# Countercurrent exchange system

200px|náhled|vpravo|Mechanismus protiproudové výměny – zde výměna tepla. Tekutina, která teče dolů, ohřívá tekutinu, která teče nahoru.

A **countercurrent exchange system** is a system in which two fluids of different properties flow parallel and against each other in semipermeable tubes, which allow compensation for these differences. In humans, this mechanism is significantly involved in the process of **maintaining renal medulla hyperosmolarity**.

## Organization

Countercurrent exchange in the renal medulla is enabled thanks to the mutual **hairpin parallel arrangement** of the individual medula formations. These are the descending and ascending limb of Henle's loop , the descending and ascending part of the vasa recta and the collecting ducts.

## Mechanism

The vasa recta are **permeable to water** and the blood flows slowly in them, so that the **osmotic gradients** between the blood and the interstitial fluid of the medulla can be **balanced**.

- In the descending part of the vessel, NaCl and urea move from the interstitium to the blood, while water moves from the blood to the interstitium.
- At the top of the capillary loop, the blood reaches its highest osmotic concentration.
- In the ascending part of the vessel, NaCl and urea move back into the interstitium and water back into the blood.

As a result, water passes from the descending to the ascending part of the vasa recta, and thus remains in circulation, while the solutes recirculate from the ascending to the descending part of the vasa recta and therefore remain in the medulla.

## Meaning

The countercurrent exchange system provides a **vascular supply** to the medulla without blood flushing the solutes from the hyperosmotic interstitium. The hyperosmotic interstitium is then necessary to condense the urine in the collecting ducts.

There are other mechanisms based on countercurrent exchange. For example, the vascular supply of peripheral parts of the body without large heat losses is provided by countercurrent heat exchange between the supply arteries and the parallel veins.

## Sources

### Related articles

- Countercurrent multiplication system
- Nephron
- Kidneys

### External sources

- Článek na anglické wikipedii (https://en.wikipedia.org/wiki/Countercurrent_exchange)

### Used literature

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