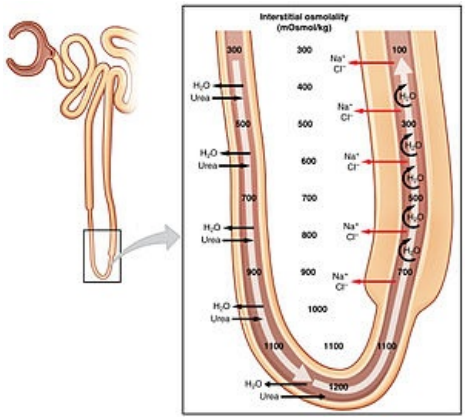
Counter current multiplication system

The countercurrent multiplying system is a system that enables the formation of a hypertonic medulla with an osmolarity gradient increasing from the cortex to the depth of the renal medulla. In humans, it acts in the medulla of the kidneys, specifically in the part of the nephron called The loop of Henle.

Loop of Henle

The loop of Henle consists of a descending limb and an ascending limb that are arranged in parallel. The individual parts of the loop are separated by an interstitium and **differ in their permeability**.

The descending limb is highly permeable to water but poorly permeable to solutes. On the contrary, the ascending arm is almost impermeable to water, but there is active transport Na^+ a Cl^- from the tubular fluid to the interstitium.



Loop of Henle

Mechanism

isotonic tubular fluid flows into the descending limb of the loop of Henle. The surrounding interstitium is hypertonic, therefore there is a passive transfer of water from the tubule to the interstitium. **Thickening** of the tubular fluid occurs

The highest osmotic concentration is reached by the tubular fluid at the top of the loop. Active transport of solutes from the tubular fluid to the interstitium takes place in the ascending branch, which conditions the formation of a **hypertonic pulp** (water resorption does not occur here). The tubular fluid is gradually **diluted and** hypoosmotic fluid leaves the loop of Henle.

Meaning

Thanks to this arrangement, a strongly **hyperosmotic interstitium** is created at the top of the loop , which sucks water (in case of opening of aquaporins with ADH) from the distal tubule and the collecting duct. It thus ensures the **production of concentrated urine**. The longer the loop of Henle (juxtamedullary nephrons in the kidney medulla), the more concentrated urine a given nephron is able to produce.

During the active resorption of solutes from the ascending limb of the loop of Henle, energy is **consumed**. However, the transport only takes place against **a constant small gradient** , so the energy consumption is relatively low.

Links

Related Articles

- Counter current multiplication system
- Nephron
- Kidneys
- Tubular processes

External links

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

References

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