

Excretion



CATABOLIC

- $\text{C}_6\text{H}_{12}\text{O}_6 + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O} + \text{Energy}$
(Tissue respiration)
- Protein/AA $\xrightarrow{\text{deamination}}$ Urea

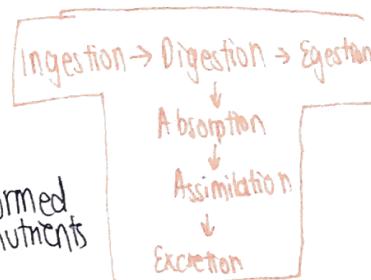
Anabolic

- AA \rightarrow Proteins/Hormones/Enzymes
- Excess Glucose \rightarrow Glycogen
- Photosynthesis

= METABOLISM
新陈代谢

EXCRETION

Process by which metabolic waste prod. & toxic mat. removed formed from absorbed nutrients



Lungs $\xrightarrow[\text{air}]{\text{Expired}}$ CO_2 & H_2O

Kidney $\xrightarrow{\text{urine}}$ Excess H_2O & mineral salts, nitrogenous waste prod. like urea, uric acid, creatinine

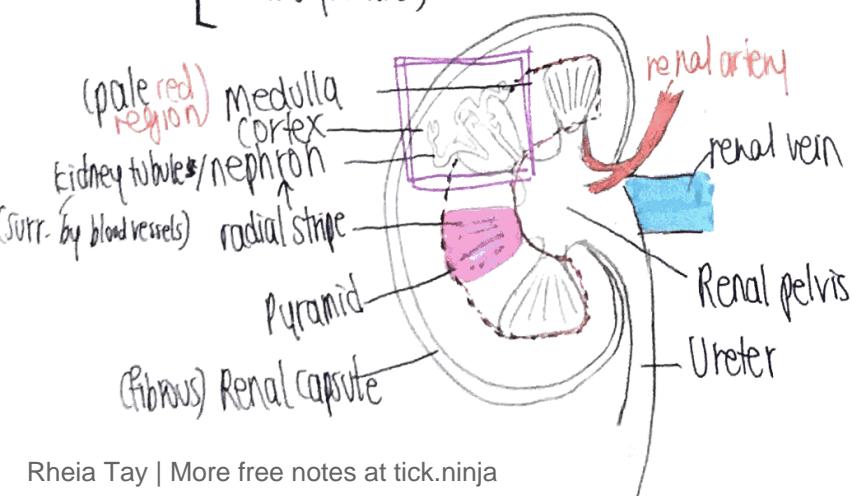
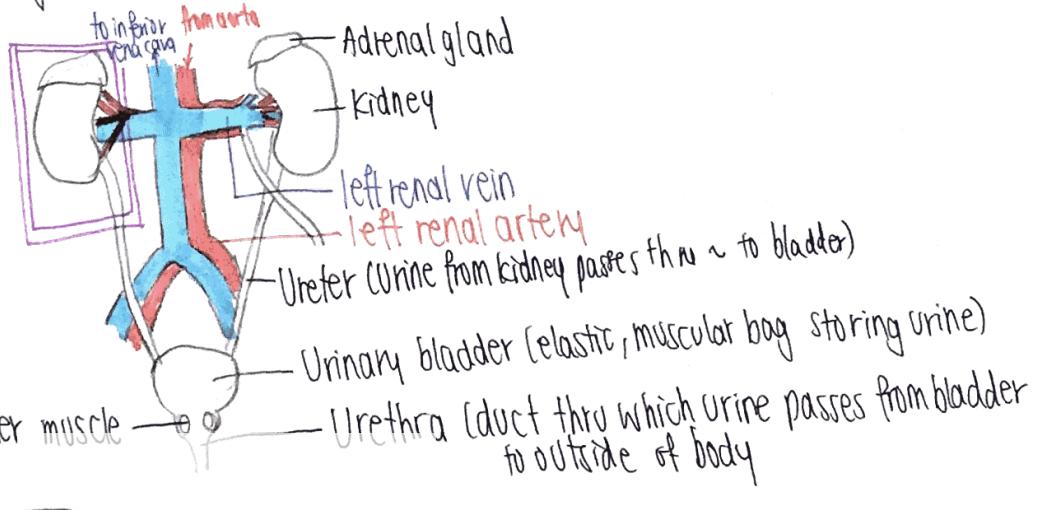
Skin $\xrightarrow{\text{sweat}}$

Liver $\xrightarrow{\text{Faeces}}$ Bile pigments

EGESTION

Removal of undigested mat. from alimentary canal

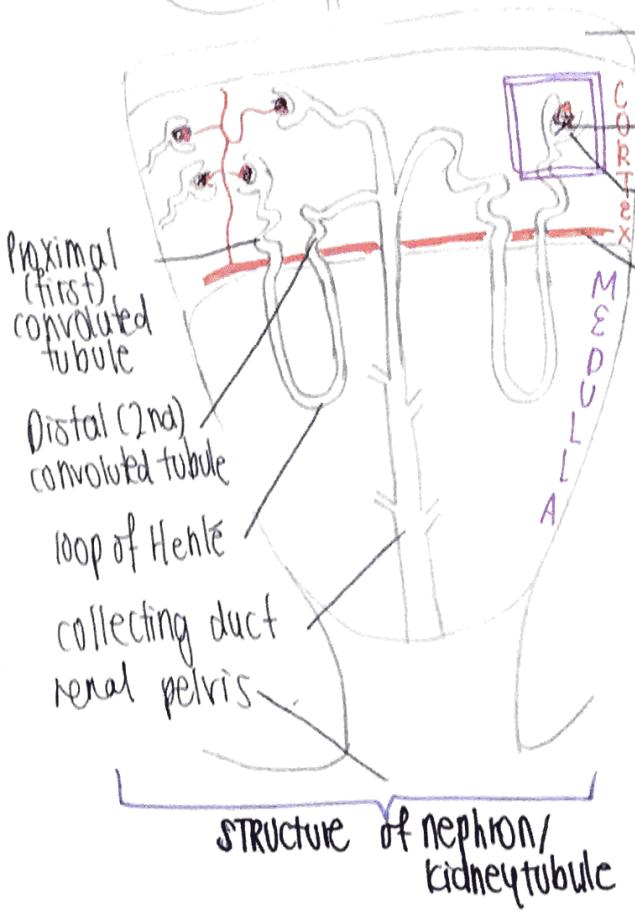
Human Urinary System!



Structure
of a
KIDNEY
(right)



Ureter

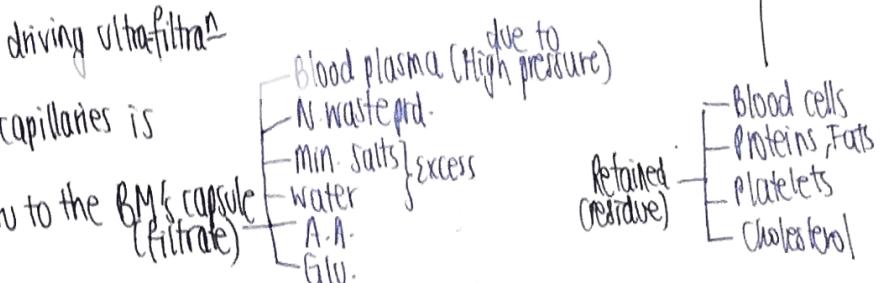


STRUCTURE of nephron/
kidney tubule

HOW IS URINE FORMED?

① ULTRA-FILTRATION @ Glomerulus

- Afferent arteriole has wider diameter than efferent arteriole
→ higher resistance in eff. arteriole due to smaller lumen
- Diff. in blood pressure
→ Hydrostatic pressure in glomerulus, driving ultrafiltration
- Basement membrane and glomerular blood capillaries is partially permeable
→ Only allow water & small mol. to pass thru to the BM & capsule (filtrate)



If they come out, might lead to rupturing of kidneys,
→ Kidney failure

② SELECTIVE REABSORPTION @ Nephron

- ① At proximal convoluted tubule, ALL glucose & AA + MOST H₂O reabsorbed into surr. blood capillaries

* Conc. of urea ↑ along the nephron

- ② At Loop of Henle, SOME H₂O.

- ③ At Distal convoluted tubule, SOME H₂O & MIN. SALTS

- ④ At collecting duct, SOME H₂O reabsorbed BUT excess H₂O & min. salts + N. waste prod. pass out into renal pelvis

Constituent of Urine

	Per 100 cm³/g
Water	96
Mjn. salts (NaCl)	1.8
Urea	2.0
Other N. subs.	0.2
Total	100

- More lia/water rich food \uparrow water & urine / Perspiring more \downarrow water & urine / Perspiring less \uparrow water & urine
- High intake of salty food \uparrow min-salts
- Protein-rich diets (deamination) \uparrow urea

Diabetes Mellitus \rightarrow Glucose in urine

- Pancreas secrete insulin, glucose converted glucagon
- Gl. is part of glomerular filtrate + nephrons do not fast enough \Rightarrow Glucose in urine

subs dissolved in solvent

\rightarrow Control of water & solute levels in blood to maintain constant H₂O potential

Osmoregulation

If blood plasma is too dilute,
water moves into blood cells & tissue cells via osmosis
 \rightarrow swell & burst



Large intake of water

H₂O pot. of blood plasma \uparrow

H. produce less ADH/vasopressin, PPG release less ADH, blood capillaries surr. nephrons reabsorb less water

More urine, urea conc. \downarrow ,

YAY!

H₂O potential of blood plasma is restored

X too concentrated
Water moves out of blood cells & tissue cells via osmosis
 \rightarrow Dehydrated/crenated & shrink, carry out metabolic functions, maybe fatal



STIMULATES

Large loss of water
H₂O pot. of blood plasma \downarrow

H. produce more ADH, PPG releases more ADH, blood cap.s surr. nephrons absorb more water

Less urine output, urea conc. \uparrow

KIDNEY FAILURE

Kidney removes excess
if not → hyperkalemia,
affecting V.B.

CAUSES

- Accidents
- Dehydration
- Poor blood flow
- poorly controlled Diabetes & H.B.P
- Alcohol abuse

TREATMENT

- Kidney transplant + Immunosuppressive drugs
- Dialysis, Hemodialysis & Peritoneal dialysis

- Limited water & protein (lutea)
- Restricted sodium intake (\uparrow b.P.) & potassium

Dialysis (Haemo-)

Features

1. Dialysate contains same conc. of essential salts as blood
 - Essential subs. (Glu, AA, Min. salts) don't diffuse out of blood into dialysis fluid
 - Essential subs. diffuse into patient's blood if he is lacking in them.
2. Long, narrow & coiled tube
 - \uparrow SA:Vol. for more thorough & efficient exchange of subs. b/wn blood & dialysis fluid
3. Direction of blood flow is opp. to dialysate
 - Dialysis fluid contains metabolic waste prod. to maintain steep conc. grad. for removal of waste prod.
(fluid doesn't contain any m.w. prod. to set up steep conc. grad., tubing bathed in specially controlled dialysis fluid & is p. permeable)

