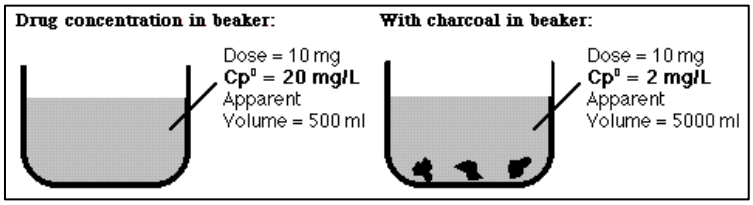
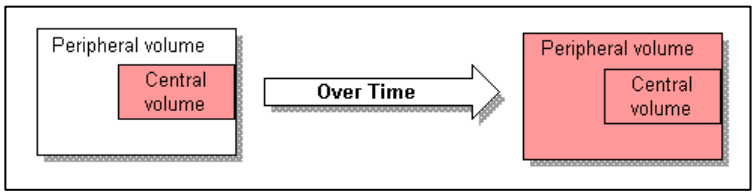
Volume of Distribution

Anesthetic Pearls: Determinants of the Volume of Distribution

Volume of Distribution (Vd) can be defined as the apparent volume into which a drug has been distributed. This can be calculated by dividing the dose administered by the resulting plasma concentration. **Vd = Dose / Concentration**



This volume can be divided into a central compartment and a peripheral compartment. The **central compartment** represents the plasma volume, into which the drug is initially diluted. **Peripheral compartments** are comprised of the tissues that the drug then distributes into over time. Redistribution among central and peripheral compartments continues until a steady state is reached. Vd is typically calculated at this point of steady state redistribution.



Major factors affecting Vd are: 1) tissue solubility, 2) protein binding, 3) drug metabolism. More soluble drugs will distribute more to peripheral compartments resulting in a lower plasma concentration and therefore higher Vd. Highly protein bound drugs will have lower Vd because more drug is kept in plasma and unavailable for peripheral distribution. Drugs that are quickly metabolized will have lower concentrations by the time steady state is reached, resulting in higher Vd.

Volume of distribution varies among individuals secondary to differences in muscle / fat distribution and total body water. Also, individuals with disease states that affect protein concentration and / or drug metabolism will alter Vd.