The requirement for any drug discovery program is to design a drug that can be dosed in a manner that allows the drug to maintain safe and effective levels in the body. An effective level is defined as at least the **minimum effective concentration**. A safe level is any concentration below the **maximum tolerated concentration**, or the dose below which severe adverse effects are not observed. The concentration range between the minimum effective concentration and maximum tolerated concentration defines the **therapeutic window** of the drug. A drug dosing regimen must maintain $C_p$ within the therapeutic window.

Multiple doses of oral drugs give a characteristic sawtooth shape. As soon as the drug is taken, the plasma concentration slowly rises until the absorption phase reaches $t_{\text{max}}$. The elimination phase then dominates, and the concentration drops until the next dose is administered. The maximum occurs at $t_{\text{max}}$ after a dose, and the minimum occurs at $t_o$ of the next dose. The observed $C_p$ in the patient corresponds to the sum of the concentrations of the different oral doses that have been administered to a patient. In the graph below, individual doses are shown as dotted lines, and the sum of all doses is the solid line.

A successful orally dosed drug will maintain the $C_p$ of the drug within the therapeutic window. Administering a drug more frequently with a smaller dose will maintain $C_p$ within a tighter range, but it inconveniences a patient with taking medication more often. The gold standard for oral dosing is a once-per-day regimen. Taking a drug once a day allows a patient to establish a convenient routine without being overly burdened.
smaller, more frequent dose

larger, less frequent dose