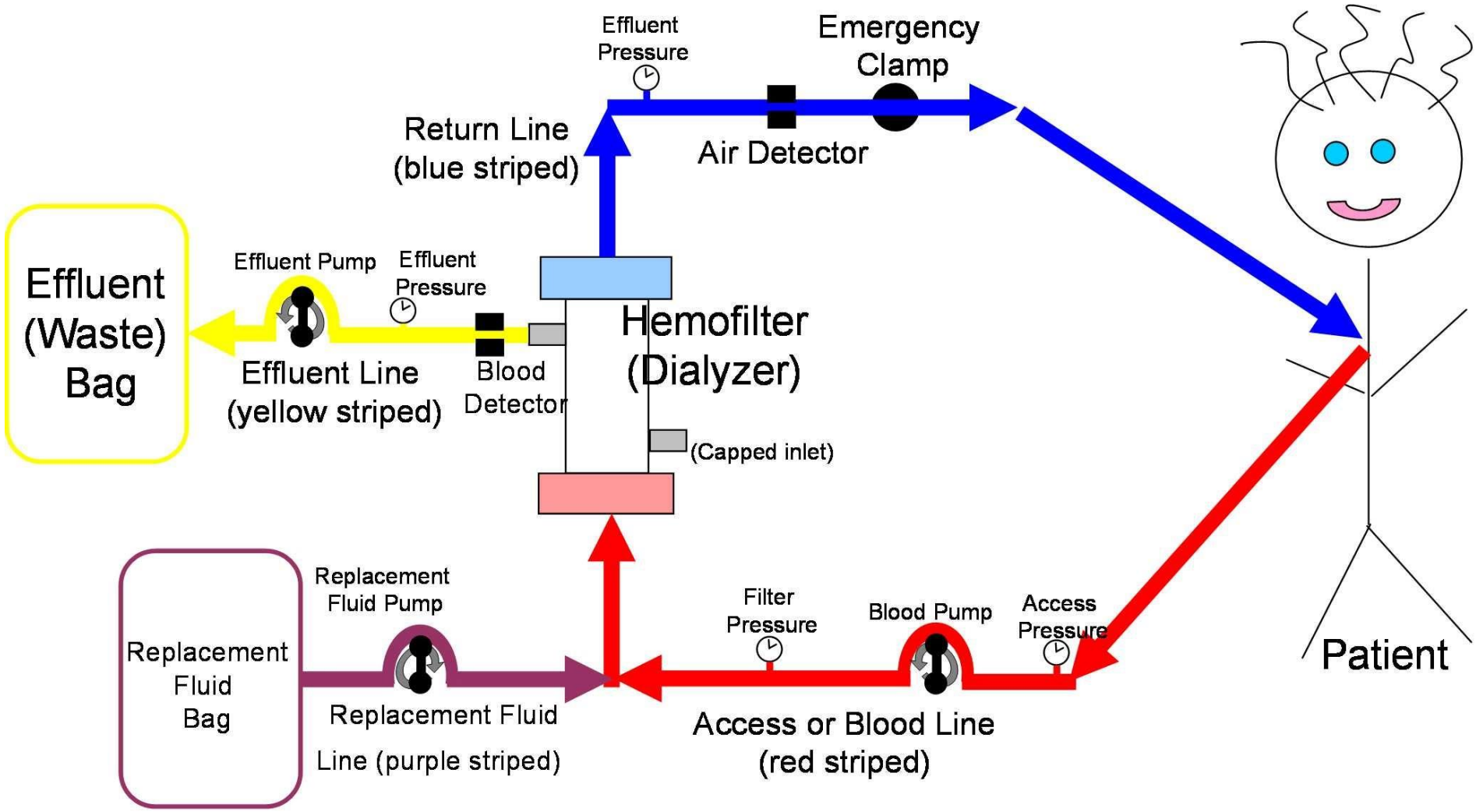




Arterovenous graft



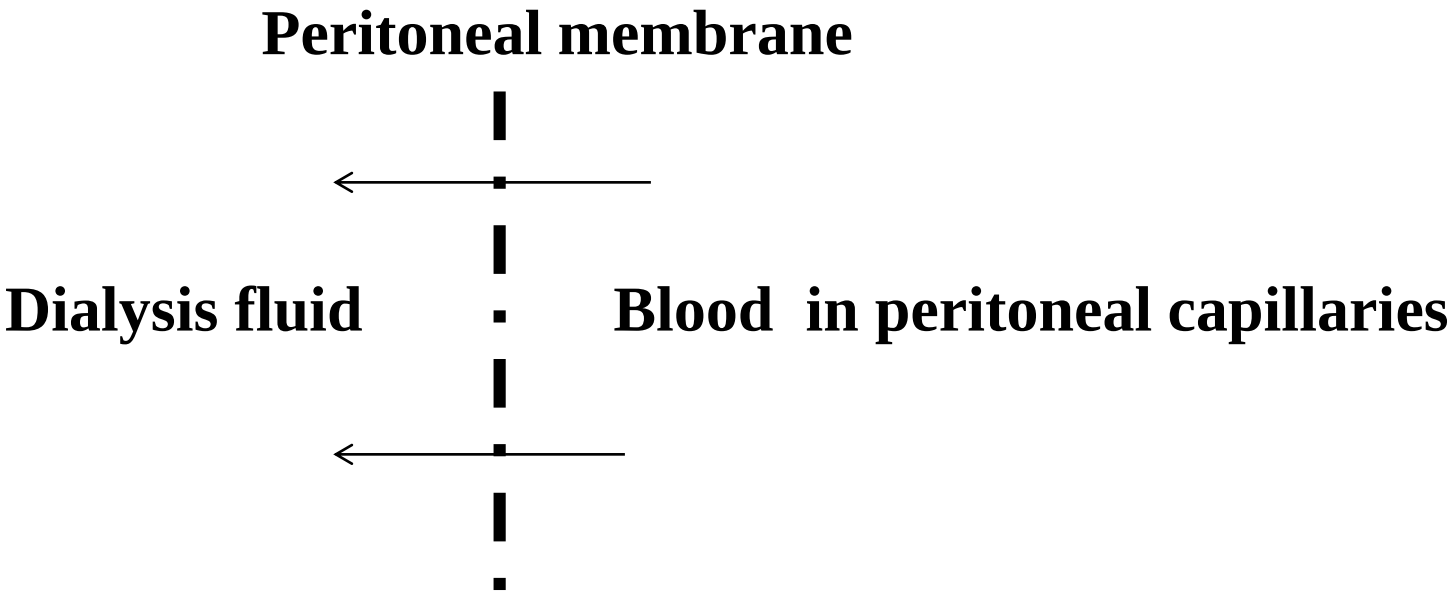
Continuous arteriovenous hemofiltration CVV-H



Peritoneal dialysis

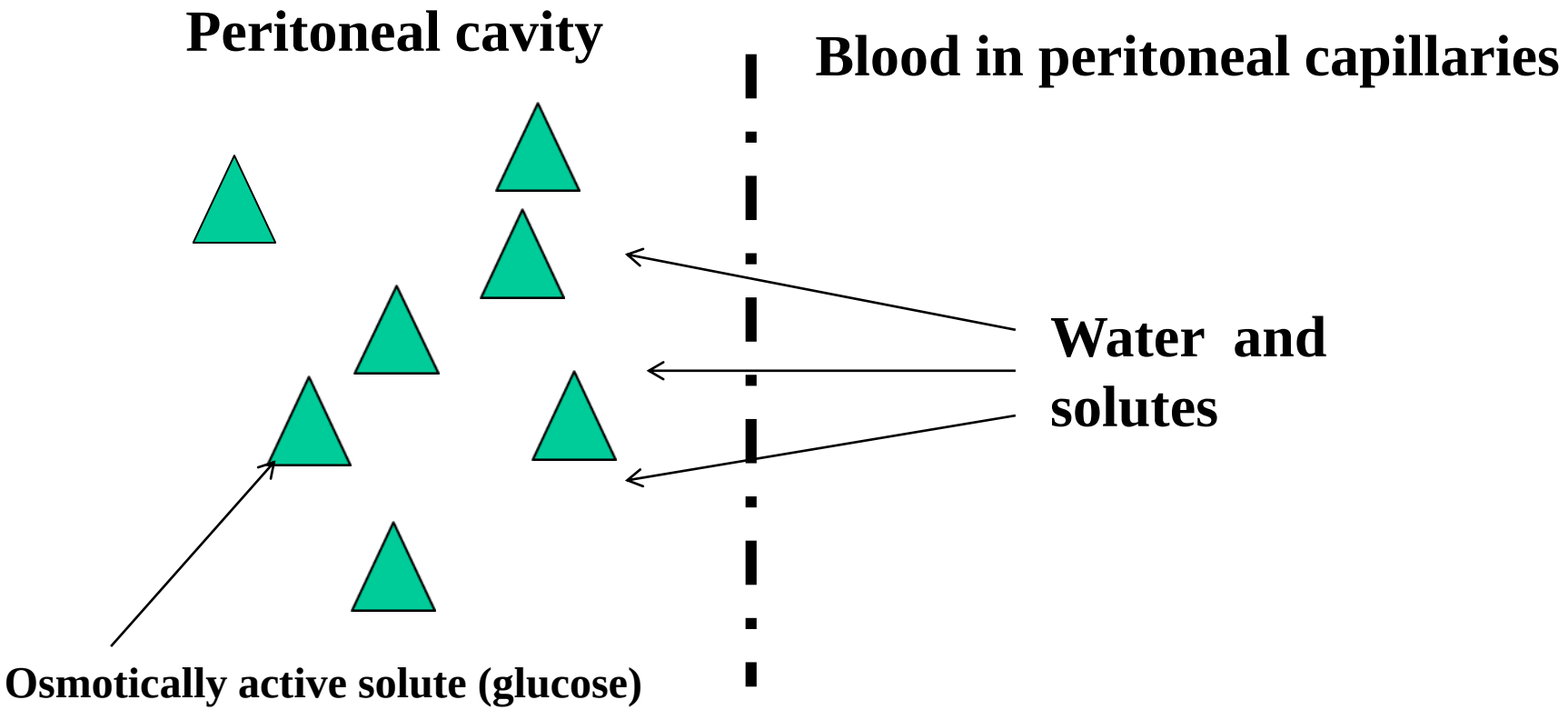
Peritoneal dialysis is performed by introducing 1-2 L of glucose containing salt solution into peritoneal cavity.

<u>Diffusion:</u> is the principal mechanism by wich PD removes waste products

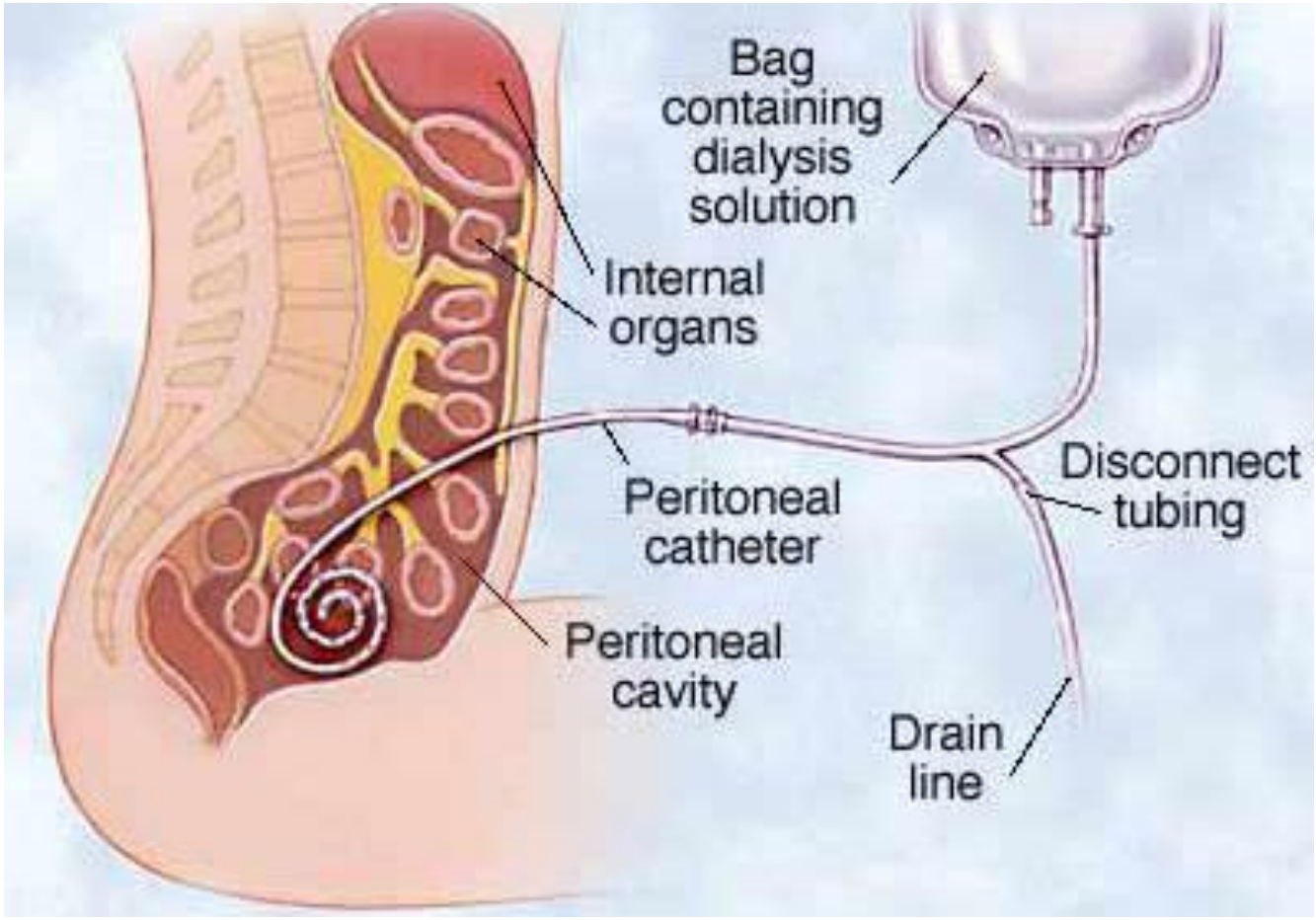


Peritoneal dialysis

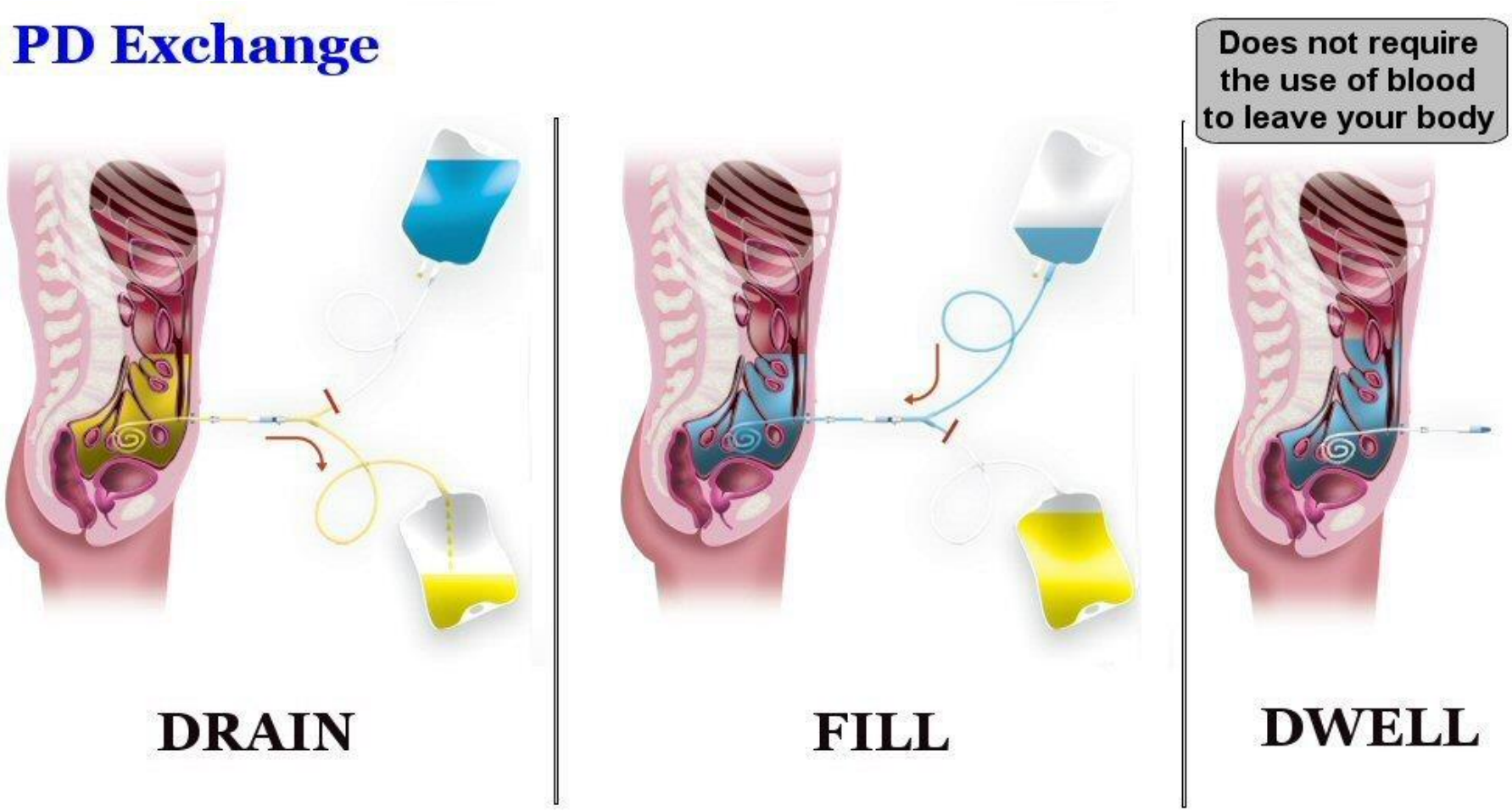
Osmotic ultrafiltration:



Peritoneal dialysis



Dialysis fluid exchange



Peritoneal dialysis

Peritoneal dialysis schedules

CAPD: continuous ambulatory peritoneal dialysis

Dialysate is always present in the abdomen and is exchanged (by draining and refilling) 4-5 times/day

CCPD: continuous cycler-assisted peritoneal dialysis

PD begins at bedtime when patient connects to the cycler machine that will periodically replace the dialysate in the patient´s abdomen with fresh dialysate solution while the patients sleeps. The dialysate is exchanged 3-5 times during the night. In the morning the patients disconnects from the cycler , leaving the fresh exchange of dialysis fluid in the abdomen

NIPD: Nocturnal intermitent peritoneal dialysis

As in CCPD schedule. The number of exchanges during the night is 5-8 or more. In the morning the abdomen is drained and left „dry“ during the day

PD catheter

Insertion od PD catheter