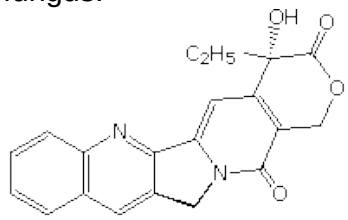
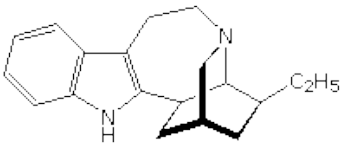
# Some Polycyclic Heterocycles

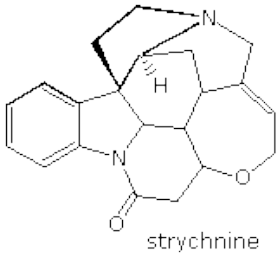
Heterocyclic structures are found in many natural products. Examples of some nitrogen compounds, known as alkaloids because of their basic properties, were given in the amine chapter. Some other examples are displayed in the following diagram. Camptothecin is a quinoline alkaloid which inhibits the DNA enzyme topoisomerase I. Reserpine is an indole alkaloid, which has been used for the control of high blood pressure and the treatment of psychotic behavior. Ajmaline and strychnine are also indole alkaloids, the former being an antiarrhythmic agent and latter an extremely toxic pesticide. The neurotoxins saxitoxin and tetrodotoxin both have marine origins and are characterized by guanidiniun moieties. Aflatoxin $B_1$ is a non-nitrogenous carcinogenic compound produced by the Aspergillus fungus.



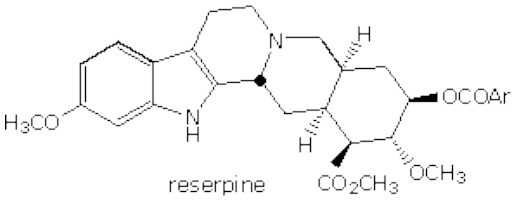
camptothecin



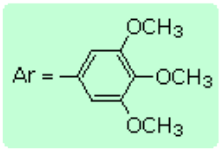
ibogamine

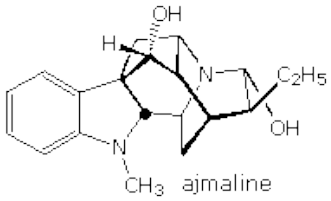


strychnine



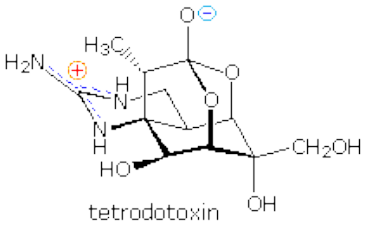
reserpine



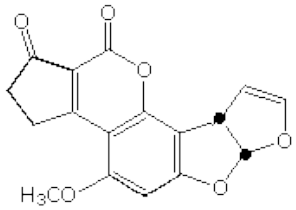



ajmaline

saxitoxin



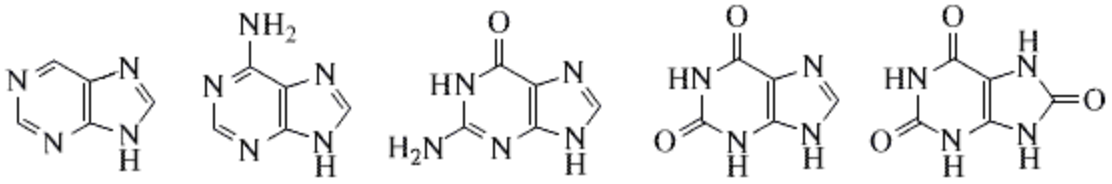
tetrodotoxin



aflatoxin $B_1$

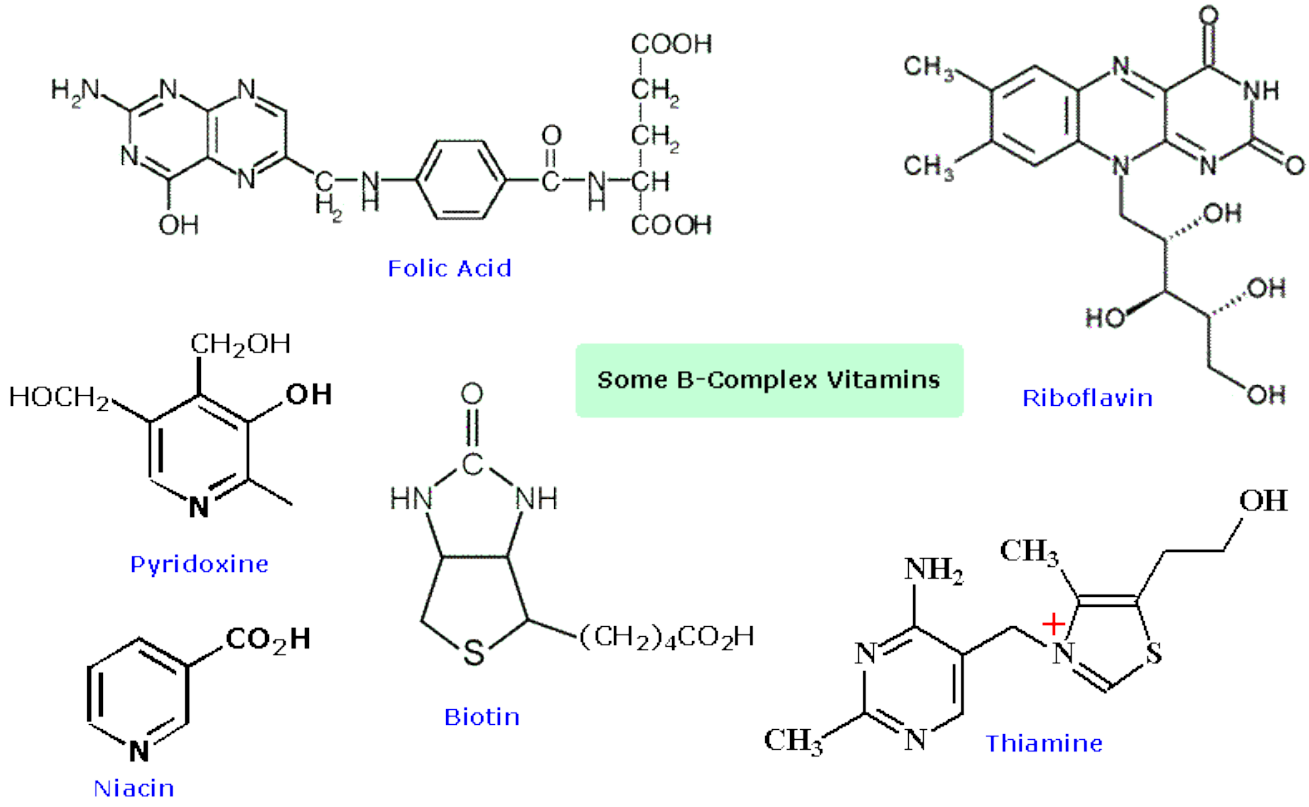
Porphyrin is an important cyclic tertrapyrrole that is the core structure of heme and chlorophyll. These structures will be drawn above by clicking on the diagram.

Derivatives of the simple fused ring heterocycle purine constitute an especially important and abundant family of natural products. The amino compounds adenine and guanine are two of the complementary bases that are essential components of DNA. Structures for these compounds are shown in the following diagram. Xanthine and uric acid are products of the metabolic oxidation of purines. Uric acid is normally excreted in the urine; an excess serum accumulation of uric acid may lead to an arthritic condition known as gout.



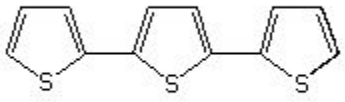

Examples of common methylated purines will be drawn above by clicking on the diagram. Caffeine, the best known of these, is a bitter, crystalline alkaloid. It is found in varying quantities, along with additional alkaloids such as the cardiac stimulants theophylline and theobromine in the beans, leaves, and fruit of certain plants. Drinks containing caffeine, such as coffee, tea and some soft drinks are arguably the world's most widely consumed beverages. Caffeine is a central nervous system stimulant, serving to ward off drowsiness and restore alertness. Paraxantheine is the chief metabolite of caffeine in the body.

Sulfur heterocycles are found in nature, but to a lesser degree than their nitrogen and oxygen analogs. Two members of the B-vitamin complex, biotin and thiamine, incorporate such heterocyclic moieties. These are shown together with other heterocyclic B-vitamins in the following diagram.

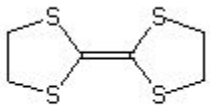



Terthienyl is an interesting thiophene trimer found in the roots of marigolds, where it provides nemicidal activity. Studies have shown that UV irradiation of terthienyl produces a

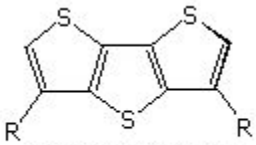
general phototoxicity for many organisms. Polymers incorporating thiophene units and fused systems such as dithienothiophene have interesting electromagnetic properties, and show promise as organic metal-like conductors and photovoltaic materials. The charge transfer complex formed by tetrathiofulvalene and tetracyanoquinodimethane has one of the highest electrical conductivities reported for an organic solid.



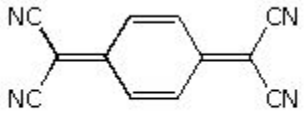
terthienyl



tetrathiofulvalene



dithienothiophene
(R=H)



tetracyanoquinodimethane

Source : http://www2.chemistry.msu.edu/faculty/reusch/VirtTxtJml/heterocy.htm#top1