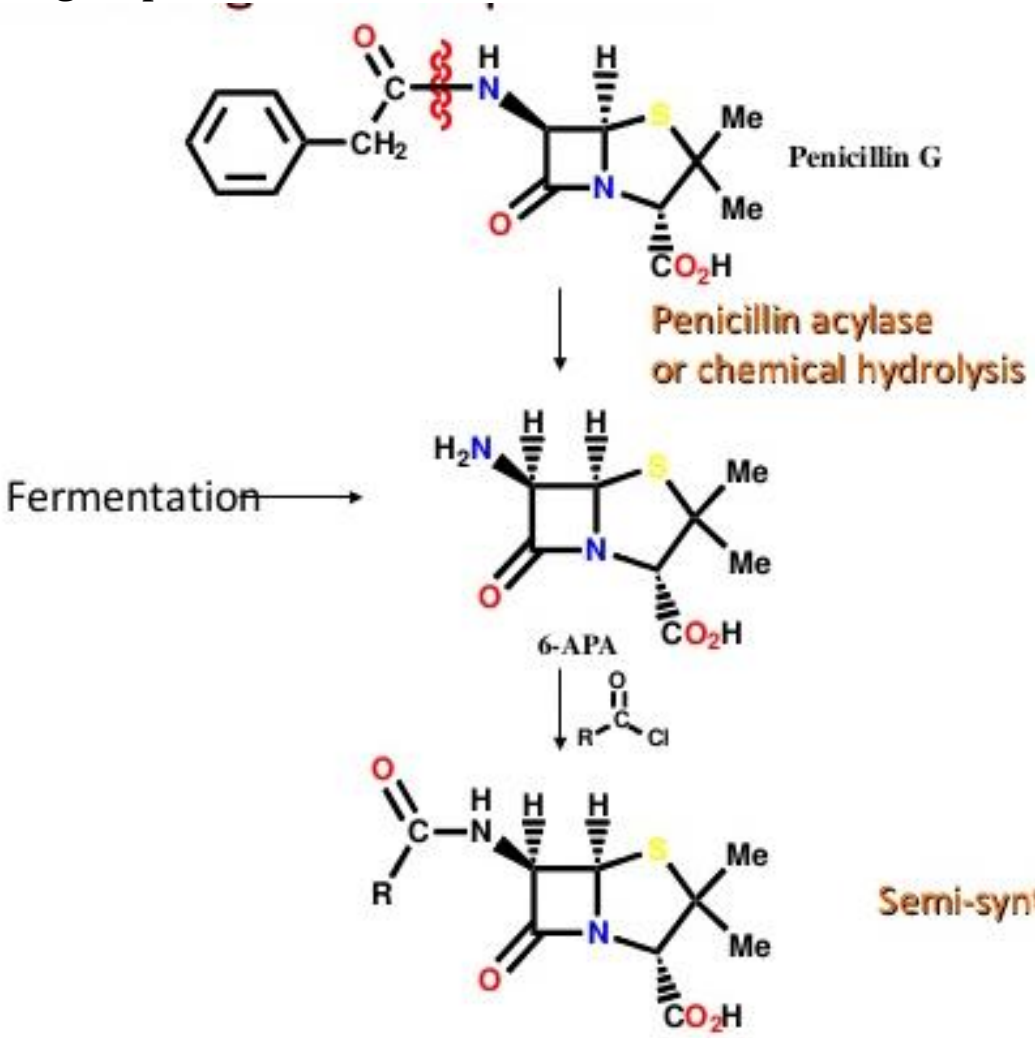
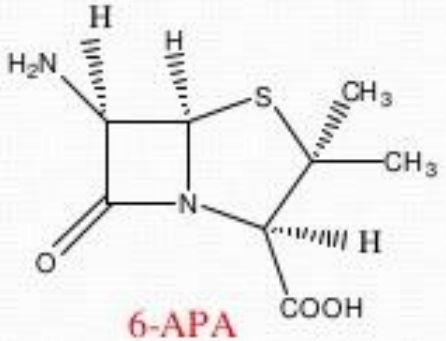
The penicillins were the first antibiotics discovered as natural products from the mold Penicillium.

Penicillins as well as cephalosporins are called beta-lactam antibiotics and are characterized by three fundamental structural requirements: the fused beta-lactam structure and a free carboxyl acid group, and one or more substituted amino acid side chains.



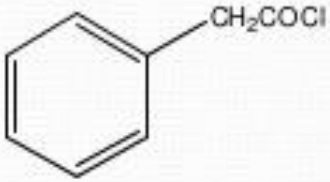
Penicillin-G where R = an ethyl pheny group, is the most potent of all penicillin derivatives. It has several shortcomings and is effective only against gram-positive bacteria. It may be broken down in the stomach by gastric acids and is poorly and irregularly absorbed into the blood stream. In addition many disease producing staphylococci are able to produce an enzyme capable of inactivating penicillin-G. Various semisynthetic derivatives have been produced which overcome these shortcomings.

Synthesis of Penicillin G from 6-APA:



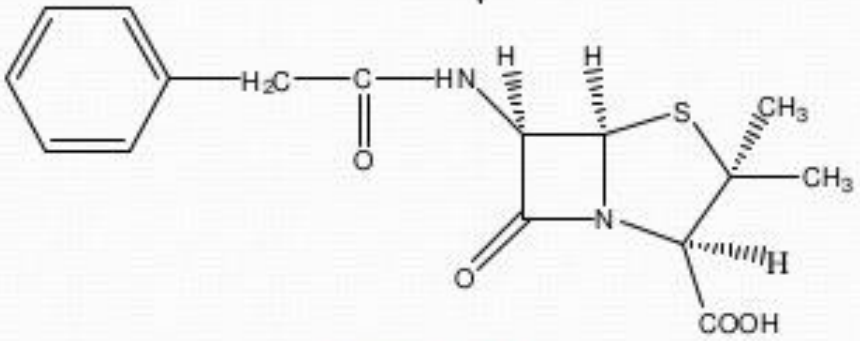
6-APA

+



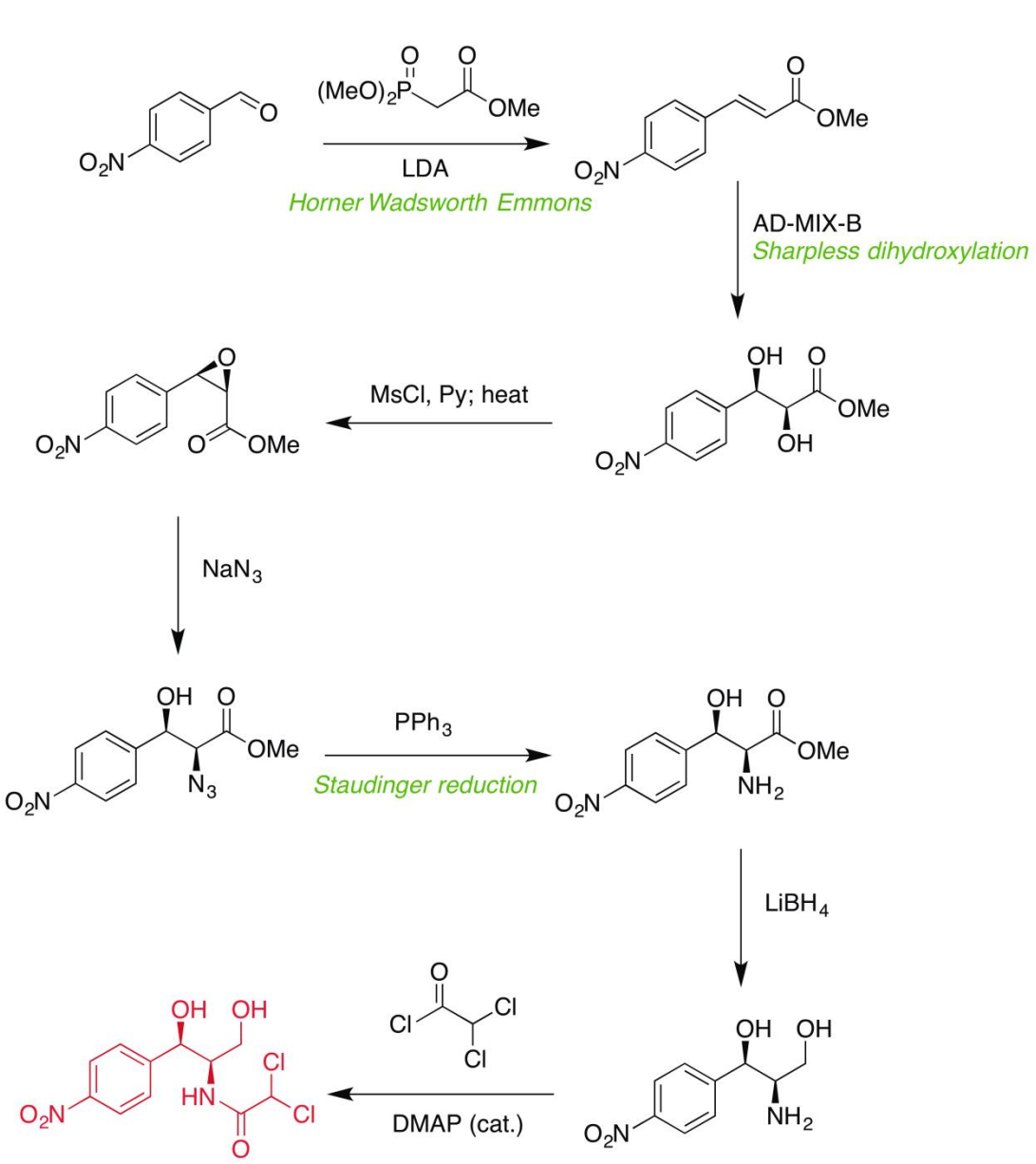
2-phenylacetyl chloride

-HCl



Penicillin G

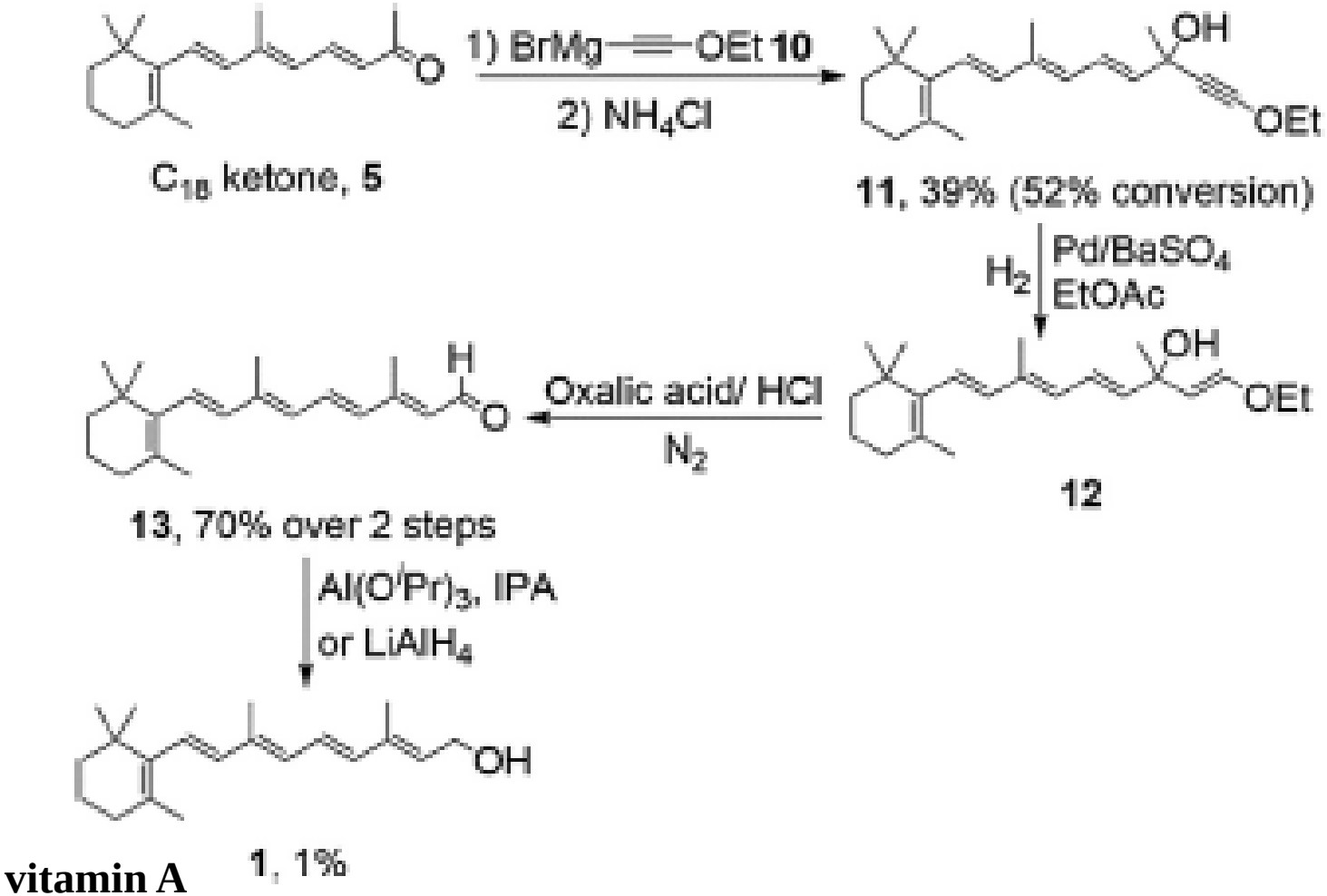
Chloramphenicol is an antibiotic useful for the treatment of a number of bacterial infections.



Chloramphenicol

Chloramphenicol is a broad-spectrum antibiotic that was derived from the bacterium Streptomyces venezuelae and is now produced synthetically. Chloramphenicol is effective against a wide variety of microorganisms, but due to serious side-effects (e.g., damage to the bone marrow, including aplastic anemia) in humans, it is usually reserved for the treatment of serious and life-threatening infections (e.g., typhoid fever). Chloramphenicol is bacteriostatic but may be bactericidal in high concentrations or when used against highly susceptible organisms. Chloramphenicol stops bacterial growth by binding to the bacterial ribosome (blocking peptidyl transferase) and inhibiting protein synthesis.

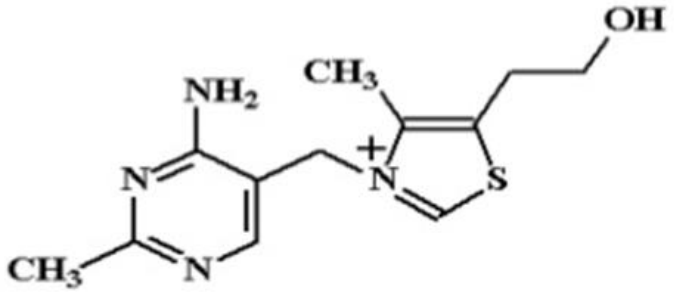
The synthesis of retinol begins from the advanced intermediate C18 ketone 5, which had previously been synthesized in the production of vitamin A acid. In the process of synthesizing **vitamin A**, Arens and van Dorp successfully developed a protocol for creating alkoxyethynyl alcohols from ethoxyacetylene and ketones, a procedure subsequently known as the Arens-van Dorp reaction and patented in 1953.



Scheme 2. Arens-van Dorp synthesis of retinol.

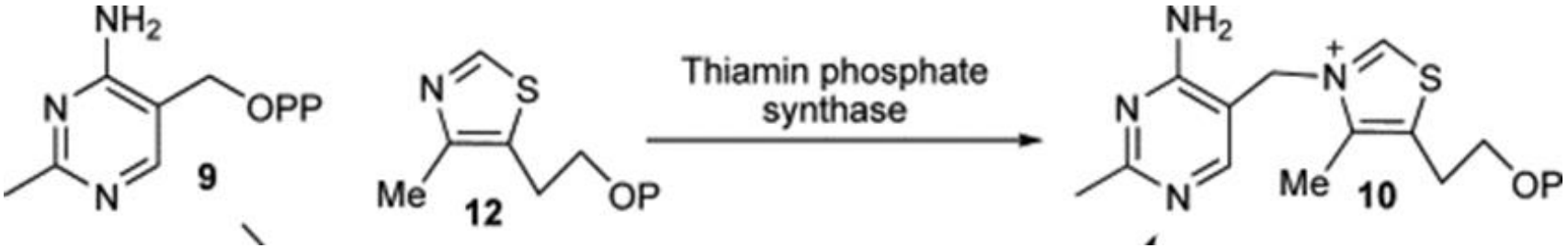
Thiamine - Structure

vitamin B1



Thiamine

Thiamine contains a substituted pyrimidine ring (dimethyl 6-amino pyrimidine) connected to a substituted thiazole ring (Methyl hydroxy ethyl thiazole) by means of Methylene bridge.



Pyridoxal phosphate

Thiazole phosphate

Vitamin B 6 is a water-soluble vitamin present in **three major chemical forms:**

pyridoxine, pyridoxal,pyridoxamine

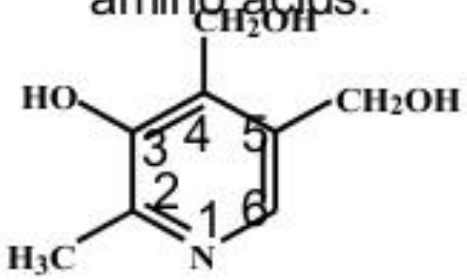
These three are interconvertible in their phosphorylated form.

It is also called Adermin,because it is used as an antidermatitic factor (**acrodynia factor**)for rats.

The plant sources mainly contain pyridoxal,pyridoxamine and animal sources contain Pyridoxine.

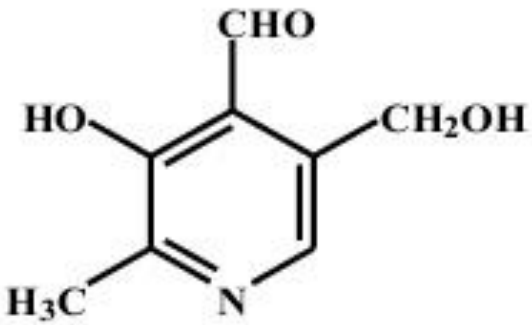
Active form is pyridoxal phosphate

It is essential coenzyme for trans amination and decarboxylation of amino acids.

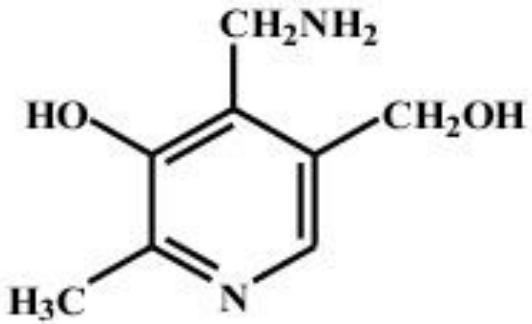


PYRIDOXINE (Pyridoxol)

[2-methyl-3-hydroxy-4-5 di(hydroxymethyl)-Pyridine]



PYRIXOXAL



PYRIDOXAMINE

Collectively, pyridoxine, pyridoxal and pyridoxamine are known as vitamin B6.

L-Ascorbic acid (vitamin C) is synthesized in plants and in the livers of most vertebrates. Humans, monkeys, and guinea pigs do not have the enzymes necessary for the biosynthesis of vitamin C, so they must obtain the vitamin in their diets. The biosynthesis of vitamin C involves the enzymatic conversion of D-glucose into L-gulonic acid—reminiscent of the last step in the Fischer proof. L-Gulonic acid is converted into a by the enzyme lactonase, and then an enzyme called oxidase oxidizes the lactone to L-ascorbic acid. The L-configuration of ascorbic acid refers to the configuration at C-5, which was C-2 in D-glucose.