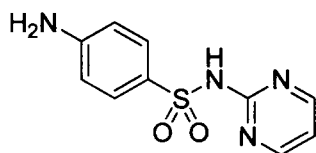
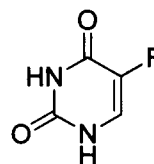


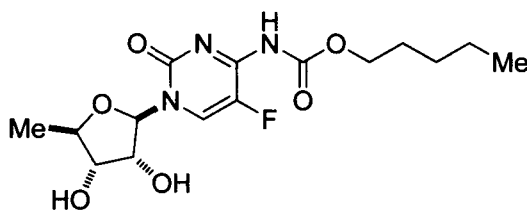
A large number of natural products and pharmaceuticals possess the pyrimidine structure. For example, sulfadiazine is a sulfonamide antibiotic that contains a 5-aminopyrimidine.¹ It eliminates bacteria that cause infections by stopping the production of folic acid inside the bacterial cell, and it is commonly used to treat urinary tract infections (UTIs). Silver sulfadiazine is a topical sulfonamide/silver antibacterial used as creams for the treatment of burns, including chemical burns. It prevents the growth of a wide array of bacteria, as well as yeast, on the damaged skin. Silver sulfadiazine is also an orally administered chemotherapeutic agent used in the treatment of metastatic breast and colorectal cancers. The chemotherapy agent 5-fluorouracil (5-FU) has been used against cancer for about 40 years. Capecitabine is a prodrug that is enzymatically converted to 5-FU in the tumor, where it inhibits DNA synthesis and slows growth of tumor tissue. 5-FU is an inhibitor that mainly works through irreversible inhibition of thymidylate synthase and blocks the synthesis of the pyrimidine thymidine, which is a nucleoside required for DNA replication.



sulfadiazine



5-FU



capecitabine

Pyrimidine-fused ring systems are abundant in nature and often used as the core structures in numerous pharmaceuticals. For instance, purines contain the pyrimidine moiety as part of a more complex, fused-ring heterocyclic structure. This class of heterocycles including substituted purines and their tautomers is the most widely distributed kind of nitrogen-containing heterocycles in nature. Two of the four deoxyribonucleotides and two of the four ribonucleotides, the respective building blocks of DNA and RNA, are purines. Adenine is one of the two purine nucleobases (the other being guanine) used in forming nucleotides of the nucleic acids. In DNA, adenine binds to thymine *via* two hydrogen bonds to assist in stabilizing the