

Secretion

Secretion is defined as moving a substance from the peritubular capillaries to the kidney tubules. This can occur after the substance has passed through the glomerulus without being filtered. Interestingly, the nephron has the ability to both filter and secrete some substances. Filtering and secreting a substance greatly increases its clearance rate. This increased rate of clearance for certain substances presented an interesting problem for physicians during WWII. Penicillin was the first antibiotic drug developed that was effective against infections. During WWII, the demand for penicillin exceeded the ability to manufacture the drug. In addition, penicillin is rapidly cleared from the body because it is both filtered and secreted in the nephron. Fortunately, secretion is a very specific process that uses proteins to bind to the substance and secrete it from the peritubular capillaries into the nephron. Because of this specificity, scientists discovered that if they added another substance that competed for the same transporter as penicillin, the life span of penicillin in the body could be extended. This resulted in a longer half-life (decreased clearance rate) for penicillin and allowed the physicians to use less penicillin per soldier, thereby alleviating the manufacturing woes. Have you ever wondered why certain drugs warn against taking them in combination with other drugs? Well, consider that a drug's dose is typically determined by age and weight. The drug amount also assumes that the kidney is working properly, thus the clearance of the drug is also considered as part of the dosing. Taking two drugs that compete for the same transporter could indirectly increase the dose of one of the drugs to lethal levels. The kidneys can also secrete substances like H^+ or HCO_3^- to help with acid/base disorders (discussed later) or even K^+ or PO_4^- depending on circumstances.



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