1.6: Excretion

**Excretion** is the final stage of a medication interaction within the body. The body has absorbed, distributed, and metabolized the medication molecules – now what does it do with the leftovers? Remaining parent drugs and metabolites in the bloodstream are often filtered by the kidney, where a portion undergoes reabsorption back into the bloodstream, and the remainder is excreted in the urine. The liver also excretes byproducts and waste into the bile. Another potential route of excretion is the lungs. For example, drugs like alcohol and the anesthetic gases are often eliminated by the lungs. [1]

**Critical Thinking Activity 1.6a**

When providing care for a patient who has chronic kidney disease, how does this disease impact medication excretion?

Note: Answers to the Critical Thinking activities can be found in the “Answer Key” sections at the end of the book.
Now let's further discuss the various routes of excretion from the body.

**Kidney**

The most common route of excretion is the kidney. As the kidneys filter blood, the majority of drug byproducts and waste are excreted in the urine. The rate of excretion can be estimated by taking into consideration several factors: age, weight, biological sex, and kidney function. Kidney function is measured by lab values such as serum creatinine, glomerular filtration rate (GFR), and creatinine clearance. If a patient's kidney function is decreased, then their ability to excrete medication is affected and drug dosages must be altered for safe administration.

**Liver**

As the liver filters blood, some drugs and their metabolites are actively transported by the hepatocytes (liver cells) to bile. Bile moves through the bile ducts to the gallbladder and then on to the small intestine. During this process, some drugs may be partially absorbed by the intestine back into the bloodstream. Other drugs are biotransformed (metabolized) by intestinal bacteria and reabsorbed. Unabsorbed drugs and byproducts/metabolites are excreted via the feces. If a patient is experiencing decreased liver function, their ability to excrete medication is affected and drug dosages must be decreased. Lab studies used to estimate liver function are called liver function tests and include measurement of the ALT and AST enzymes that the body releases in response to damage or disease.

**Other Routes to Consider**

Sweat, tears, reproductive fluids (such as seminal fluid), and breast milk can also contain drugs and byproducts/metabolites of drugs. This can pose a toxic threat, such as the exposure of an infant to breast milk containing drugs or byproducts of drugs ingested by the mother. Therefore, it is vital to check all medications with a healthcare provider before administering them to a mother who is breastfeeding. 

Putting it all together...

Prescribing and administering medications in a safe manner to patients is challenging and requires a team effort by pharmacists, healthcare providers, and nurses. In addition to the factors described in this chapter, there are many other considerations for safe medication administration that are further explained in the “Legal/Ethical” chapter.

**Lifespan Considerations**

**Neonate & Pediatrics:** Young patients have immature kidneys with decreased glomerular filtration, resorption, and tubular secretion. As a result, they do not clear medications as efficiently from the body. Dosing for most medications used to treat infants and pediatric patients is commonly based on weight in kilograms, and a smaller dose is usually
prescribed. In addition, pediatric patients may have higher levels of free circulating medication than anticipated and may become toxic quickly. Therefore, frequent assessment of infants and children is vital for early identification of drug toxicity.  

**Older Adult:** Kidney and liver function often decrease with age, which can lead to decreased excretion of medications. Subsequently, medication may have a prolonged half-life with a greater potential for toxicity due to elevated circulating drug levels. Smaller doses of medications are often recommended for older patients due to these factors, which is commonly referred to as “Start low and go slow.”

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**Interactive Activity**

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