Drug's with a lower clearance persist for a longer time in the body. Drug's with a higher clearance persist for a shorter time in the body. The longer a drug resides in the body, then the greater the exposure a patient has to a drug. A measure of drug exposure is the area under curve (AUC). AUC is the area beneath the $C_p$-time curve. The units on AUC are a very non-intuitive concentration-time. (As with any area, the units are simply the units for the x-axis multiplied by the units of the y-axis.) For this discussion, concentration is specifically mass/vol and not molarity. Molarity is convenient for the coverage of in vitro results and binding studies, but pharmacokinetic data originate from living systems – either animals or humans. $C_p$ data in animals and humans are normally in mass/vol. AUC and clearance are intimately related. In fact, it is through AUC that clearance can be calculated. So, how can one determine AUC for a drug?

AUC can be determined in two ways. Method one involves integrating the $C_p$-time plot of a drug. An idealized $C_p$-time plot for an IV bolus is shown below. The AUC for this plot, when evaluated from $t=0$ to $t=\infty$, is $C_p^o/k_{el}$. Of course, one would first need to know both $C_p^o$ and $k_{el}$. These values could be determined from a ln $C_p$-time plot from the same data.

Method two for determining AUC for a drug is to crudely estimate the value with the trapezoid rule. Each data point defines a trapezoid-shaped region in the curve. The sum of the areas created by each data point gives an approximate AUC. While crude, this method is fairly effective and simple. Because $C_p$-time data points do not stretch to infinity, one needs a method to estimate the AUC from the last $C_p$ data point to infinite time. The remaining area can be estimated as the value of the final $C_p$ point divided by the $k_{el}$ value of the drug.
Regardless of how $AUC$ is estimated, dividing the amount of drug that the animal or human was dosed by $AUC$ gives $CL$. This calculation is the most common method for determining $CL$ for a drug.

$$CL = \frac{D_o}{AUC}$$

Note the units on $CL$. If dose is a drug mass and $AUC$ uses mass instead of moles, then the mass units cancel and $CL$ comes out with the correct units of volume/time.

$$\frac{\text{volume}}{\text{time}} = \frac{\text{mass}}{\text{mass} \times \text{time}}$$

$$= \frac{1}{\text{time}}$$