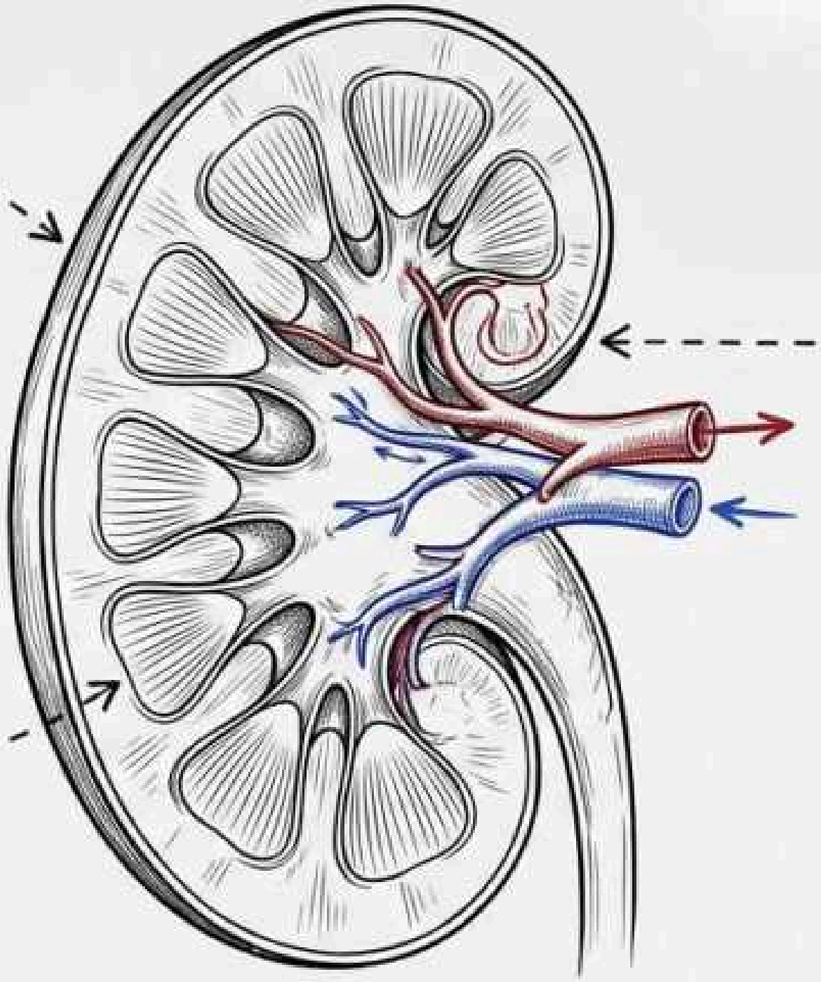
How the Kidney Works: MED 523 B Lecture 1

1. The Nephron



2. Glomerular Filtration

3. Tubule Reabsorption/ Secretion

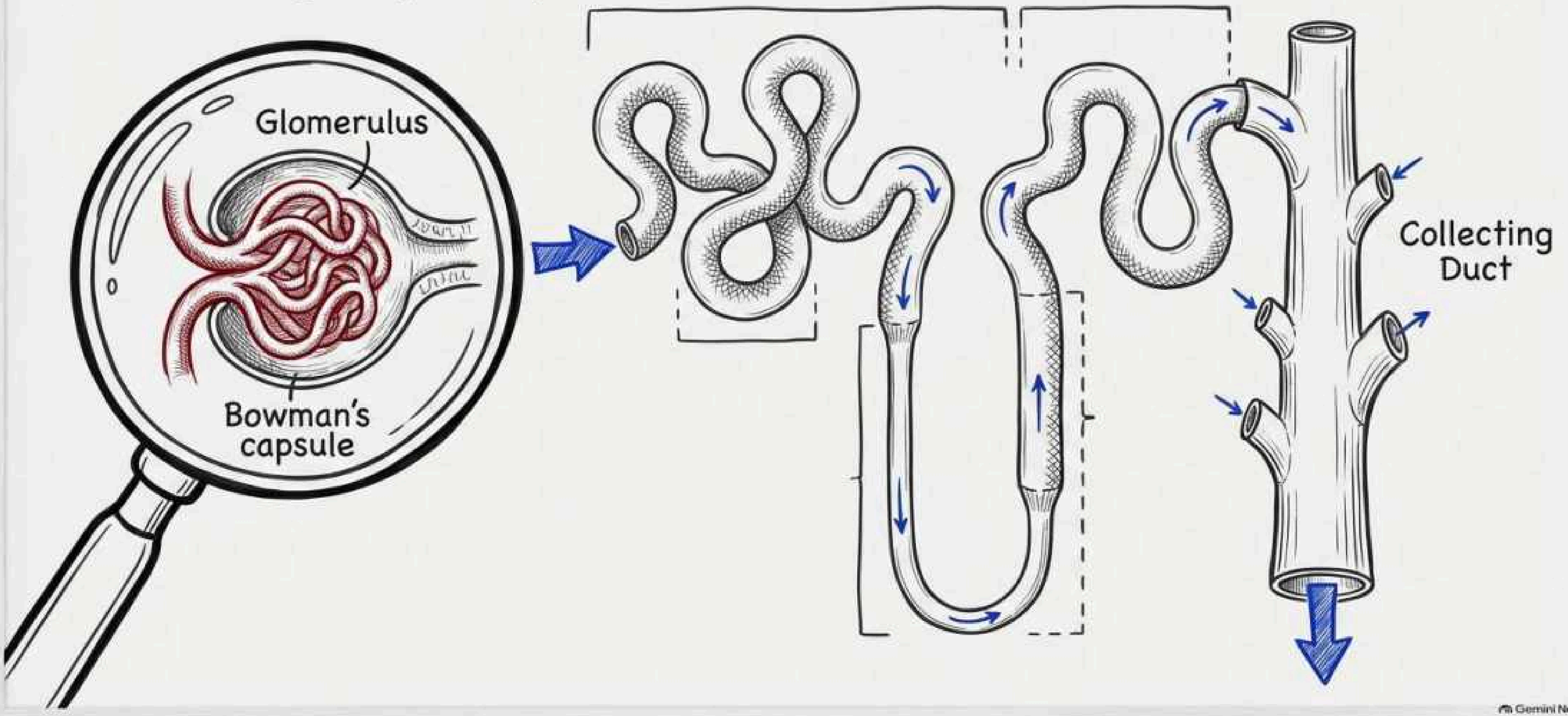
4. Kidney Hormones

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The Nephron Unit

¶ 1.1

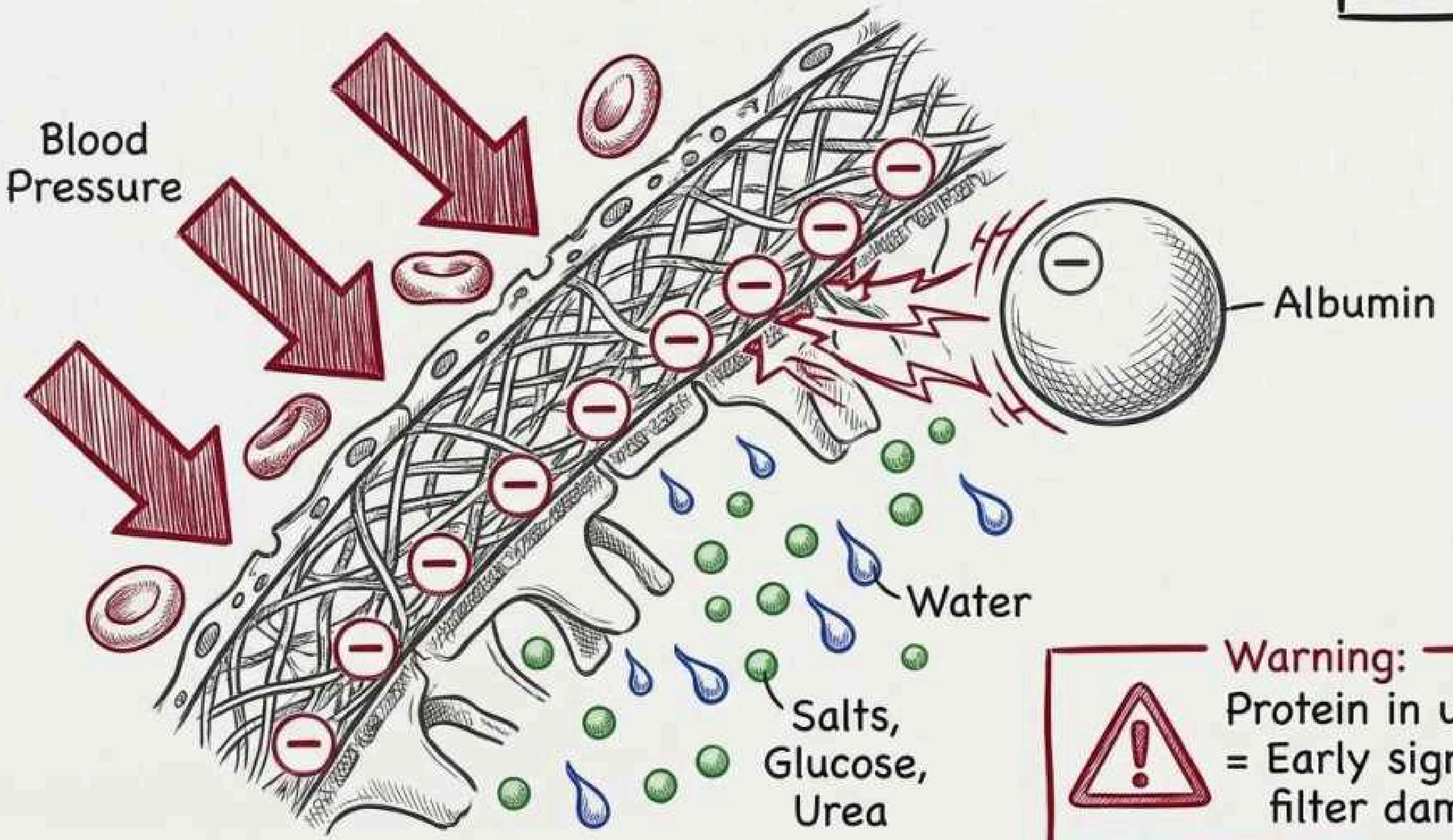
~1 Million working units per kidney.



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The Glomerular Filter

¶1.2



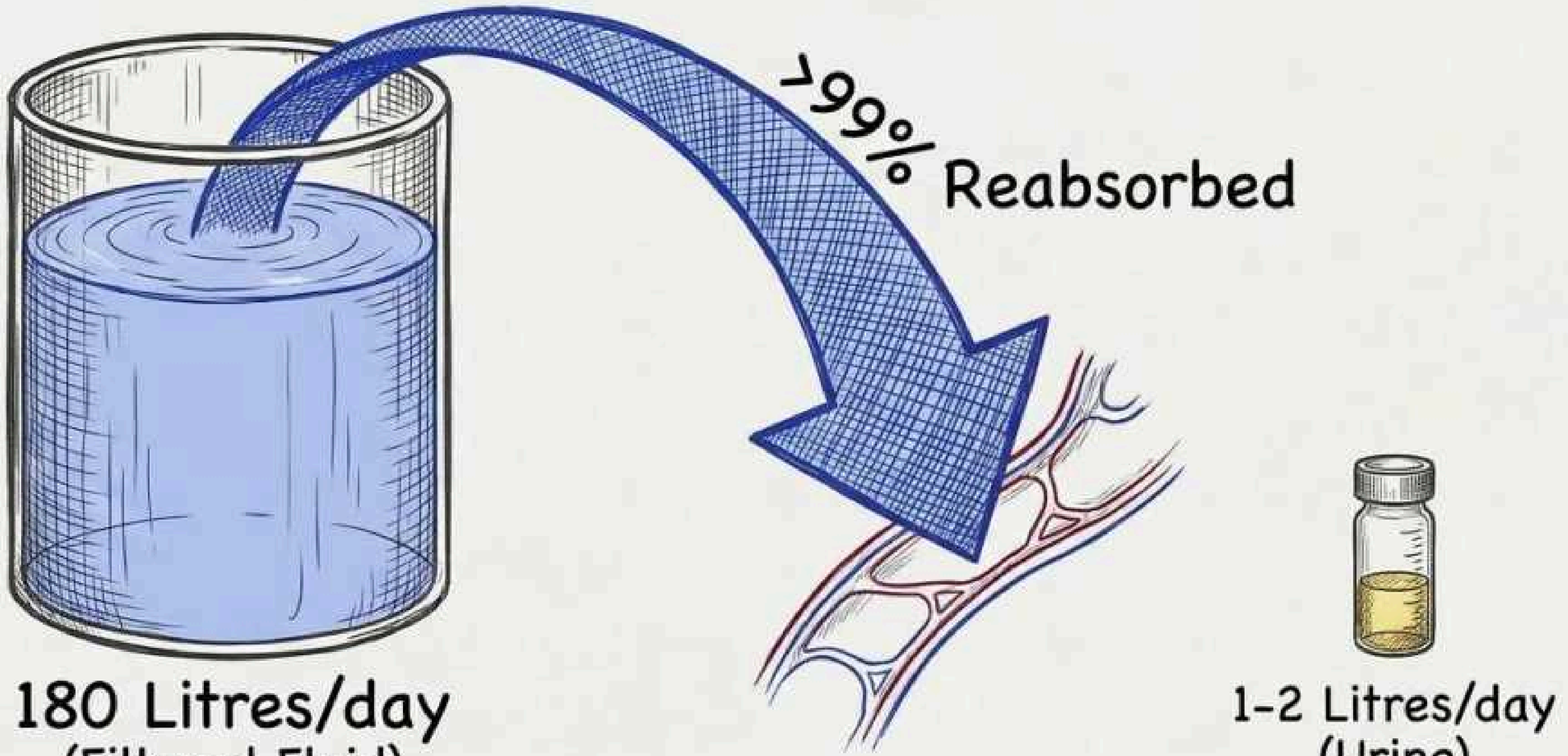
Warning:
Protein in urine = Early sign of filter damage.

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The Volume of Filtration (GFR)

¶1.3

Glomerular Filtration Rate (GFR) ≈ 120 mL/min

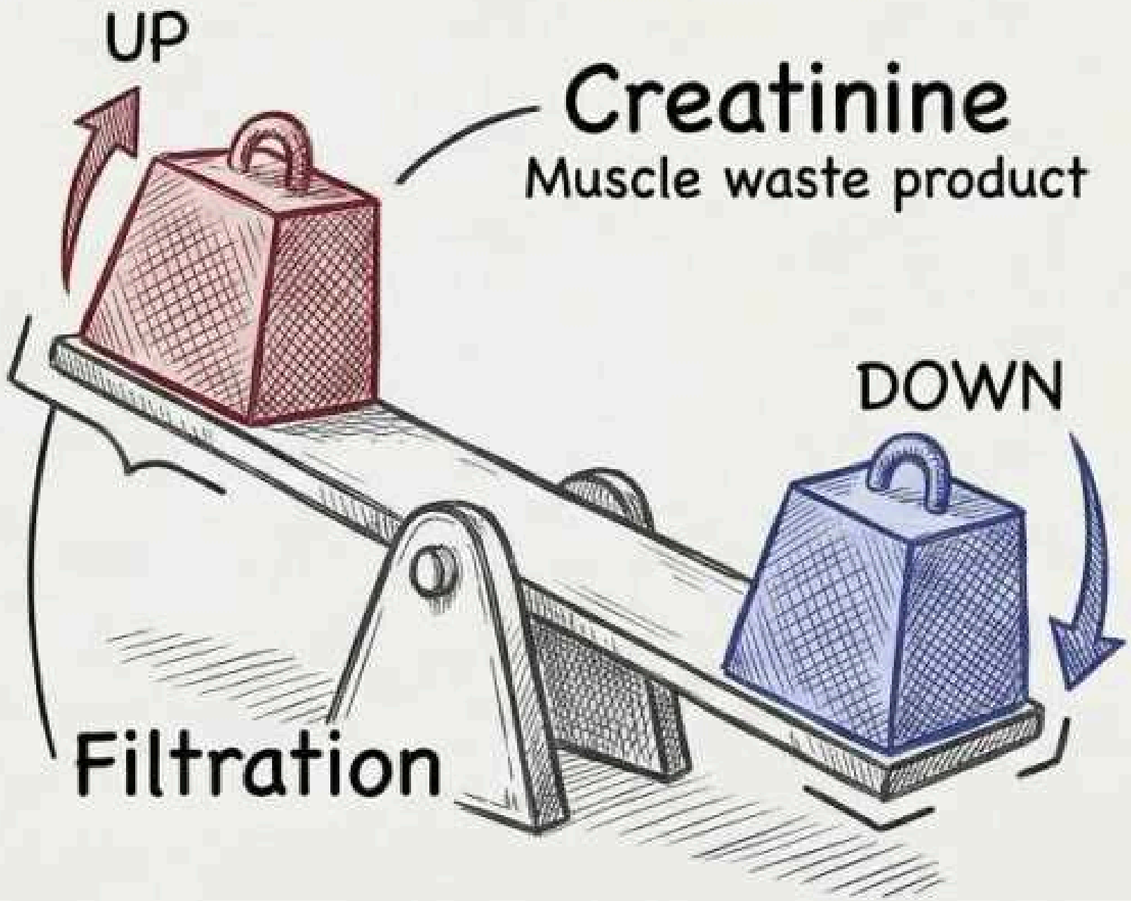


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Measuring GFR in Practice

¶ 1.4

GFR is the best single measure of kidney function.



$$eGFR = f(\text{Creatinine, Age, Sex})$$



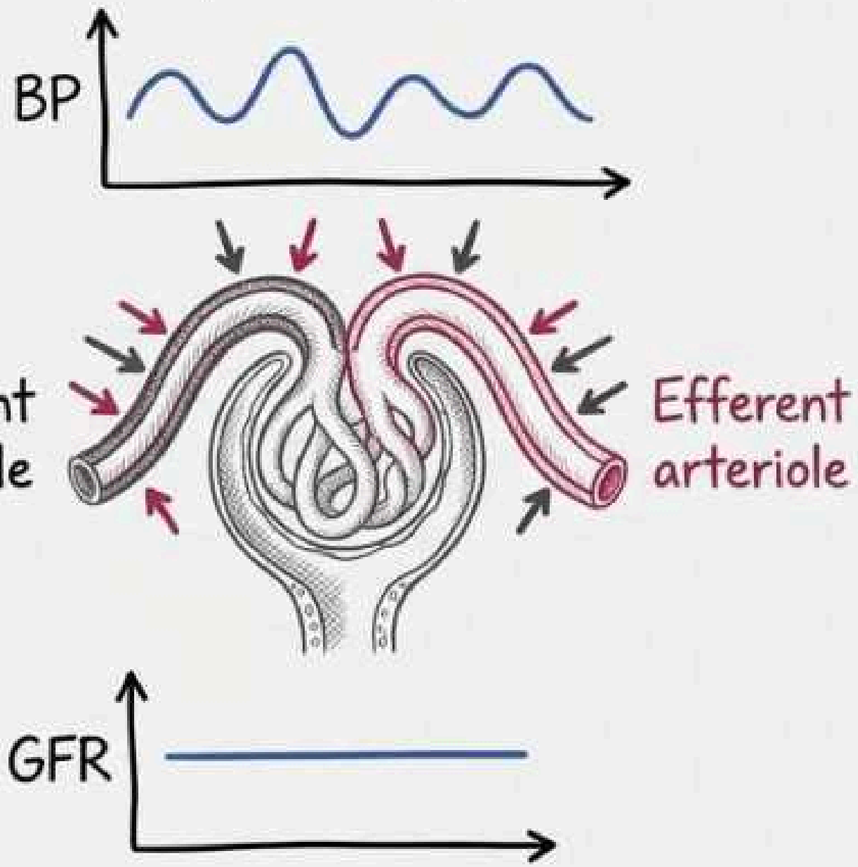
Note: Result can be affected by muscle mass & diet.

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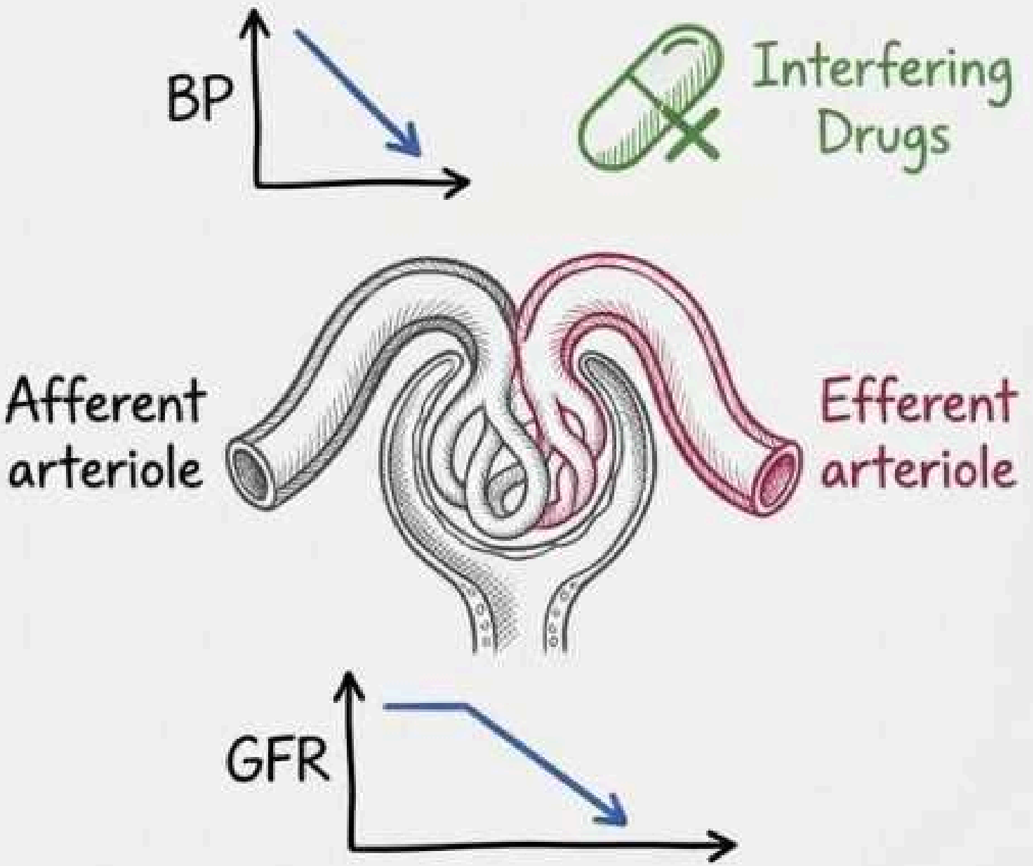
Autoregulation of Filtration

¶ 1.5

Healthy Autoregulation



Failure



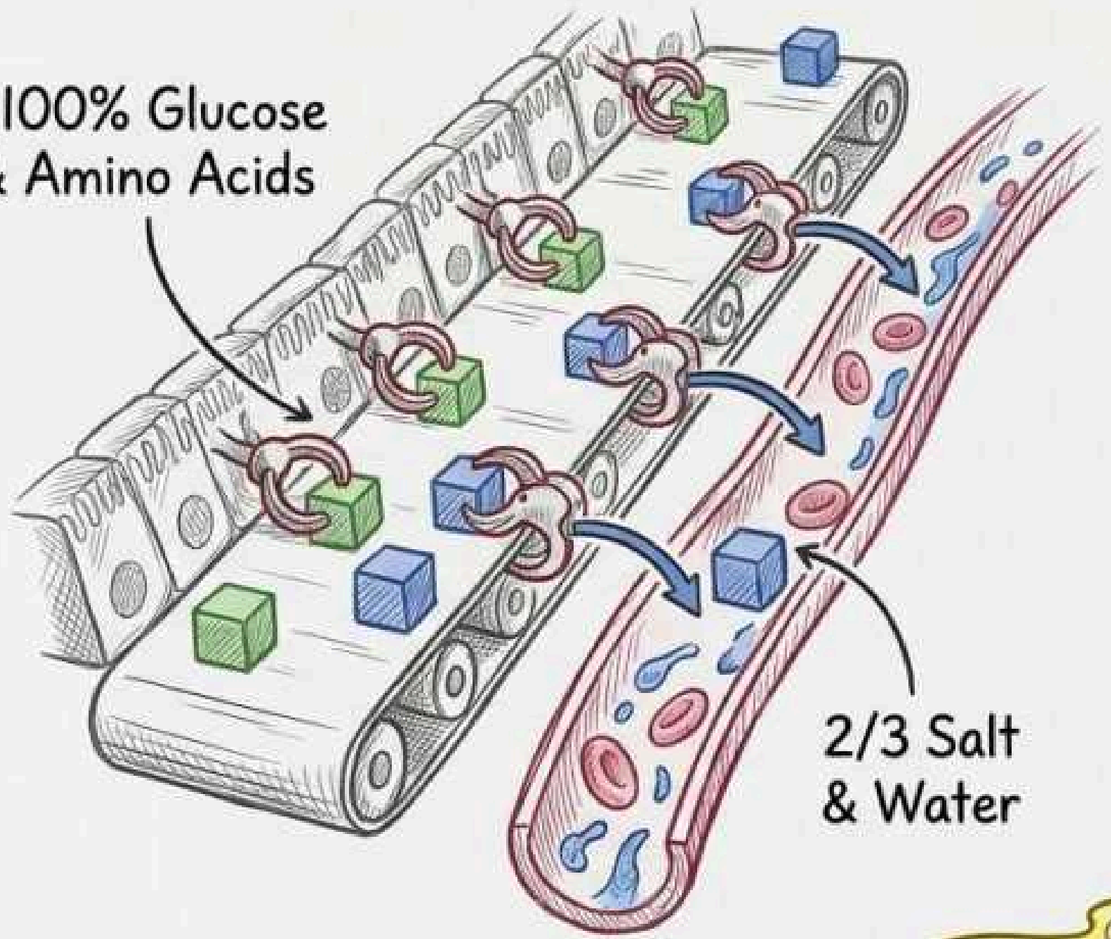
The kidney protects its own filtration rate—until BP falls too low or drugs interfere.

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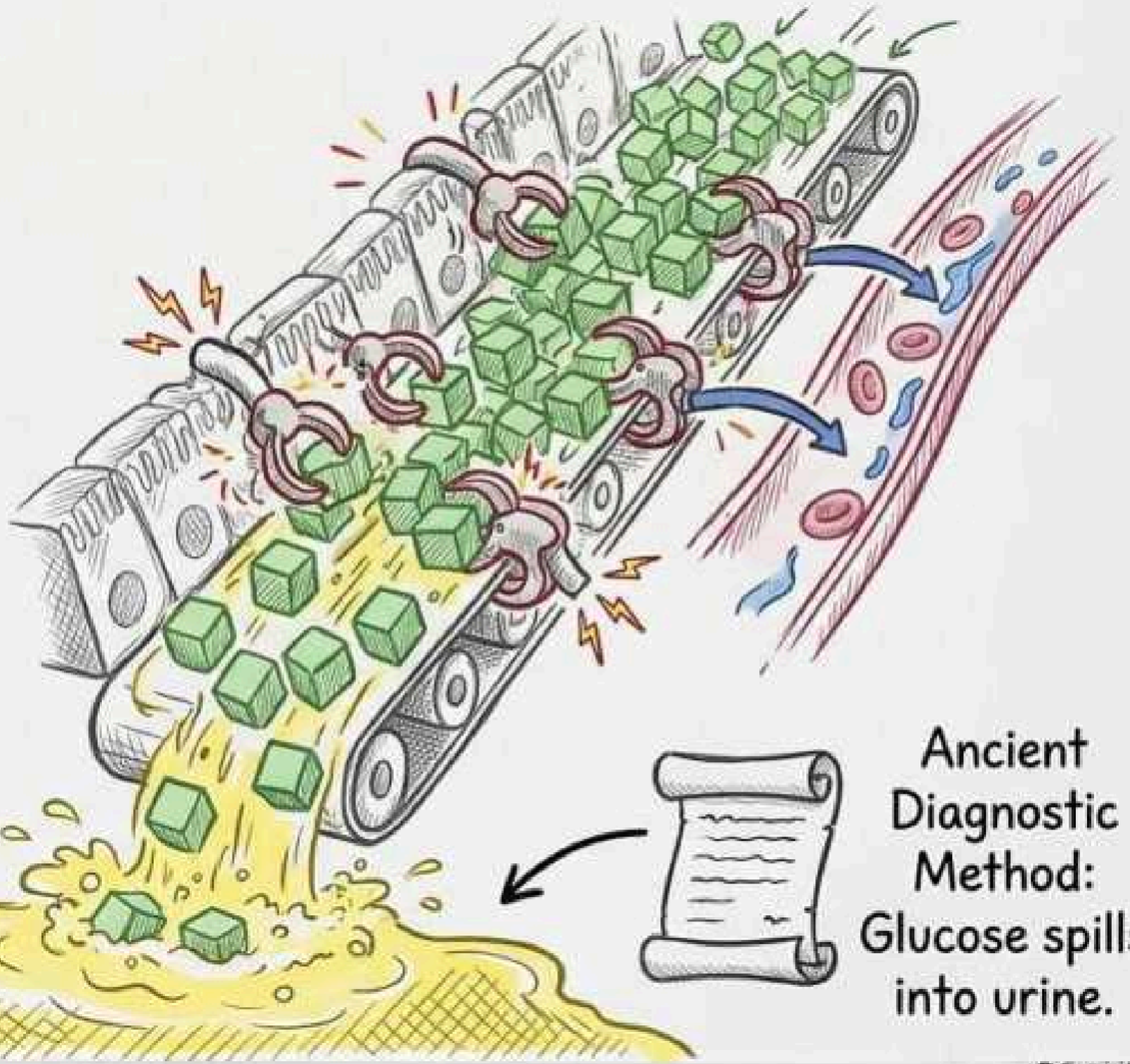
Proximal Tubule Reabsorption

¶ 1.6

Normal Reabsorption



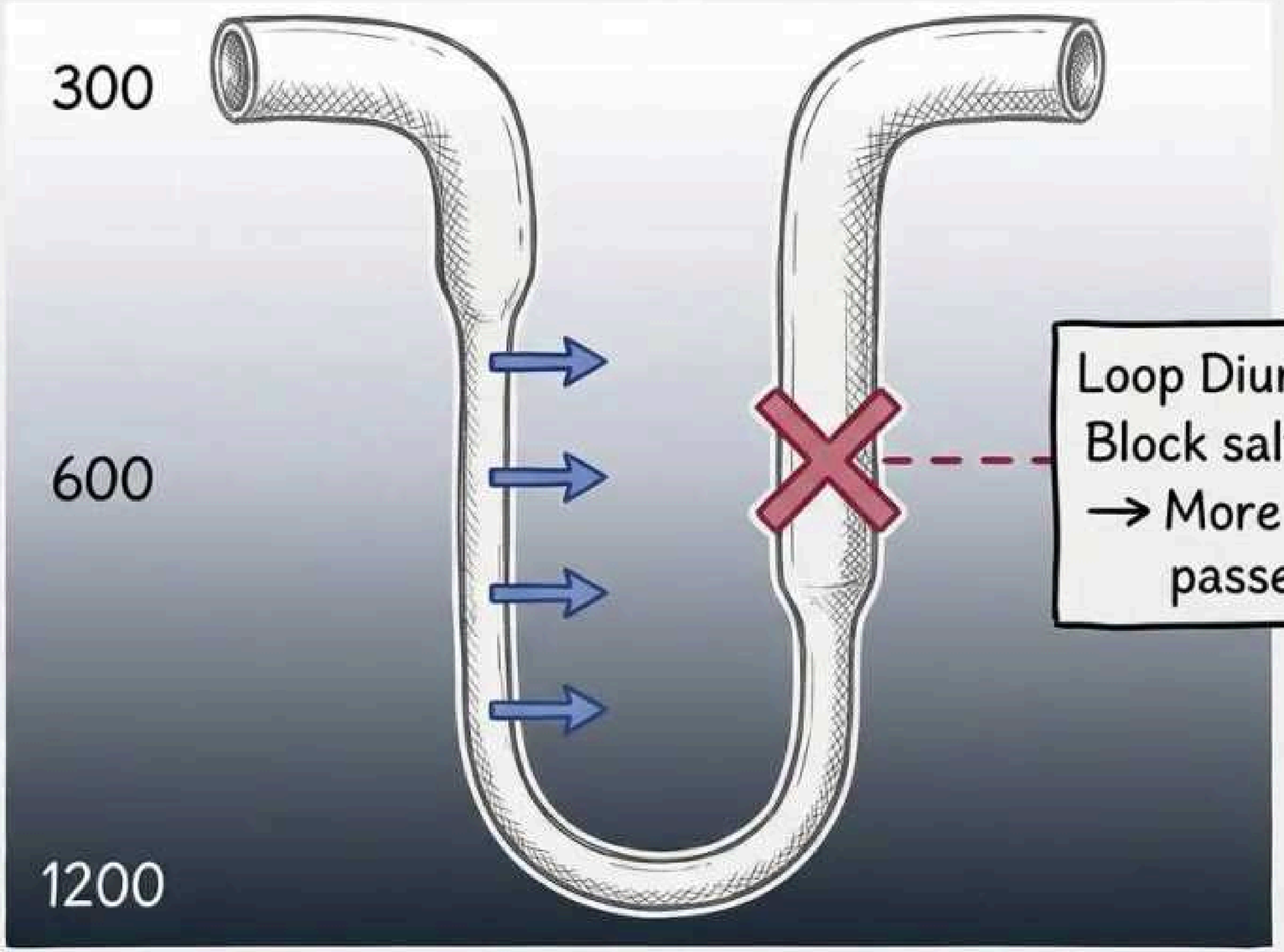
Uncontrolled Diabetes



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The Loop of Henle

¶ 1.7

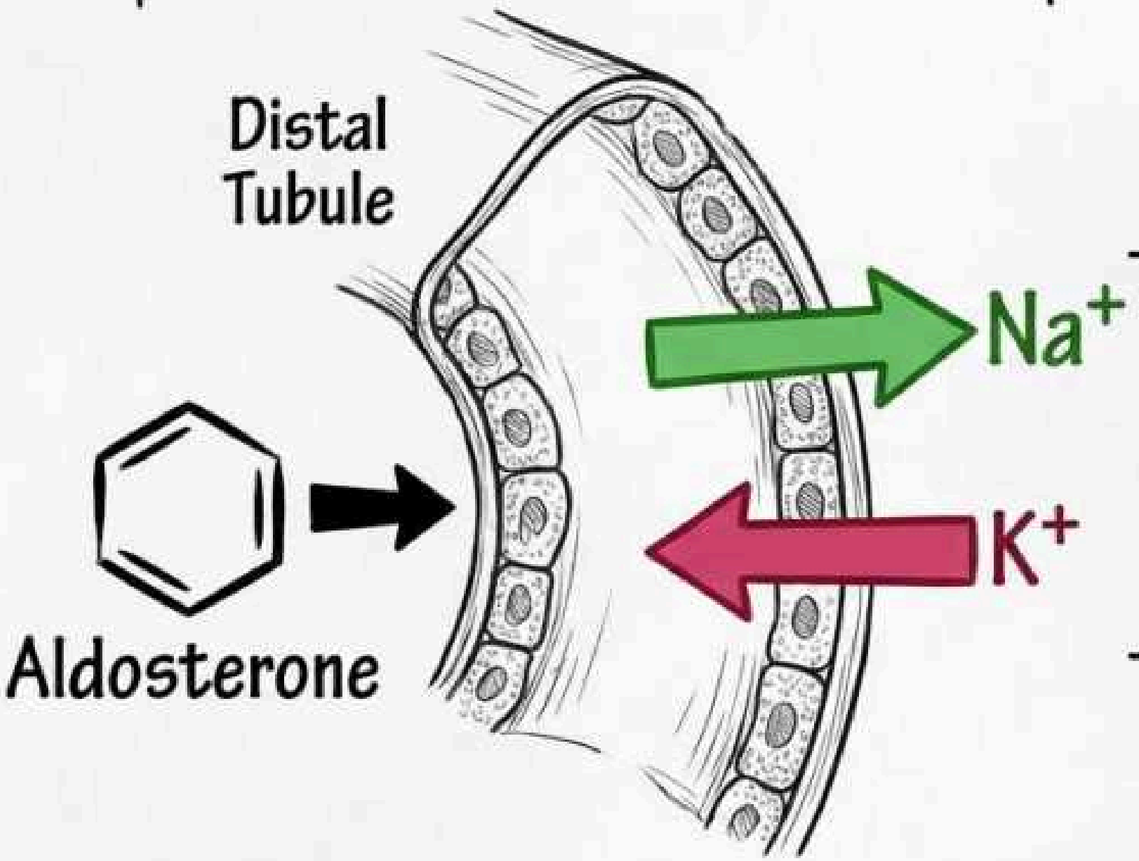


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Hormonal Fine-Tuning

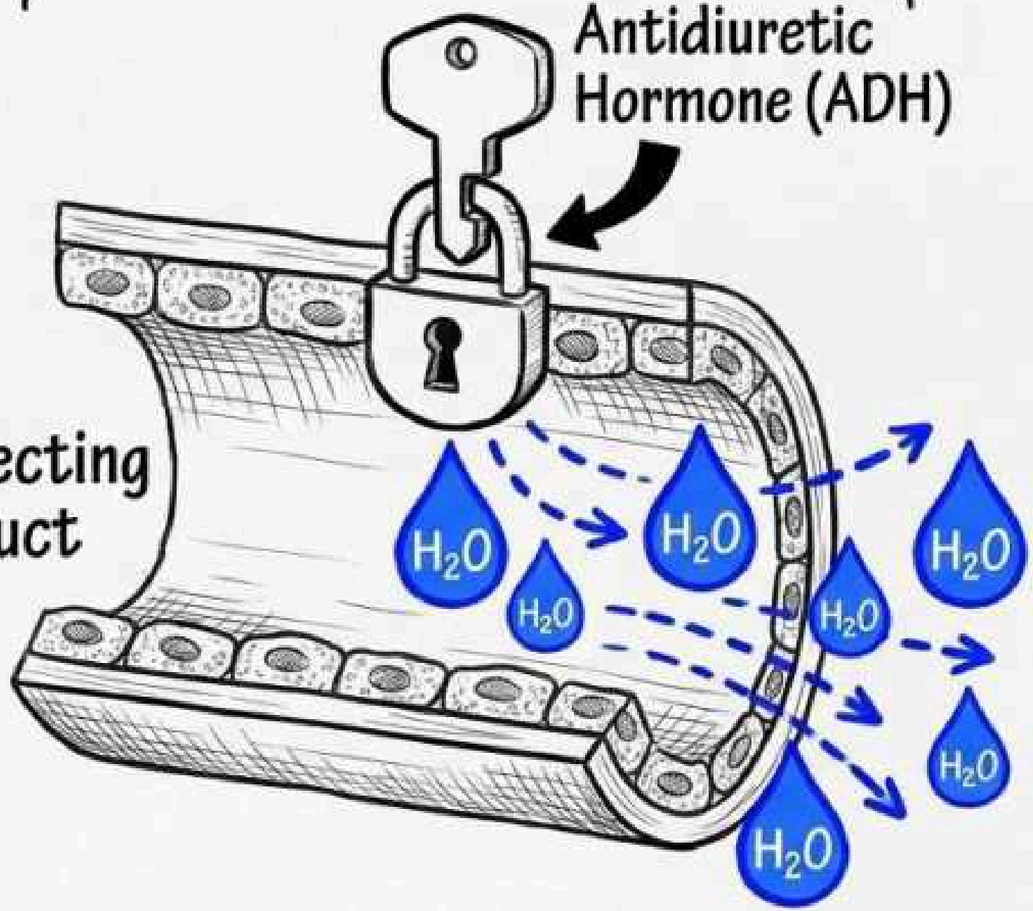
¶ 1.8

Aldosterone Mechanism



Collecting duct

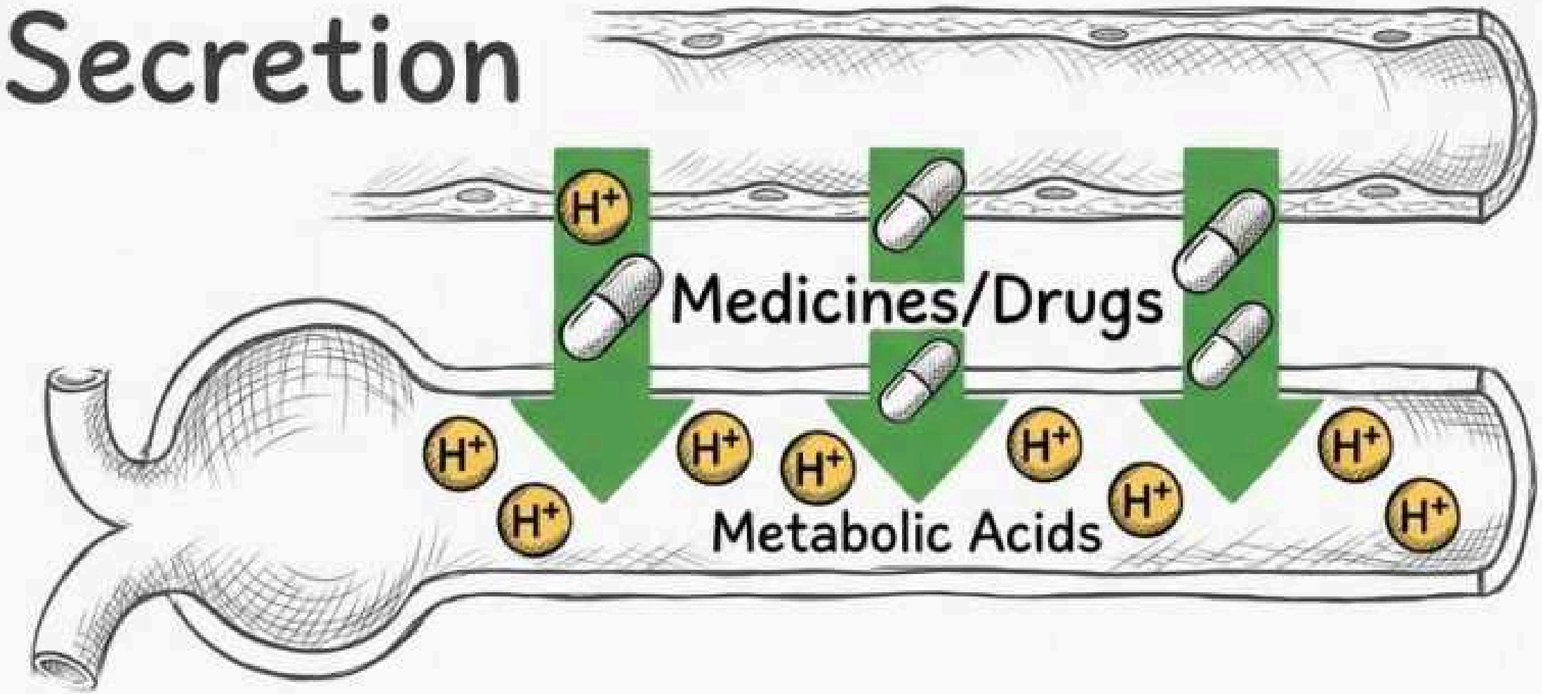
ADH Mechanism



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Tubular Secretion

¶ 1.9



⬇ Kidney Function = ⬇ Clearance of Drugs & Acids

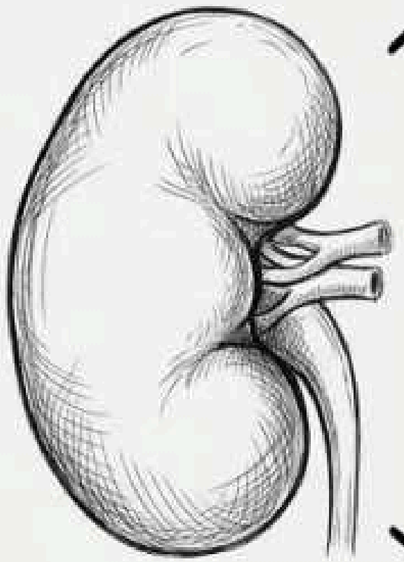
Therefore: Requires Lower Dosages in Kidney Disease

(Link: Medicine 511 B)

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The Endocrine Kidney

¶ 1.10



Renin — Starts the Renin-Angiotensin-Aldosterone System (RAAS) (Ref: MED 521 B).

Erythropoietin (EPO) → Bone Marrow → Red Blood Cells → Failure = Anaemia.

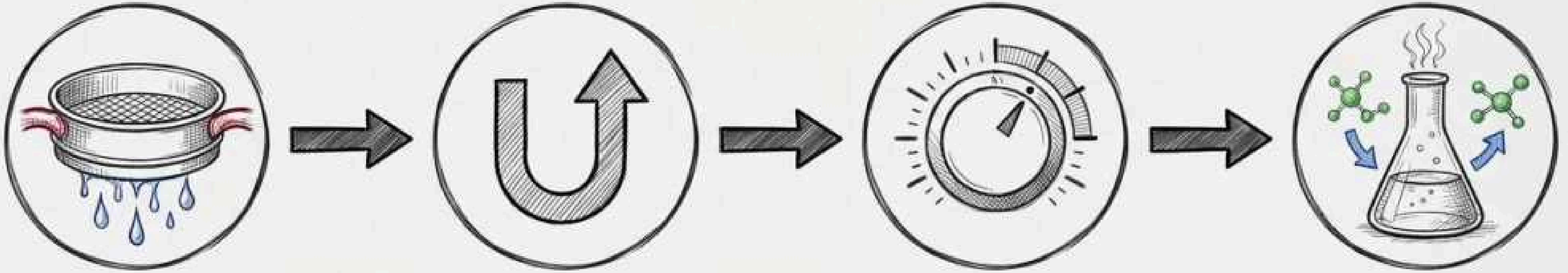
Activated Vitamin D → Gut Calcium Absorption → Failure = Bone Disease.

Failing kidneys = waste build-up + anaemia + bone disease.

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Synthesis & Next Steps

¶ 1.11



Filter

Process a vast volume of plasma.

Reclaim

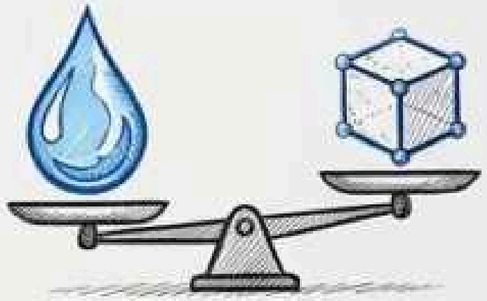
Take almost all of it back.

Fine-Tune

Adjust what remains under hormonal control.

Synthesize

Produce essential systemic hormones.



Next Lecture: Keeping the Body's Water & Sodium in Balance.

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