Debunking Fluid Distribution in the Body

Total body water is about 60% of body weight in adult mammals.

Total body water is divided into two compartments:

1. Intracellular Fluid

~2/3 of TBW
Fluid INSIDE cells
Rich in K^+, Mg^{2+}, phosphate and proteins

2. Extracellular Fluid

~1/3 of TBW

Subdivided into two components

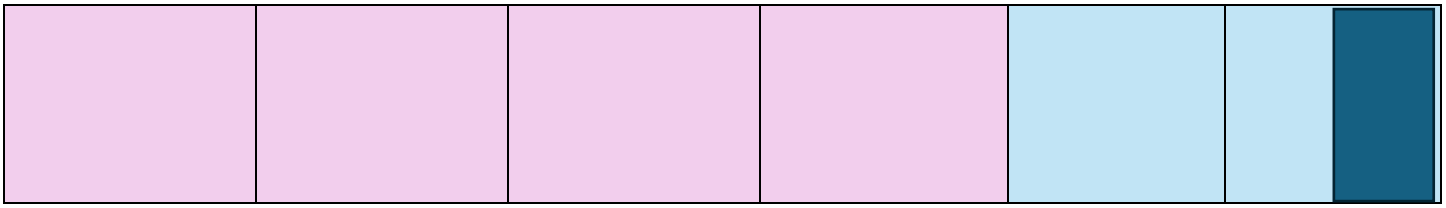
Interstitial fluid (~75% of ECF)
Fluid BETWEEN cells

Intravascular fluid (~25% of ECF)
PLASMA in blood vessels
Rich in Na^+, Cl^-, HCO_3^-

Example time!

Say we have a 10kg dog

60% of 10 is 6 so we are assuming that the total body water (TBW) of this dog is 6 L *each square represents 1 L of fluid



2/3 of the TBW is intracellular fluid: 6 L (2/3) = 4 L of intracellular fluid

1/3 of the TBW is extracellular fluid: 6 L (1/3) = 2 L of extracellular fluid

Within the extracellular fluid 2/3 is interstitial: 2 L (2/3) = 1.5 L interstitial fluid

Within the extracellular fluid 1/3 is plasma: 2 L (1/3) = 0.5 L plasma

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Now let's get that fluid moving!

Hydrostatic vs Oncotic pressure

Hydrostatic pressure is a PUSHING force

Oncotic pressure is a PULLING force exerted by proteins in the blood *ALBUMIN

Fluid moves between compartments (mainly interstitial and plasma) based on Starling Forces

There are four Starling Forces

Capillary Hydrostatic Pressure

The pressure exerted by the blood within the capillary PUSHING fluid out of the capillary

Interstitial Hydrostatic Pressure

The pressure exerted by the fluid in the interstitial space PUSHING fluid into the capillary

Capillary Oncotic Pressure

The osmotic pressure due to the presence of proteins in the interstitial fluid, PULLING fluid into the capillary

Interstitial Oncotic Pressure

The osmotic pressure due to the presence of proteins in the interstitial fluid, PULLING fluid into the interstitial space

Bringing in some physiology

Arterial end: Capillary hydrostatic pressure is GREATER than blood colloidal osmotic pressure

Favors FILTRATION

Venous end: Blood colloidal osmotic pressure is GREATER than capillary hydrostatic pressure

Favors REABSORPTION

Clinical Effects of Changes in Hydrostatic Pressure

Increased hydrostatic pressure (heart failure, venous congestion)

Debunking Fluid Distribution in the Body

More fluid pushed out of vessels leading to edema or effusion

Decreased hydrostatic pressure (hypovolemic shock or dehydration)

Loss of circulating blood volume leads to less perfusion pressure which leads to less fluid moving out of the vasculature. The osmotic pressure gradient (concentration of plasma proteins is higher in the capillaries) pulls fluid back into the blood vessels into the intravascular space