Today many competitive inhibitors are used as drugs.

Sulfanilamide, a sulfur drug, is an antibacterial agent because it is a competitive inhibitor of an enzyme catalyzed reaction using *p*-aminobenzoic acid in the synthesis of folic acid.

Note the structural similarity of the substrate and competitive inhibitor.

Folic acid is a water-soluble vitamin.

Sulfanilamide is apparently not harmful to man because folic acid is not synthesized by man but obtained in the diet.

Apparently bacteria can't absorb sufficient folic acid from the host and are susceptible to inhibition by such drugs.

Methotrexate (amethopterin) is a competitive inhibitor of dihydrofolate reductase because its structure is similar to dihydrofolate as shown in the handout figure.

Methotrexate is used in cancer chemotherapy because it blocks tetrahydrofolate synthesis which is essential to the biosynthesis of the thymine mononucleotide.

Rapidly dividing cancer cells which are synthesizing DNA are more susceptible to methotrexate than slower growing normal cells.

Consider another type of inhibitor referred to as a noncompetitive.

Noncompetitive inhibitors are characterized by the following kinetics relative to the kinetics in the absence of an inhibitor

The maximum velocity in the presence of a noncompetitive inhibitor is lower than that in the absence of inhibitor.

This behavior can be accounted for by a kinetic scheme for which the inhibitor combines reversibly with the enzyme at a site different from that of the substrate as follows

One can derive a rate equation for the reaction in the presence of inhibitor in a manner to that for the reaction in the absence of inhibitor

Let's show that at "high" [S], $v \neq V_{max}$.

If [S] » K_M, $v = V_{max}/(1+[I]/K_I)$. Since $[I]/K_I$ is positive, $(1+[I]/K_I) > 1$ and $v < V_{max}$.

K_I can be determined from a double reciprocal plot of the kinetic data