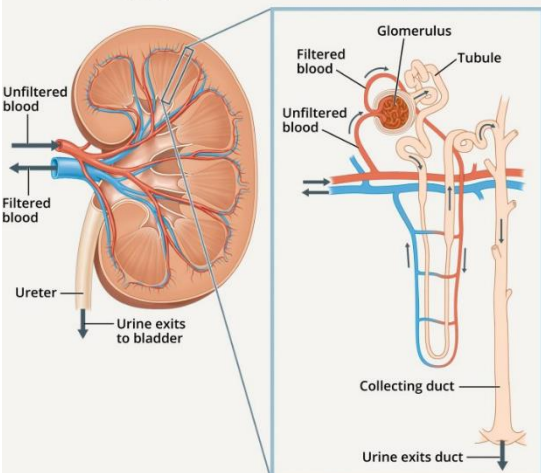


生物策略表

類別	生物策略 (Strategy)
生物策略 STRATEGY	腎臟如何過濾與循環 (How Kidneys Filter and Recycle)
生物系統 LIVING SYSTEM	人類 (<i>Homo sapiens</i>)
功能類別 FUNCTIONS	#捕捉、吸收或過濾化學個體 #調整濃度(離子、溶質等) #Capture, Absorb, or Filter Chemical Entities #Modify Concentration (of Ions, Solutes, Etc.)
作用機制標題	人類腎臟過濾血液中的廢物，並利用滲透作用、膜通透性的變化和蛋白質幫浦將對身體有益的化合物循環回其中。(Human kidneys filter waste from the blood and recycle beneficial compounds back into it using osmosis, variations in membrane permeability, and protein pumps.)
生物系統/作用機制 示意圖 (確認版權、註明出處；畫質)	 <p>照片出處:美國國家糖尿病、消化與腎臟疾病研究所，美國國家衛生院(Image by: National Institute of Diabetes and Digestive and Kidney Diseases, National Institutes of Health.)</p>
作用機制摘要說明 (SUMMARY OF FUNCTIONING MECHANISMS)	
<p>腎的主要目的是從我們的血液中過濾代謝廢物。為了有效地做到這一點，它必須處理大量的我們身體很需要的東西，例如來自血液中去除水分、礦物質、葡萄糖的液體。如果腎臟不回收這些有用的化合物，我們將不得不每天攝取許多加侖的水和大量的礦物質。</p> <p>腎臟的機制是由超過百萬個獨立生產線——腎元 (nephron) 所組成。腎元有兩個功能區，分別為絲球體和腎小管。</p> <p>絲球體是一束圓形血管，大部分的過濾發生在此處。圓形絲球體中的多孔血管壁允許小分子(水、礦物質和廢物)從血管進入腎元內部再進入腎小管。較大的分子，例如蛋白質太大而無法通過並留在血液中。</p> <p>然後，腎小管將有益的水和礦物質返回到圍繞他的血管中，並允許廢物作為尿液排出。腎小管的第一部份透過通過滲透膜回收大部分的水。該部份通常也不能滲透礦物質。</p>	

第二部份，水不能滲透，主要利用蛋白質幫浦將礦物質離子返回血液。當擴散主動移動離子時，因為另一側已經有太多離子，蛋白質幫浦通常使用身體的能量分子三磷酸腺苷，主動得移動他們。

腎元的最終產物是含有一些水和廢物得為循環液體。他離開腎元的集尿管並流向膀胱，膀胱根據需要儲存和排出尿液。

(A kidney's primary purpose is to filter metabolic waste products from our blood. To do so effectively, it has to process a lot of fluid, which also ends up removing water, minerals, and glucose from the blood—things our bodies need. If the kidney didn't recycle these useful compounds, we would have to consume gallons of water and large quantities of minerals each day.

The machinery of the kidneys is a collection of over a million independent processing lines—the nephrons. A nephron has two functional zones, the glomerulus and the tubule.

The glomerulus is a round bundle of blood vessels, where the bulk of the filtering occurs. The porous vessel walls in the round glomerulus allow small molecules (water, minerals, and waste products) to cross from the bloodstream into the nephron's interior and into the tubules. Larger molecules, like proteins, are too big to pass through and remain in the bloodstream.

The tubule then returns beneficial water and minerals to blood vessels that surround it and allows waste material to drain away as urine. The first portion of the tubule recovers most of the water across permeable membranes via osmosis. This section is also generally impermeable to minerals.

The second portion, which water cannot penetrate, focuses on using protein pumps to return mineral ions to the blood. When diffusion won't passively move ions because there are already too many on the other side, protein pumps typically use the body's energy molecule—ATP—to actively move them.

The end result inside the nephron is the unrecycled fluid containing some water and waste products. It exits the nephron's collecting ducts and heads to the bladder, which stores and drains the urine as needed.)

文獻引用 (REFERENCES)

一個典型的腎包含大約一百萬個腎元。每一個腎元都包含一個叫做腎小體的過濾成分，和一個發生再吸收和分泌作用的腎小管。

“A typical kidney contains about 1 million nephrons. Each nephron consists of a filtering component, called a renal corpuscle, and a tubule where reabsorption and secretion take place.”

腎小管再吸收是液體和溶質從腎小管系統進入到微血管的運動。這個過程使身體保留液體和所需的溶質。被動運輸包含滲透作用和擴散作用，然而主動運輸機制，例如一級和次級運輸和胞吞作用，需耗能逆著電化學濃度梯度來移動物質。

“Tubular reabsorption is the movement of fluid and solutes from the tubular system into the peritubular capillaries. This process allows the body to retain fluid and desired solutes . . . Passive transport includes osmosis and diffusion while active transport mechanisms, such as primary and secondary transport and endocytosis, require the use of energy to move substances against an electrochemical gradient.”

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生物系統延伸資訊連結 (LEARN MORE ABOUT THE LIVING SYSTEM/S)

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AskNature 原文連結

<https://asknature.org/strategy/how-kidneys-filter-and-recycle/>

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