

Excretion in Humans

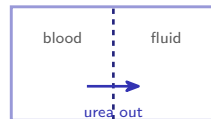
IGCSE Biology ■ Topic 13

IGCSE Biology



What we will cover

- 1 Excretion & the urinary system
- 2 The nephron
- 3 The liver & urea
- 4 Dialysis

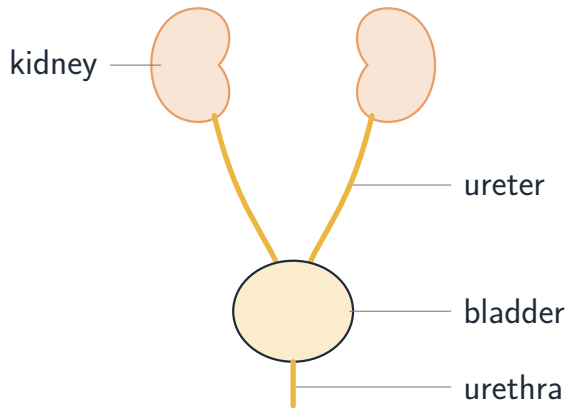


dialysis

1

The kidneys

Excretion and the urinary system



- **carbon dioxide** 二氧化碳 – made during respiration, and breathed out through the lungs.
- **urea** 尿素 – made in the **liver** 肝脏, and removed by the kidneys together with excess water and **ions** 离子.

The plumbing, and what the liver does first

Ureters

The **ureters** 输尿管 are the tubes from the kidneys to the bladder; the urethra carries urine out.

Nephrons

Each kidney holds millions of tiny tubes called **nephrons** 肾单位 – the filtering unit, repeated.

Deamination

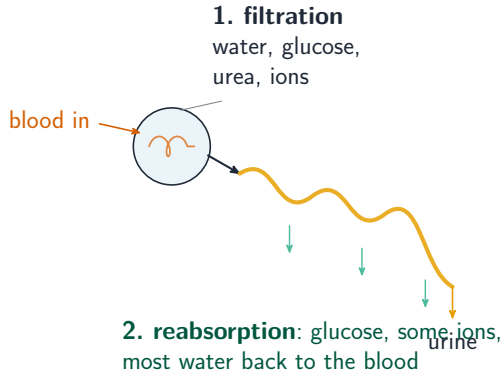
Excess amino acids cannot be stored. The liver removes the **nitrogen** 氮-containing part – **deamination** 脱氨基 – and turns it into **urea** 尿素.

Assimilation

The liver also carries out the **assimilation** 同化 of **amino acids** 氨基酸: joining them into the proteins the body needs.

The kidney does not *make* urea; the liver does. The kidney only removes it from the blood.

The nephron



A **nephron** 肾单位 cleans the blood in two steps:

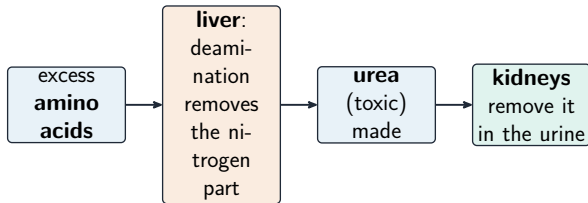
- **filtration** 过滤 at the **glomerulus** 肾小球 – water, glucose, urea, ions out
- **reabsorption** 重吸收 – **all** glucose, **some** ions, **most** water back

What is left is urine.

2

Urea and dialysis

The liver and urea



The **liver** 肝脏 breaks down excess **amino acids** 氨基酸 by **deamination** 脱氨基作用, making **urea** 尿素.

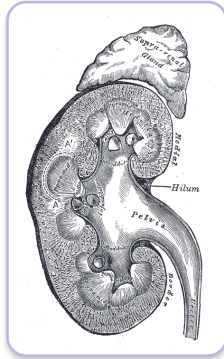
Urea is **toxic**, so the kidneys must excrete it before it builds up.

Dialysis



If the kidneys fail, a **dialysis** 透析 machine does their job. Blood flows through; waste & excess water cross a thin membrane; clean blood returns.

The urinary system



The kidneys filter the blood and make urine.

Inside the kidney

(Supplement) two regions

an outer **cortex** 皮质 and an inner **medulla** 髓质

the cortex

holds the glomeruli and the convoluted tubules, where filtering and most reabsorption happen

the medulla

holds the loops of Henle and the collecting ducts, where water is concentrated

the pelvis

where urine collects before leaving down the ureter

the nephron

the working unit – about a million per kidney, spanning both regions

the two steps

ultrafiltration in the glomerulus, then **selective reabsorption** along the tubule

Filtration removes almost everything small; reabsorption takes back what the body wants. That order is why glucose appears in the filtrate but not in normal urine.

Exam tips

- Excretion removes metabolic wastes. Carbon dioxide leaves through the lungs; urea, excess water and excess ions leave through the kidneys.
- Urine path: kidney → ureter → bladder → urethra.
- Nephron: the glomerulus **filters** the blood; the nephron **reabsorbs** all the glucose, some ions and most of the water. What is left is urine.
- Urea is made in the **liver** from excess amino acids by **deamination**.
- We must excrete urea because it is **toxic** to the body.

3

Recap

Worked example – what the kidney does

Glucose is filtered out of the blood at the kidney, yet healthy urine has none. Explain.

- At the glomerulus, high pressure forces small molecules out: **ultrafiltration**.
- Water, glucose, salts and urea all cross; **blood cells and proteins are too big** to.
- So the filtrate **does** contain glucose at first.
- Further along the tubule, **all** the glucose is taken back into the blood: **selective reabsorption** 选择性重吸收.
- **Glucose in urine** therefore suggests diabetes – too much to reabsorb.

Two steps: **ultrafiltration** (by size, at the glomerulus) then **selective reabsorption** (useful things taken back). Urea is the **waste** that stays.

Topic 13 – key takeaways

1

Wastes

CO₂ via lungs; urea via kidneys

2

Urine path

kidney, ureter, bladder, urethra

3

Nephron

filter, then reabsorb glucose, ions, water

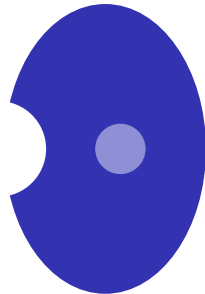
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Urea

liver makes it by deamination; it is toxic

Check yourself

- 1 Which organ makes urea?
- 2 What happens at the glomerulus?
- 3 What does the nephron reabsorb all of?
- 4 Why must urea be excreted?



Answers 1. the liver 2. filtration of the blood 3. glucose 4. it is toxic if it builds up