

# **Chemistry in Everyday life**

**By  
Sinha Sir , Kota**

# How do enzymes catalyse the reaction

1. Biological processes are **enzyme catalyzed reactions**. Enzymes increases/alter the rate of biological reactions.

2. Carrier proteins carry polar molecules across the cell membrane.

2. **Proteins which perform the role of biological catalysts in the body are called enzymes.**

3. **Proteins ,which are crucial to communication system in the body are called receptors**

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# How do enzymes catalyse the reaction

1. How do Enzymes catalyse the reaction?

Enzymes perform two major functions:

(i) Role 1: To hold the **substrate** for a chemical reaction. **Active sites** of enzymes hold the substrate molecule in a suitable position, so that it can be attacked by the reagent effectively.

Substrates bind to the active site of the enzyme through a variety of interactions such as ionic bonding, hydrogen bonding, van der Waals interaction or dipole-dipole interaction.

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# How do enzymes catalyse the reaction

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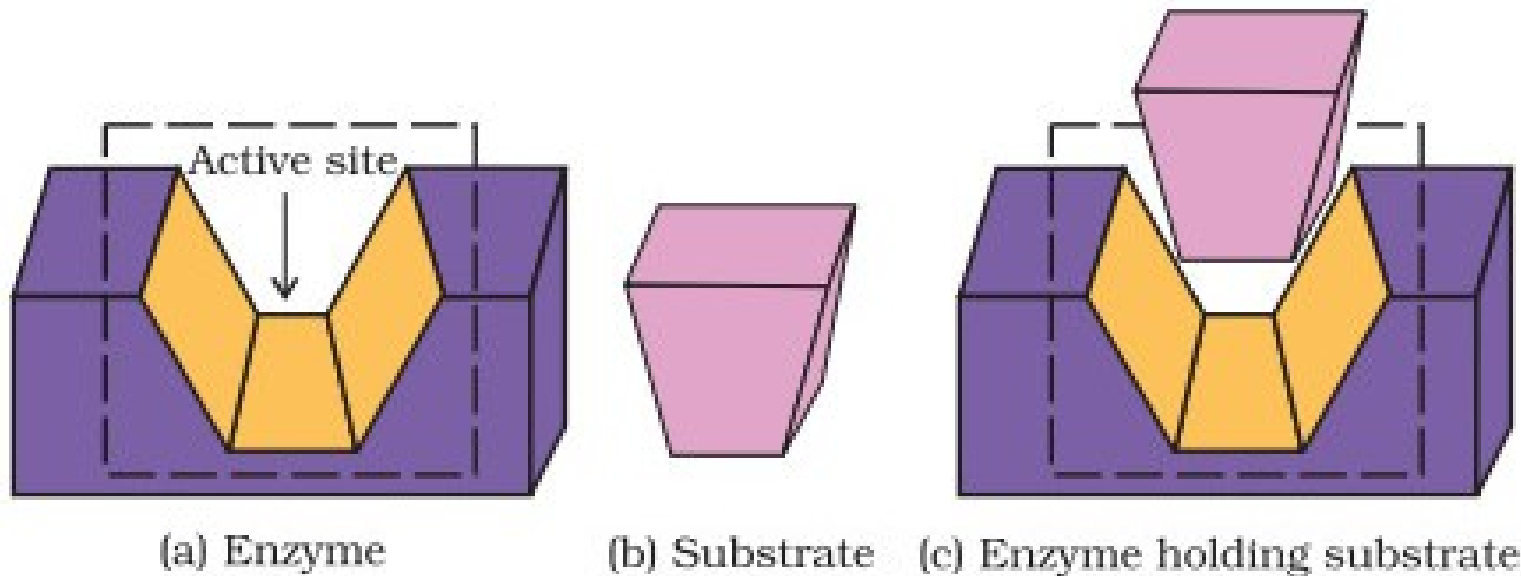
Enzymes perform two major functions:

(ii) Role 2: to provide functional groups that will attack the substrate and carry out chemical reaction.

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# How do enzymes catalyse the reaction

## Lock & Key Model



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# What the drugs do?

Drugs inhibit any of the above mentioned activities of enzymes.

These can block **the binding site of the enzyme** and prevent the binding of substrate, or can **inhibit the catalytic activity** of the enzyme.

Such drugs are called **enzyme inhibitors**.

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The receptors are highly specialized **macromolecules** present in tissues that combine chemically with drug. Many biological Receptors are macromolecules , composed of **proteins, nucleic acids, lipids**, etc.

Action of drugs take place in three steps.

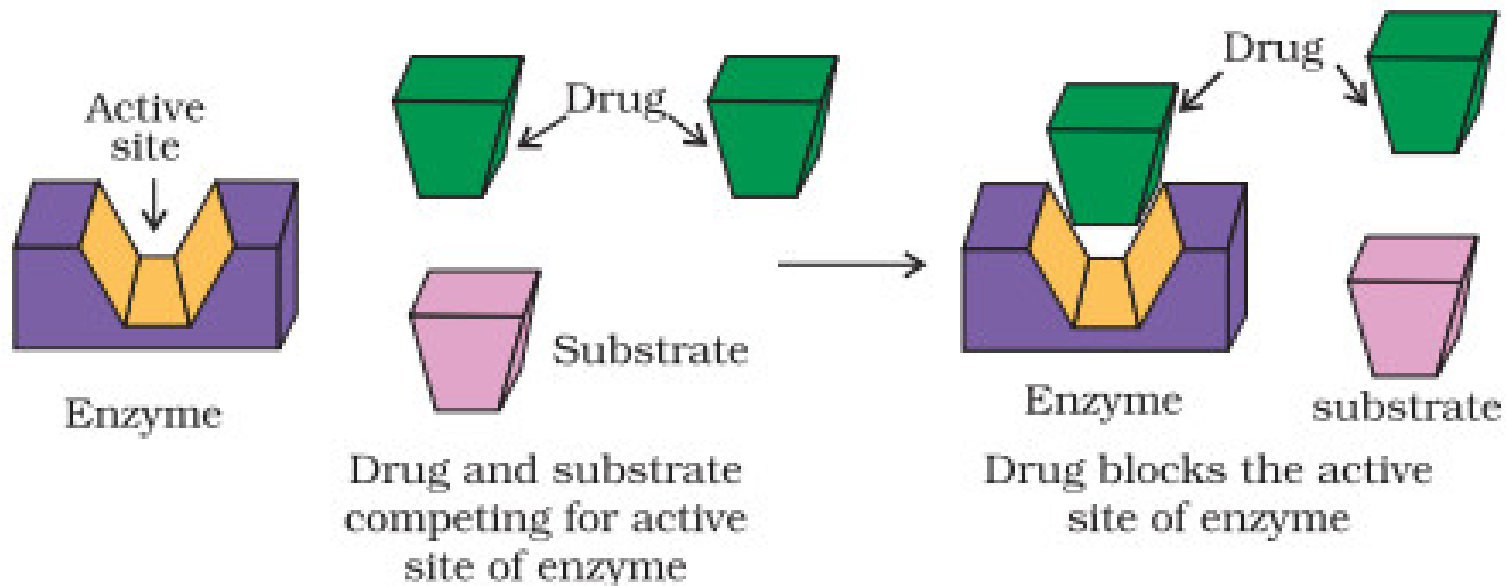
- a) **Enzyme as drug target**
- b) **Action of drugs**
- c) **Receptor act as drug targets**

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# Action of drugs on target

Drugs inhibit the attachment of substrate on active site of enzymes in two different ways;

(i) Drugs compete with the natural substrate for their attachment on the active sites of enzymes. Such drugs are called **competitive inhibitors**

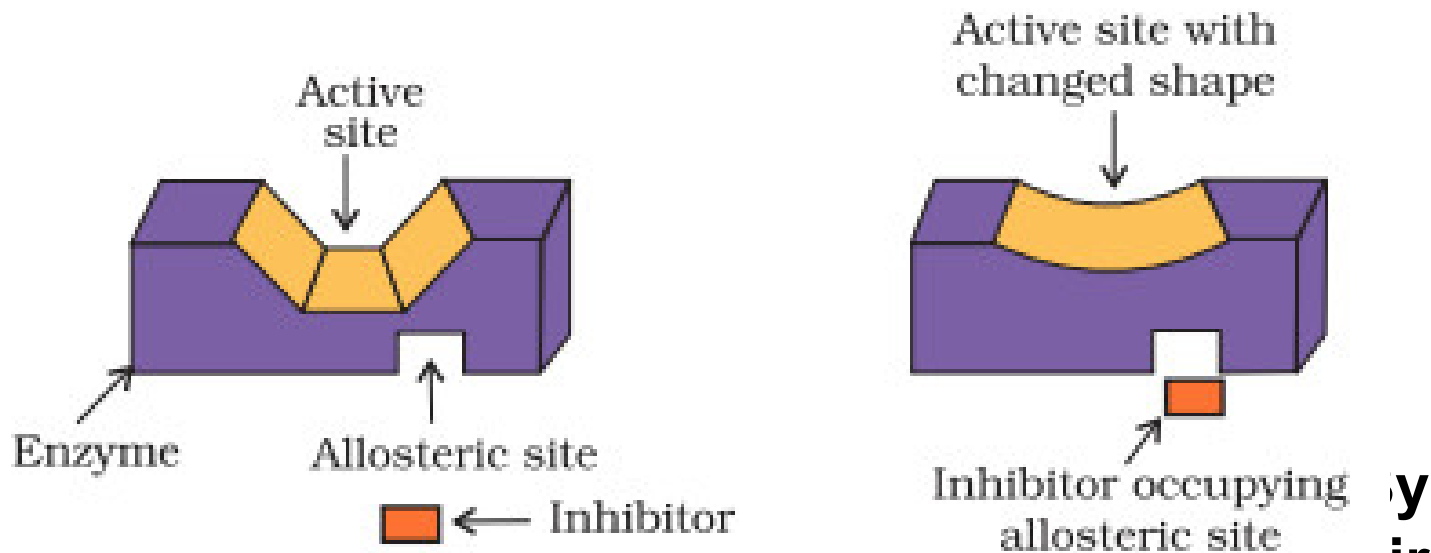




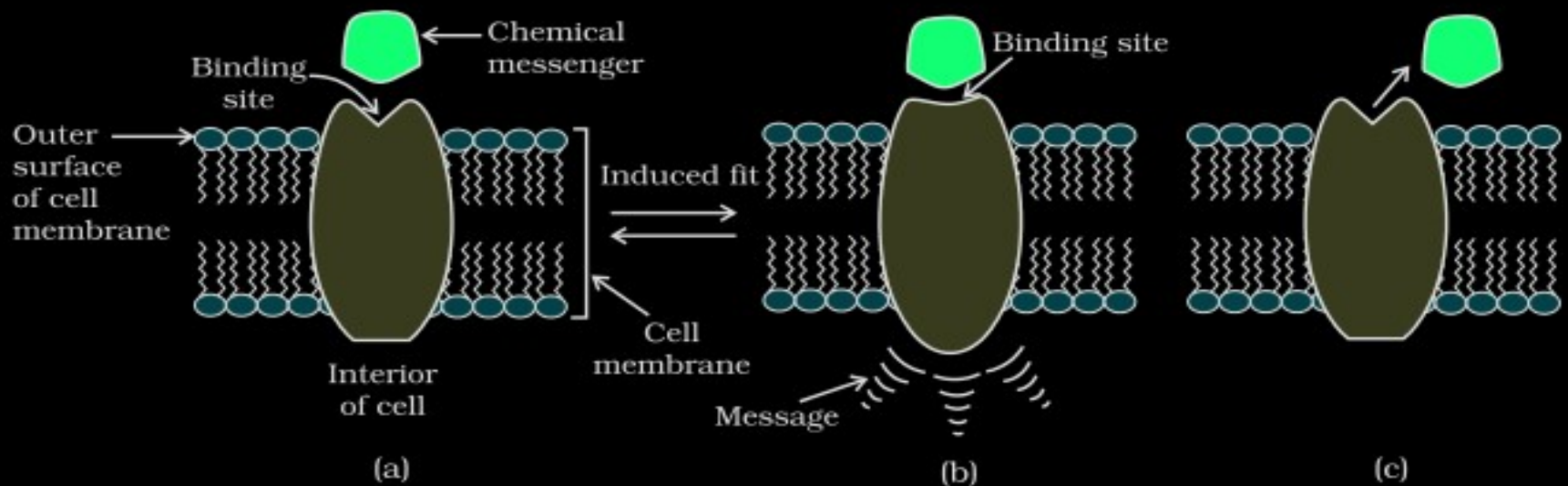
# Action of drugs on target

Some drugs do not bind to the enzyme's active site.

These bind to a different site of enzyme which is called **allosteric site**. This binding of inhibitor at allosteric site changes the shape of the active site in such a way that substrate cannot recognise it.

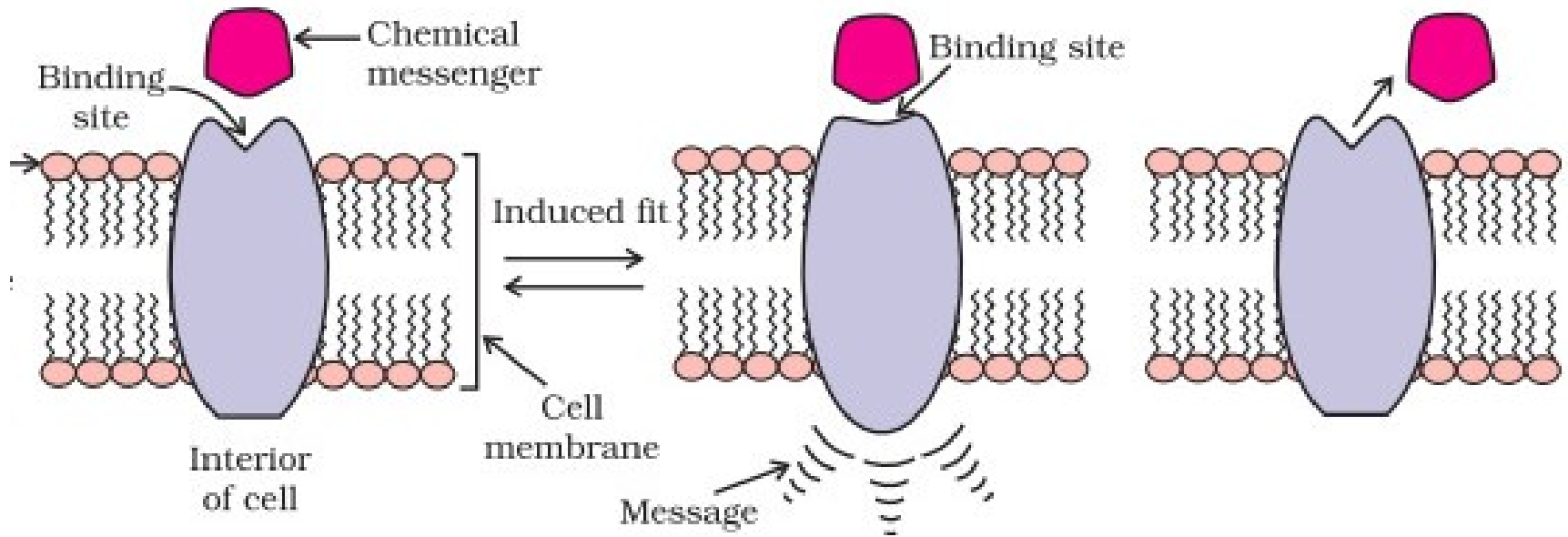


**c) Receptors as drugs target** : Receptors are proteins that are crucial to body's communication process. Majority of these are embedded in cell membranes. Receptor proteins are embedded in the cell membrane in such a way that their small part possessing active site projects out of the surface of the membrane and opens on the outside region of the cell membrane



In the body, message between two neurons and that between neurons to muscles is communicated through certain chemicals. These chemicals, known as chemical messengers are received at the binding sites of receptor proteins. To accommodate a messenger, shape of the receptor site changes. This brings about the transfer of message into the cell. Thus, chemical messenger gives message to the cell without entering the cell

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Most receptors are selective towards chemical messengers.

**Antagonists Drugs** : Drugs that bind receptor and disturb their functions are called as **antagonists**

while

**Agonists** Drugs : that activate receptors are called as **agonists**.

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# Chemicals in medicines

- A) Analgesics
- B) Tranquilizers
- C) Antimicrobials
- D) **Antifertility drugs**
- E) Antacids and **antihistamine**

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# Antacids

**a)Antacids:** It neutralize excess of acid in the stomach. During digestion of food stomach secretes HCl. Sometimes hyperacidity occur due to excessive secretion of HCl.

**Sodium bicarbonate (Eno)** and **metal hydroxide of magnesium and aluminum** (Digene ) are used as antacids which neutralize excess of acid.

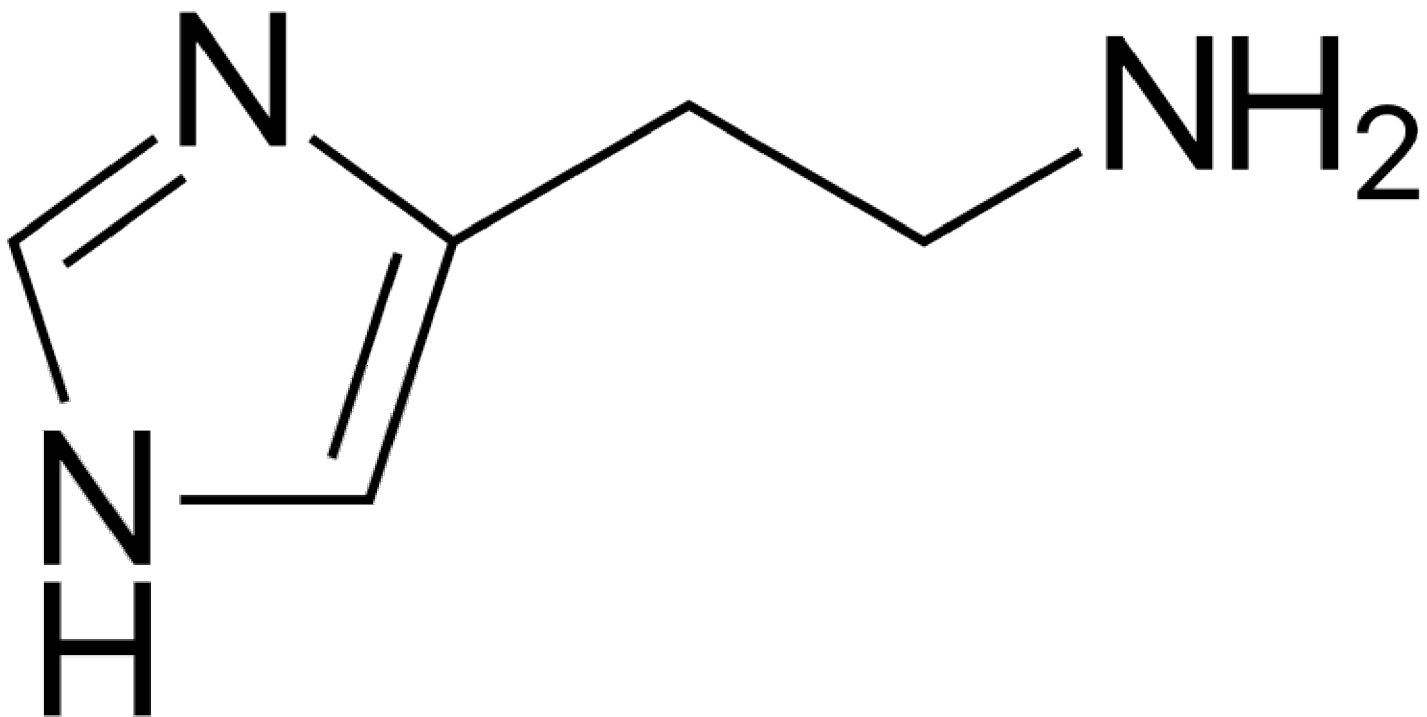
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Treatment of hyperacidity: histamine, stimulates the secretion of pepsin and hydrochloric acid in the stomach. The drug cimetidine (Tegamet), was designed to prevent the interaction of histamine with the receptors present in the stomach wall.

**Ranitidine, cimetidine** prevent the interaction between histamine and receptor in stomach wall ,and hence release less amount of acid. Anti-Histamine  
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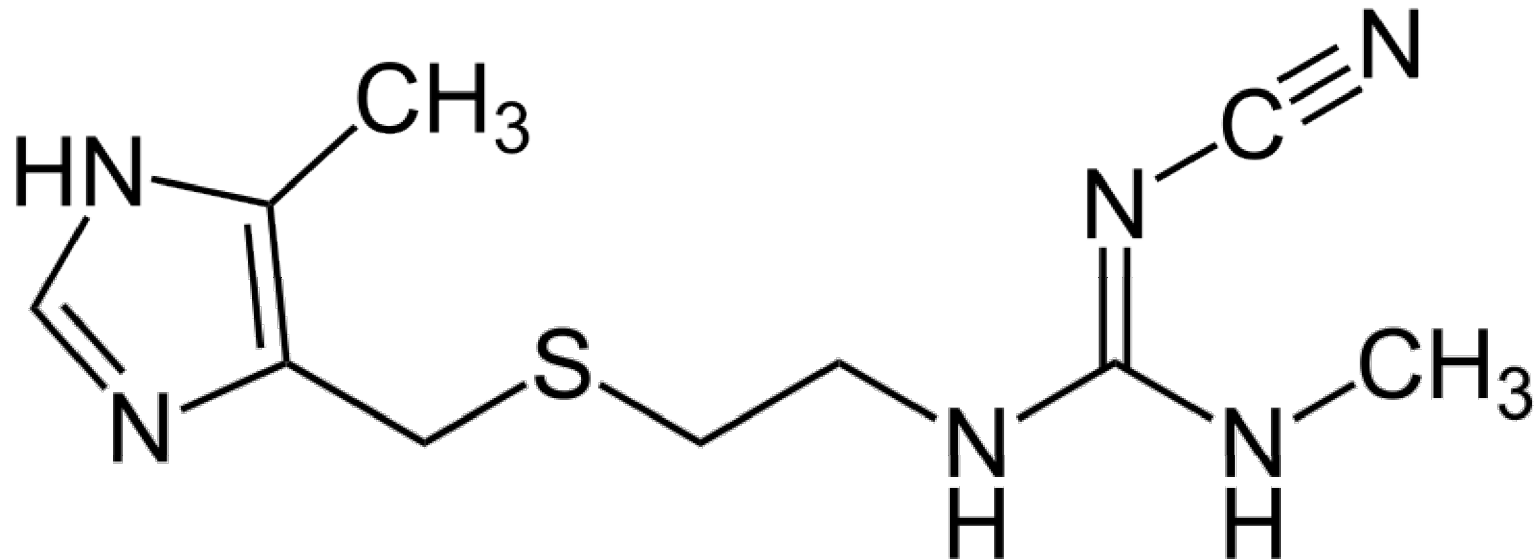
# Histamine



**Imidazole + ethyl + amine**

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# Cimetidine



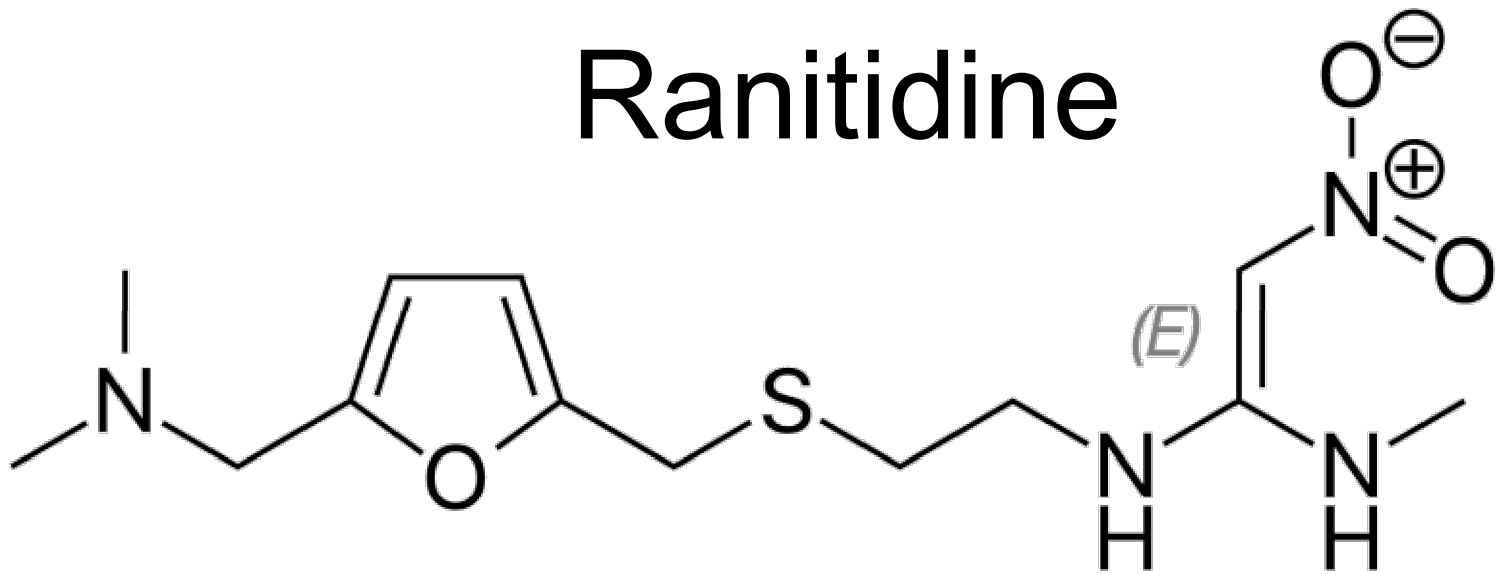
**Imidazole**

**Guanadine**

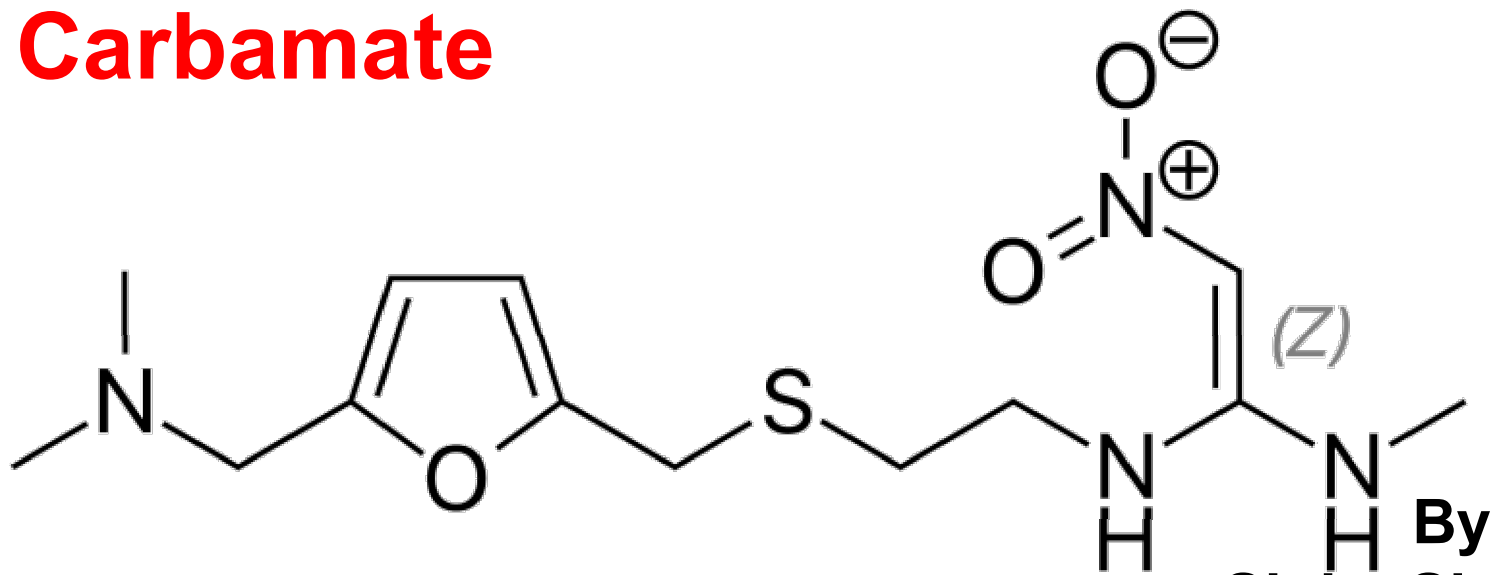
**Cyanide Sulphide**

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# Ranitidine



## Carbamate



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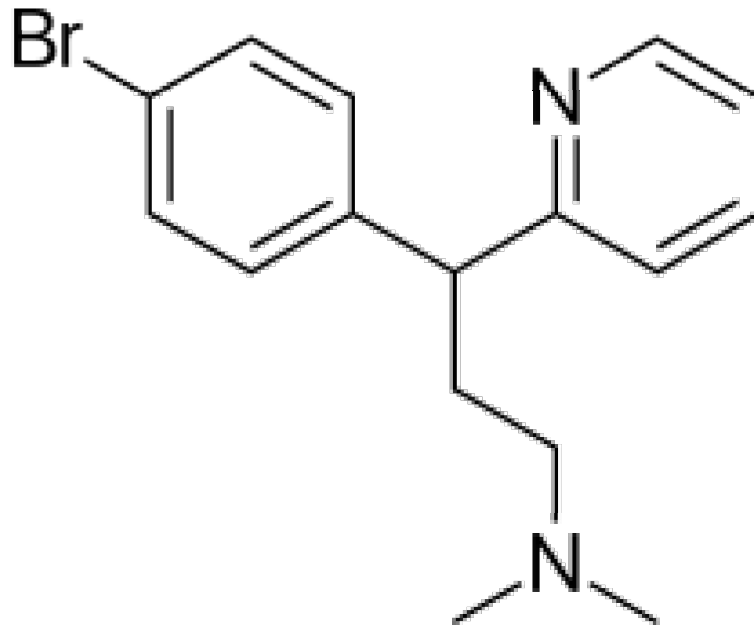
## **Anti Allergic :**

Brompheniramine (Dimetapp) and terfenadine (Seldane), act as antihistamines. They are antiallergic and work on different receptors.

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# Anti Allergic : Brompheniramine

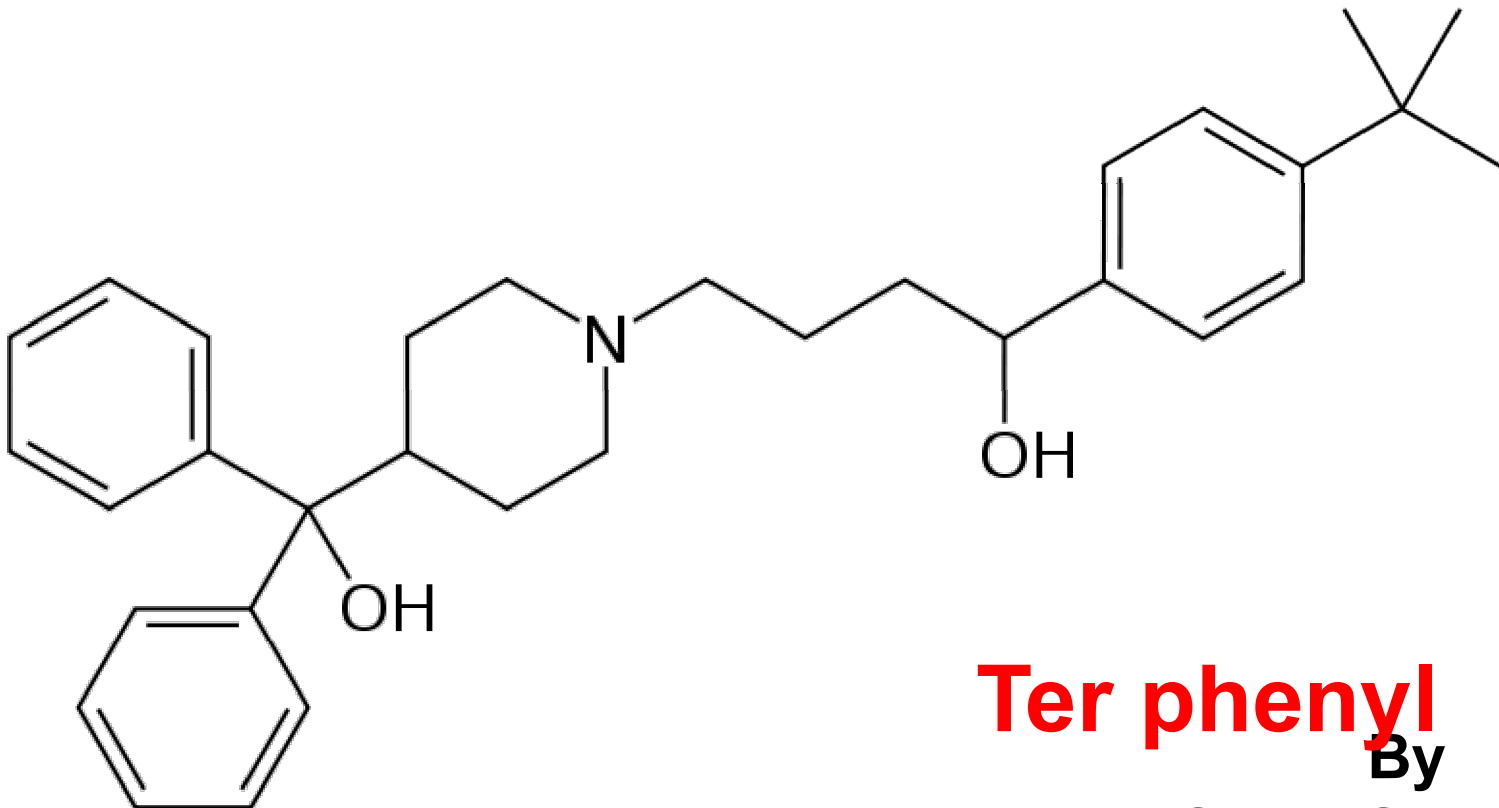
**Bromo  
Phenyl  
Pyridine  
amine**



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## **Anti Allergic :** Terfenadine

Terfenadine (Seldane), act as antihistamines. They are antiallergic and work on different receptors.



**Ter phenyl**  
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## **Tranquilizers** Mild

treatment of stress & mental diseases.

relieve anxiety, stress,

component of sleeping pills.

1. **Iproniazid** and **phenelzine** are mild

2. **Chlordiazepoxide**, **meprobamate**, are relatively mild tranquilizers suitable for relieving tension.

3. **Equanil** is used in controlling depression and hypertension.

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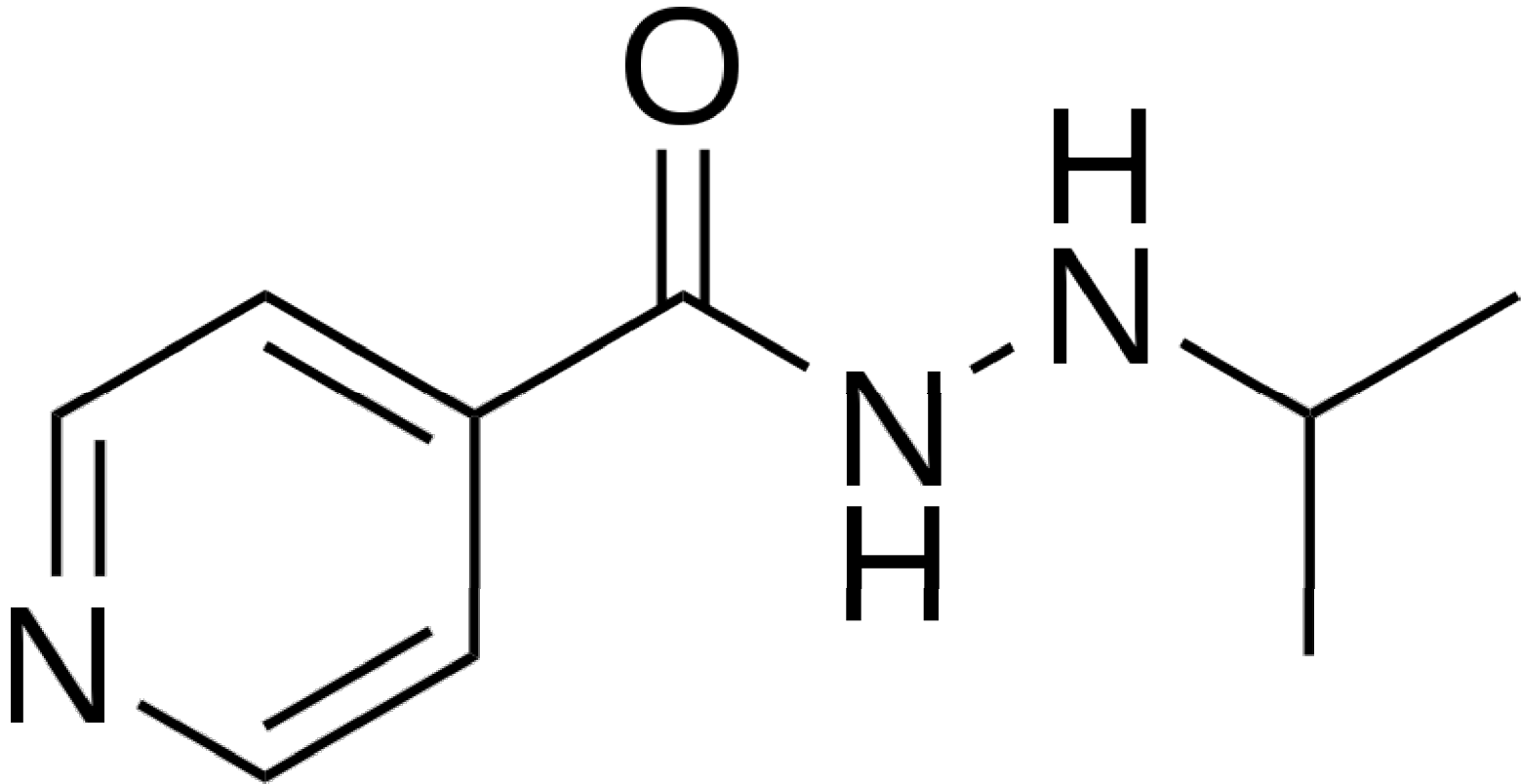
Derivatives of barbituric acid : **veronal, amytal, nembutal, luminal** are **hypnotic**, i.e., sleep producing agents.

Some other substances used as tranquilizers are **valium** and **serotonin**.

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# Iproniazid

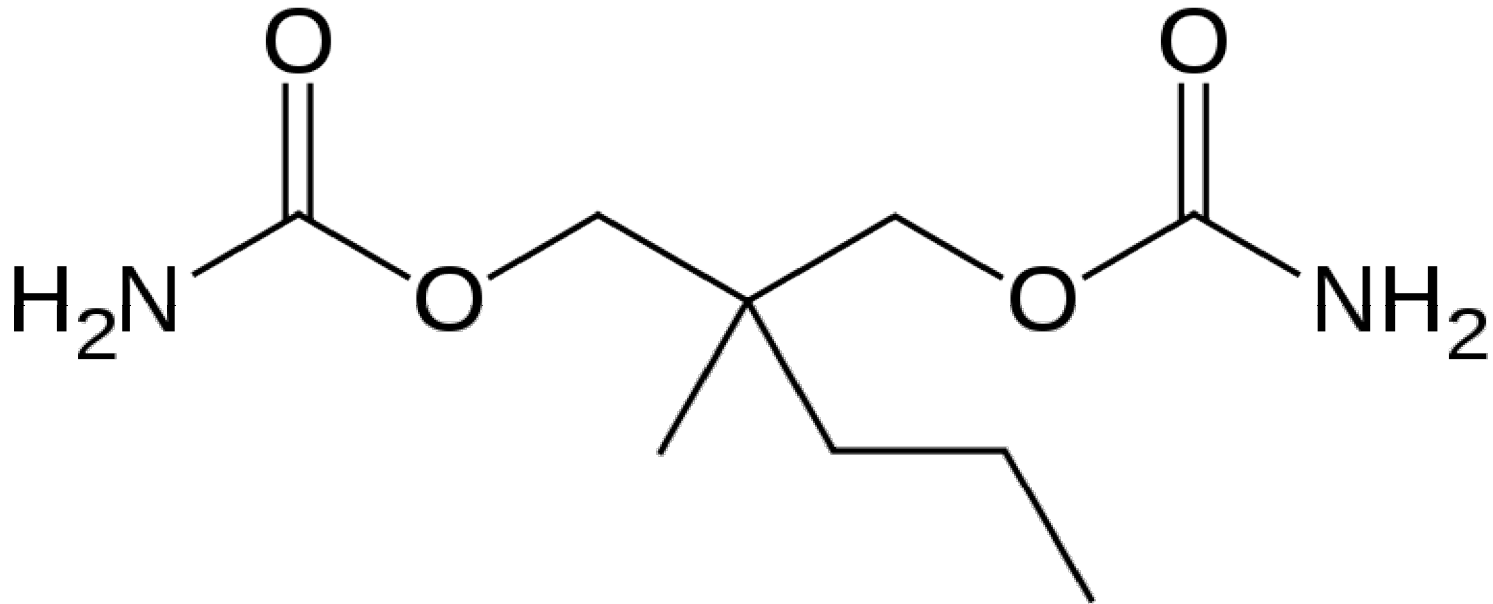


**Amide-azo**

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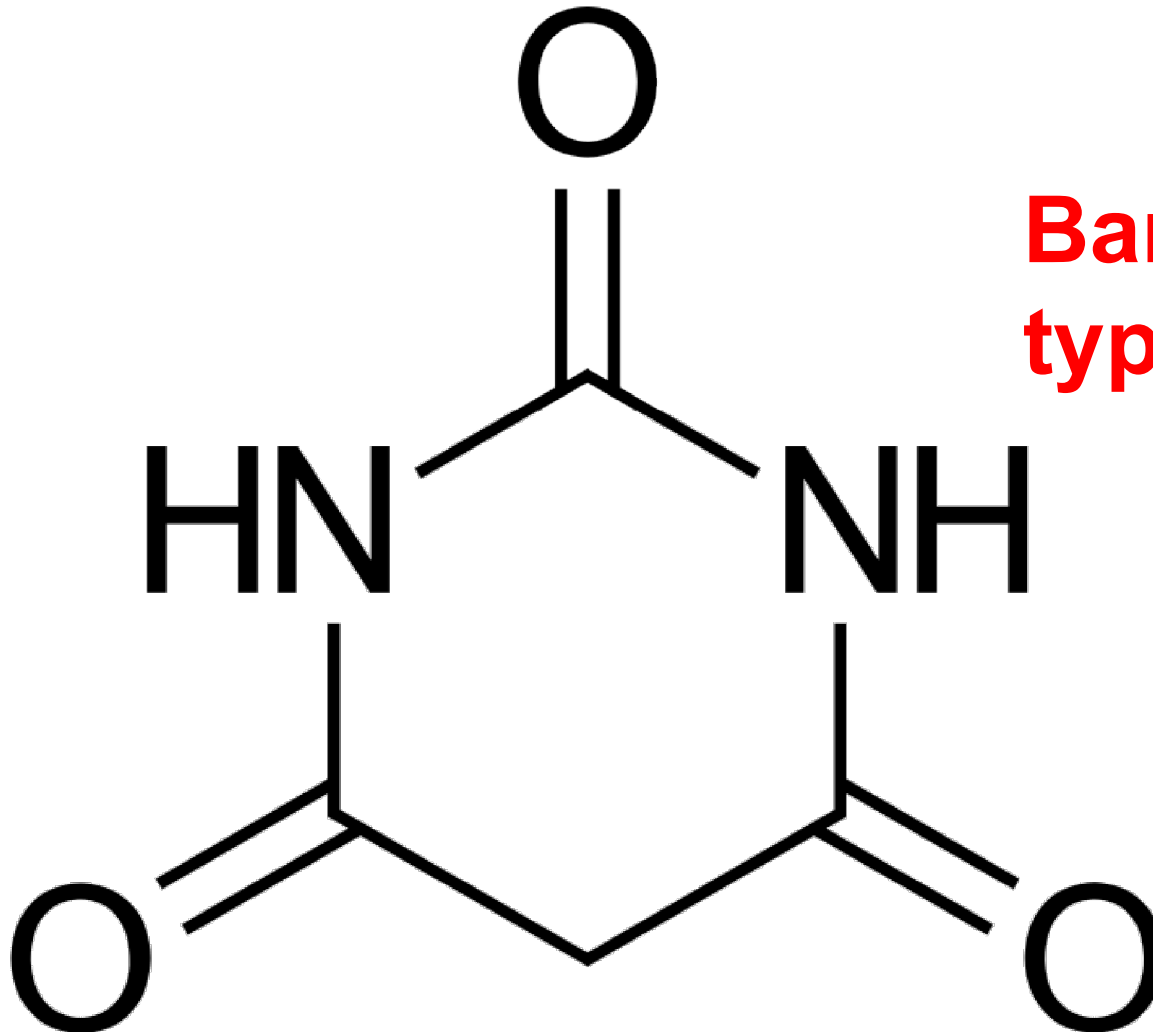
# Meprobamate



**Carbamate**

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# Barbituric-acid

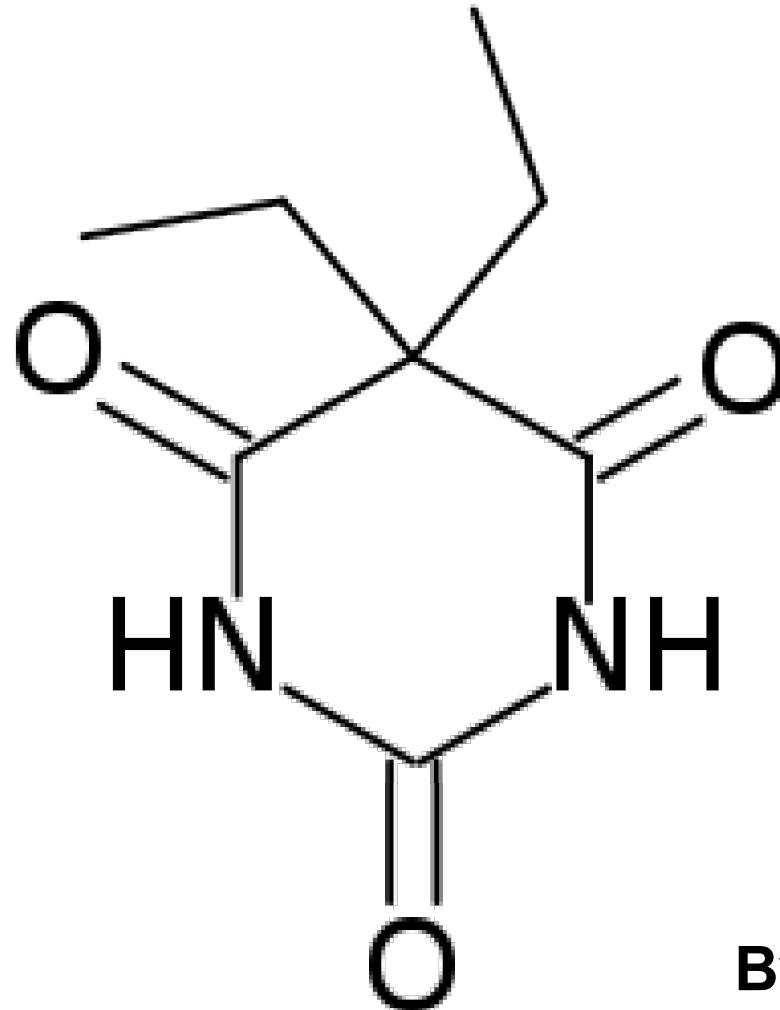


**Barbituric  
type**

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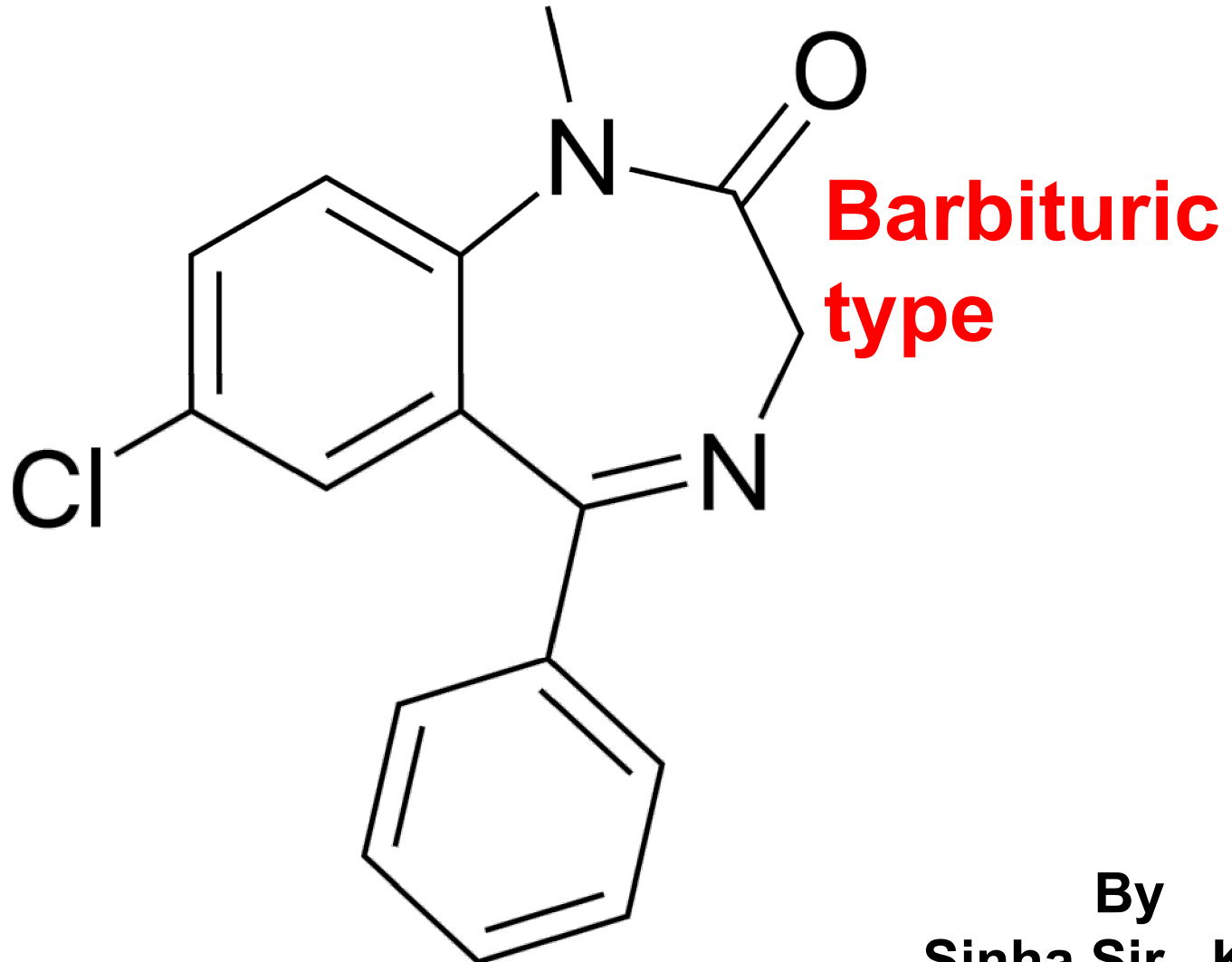
# Barbital

**Barbituric  
type**



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# Diazepam\_valium



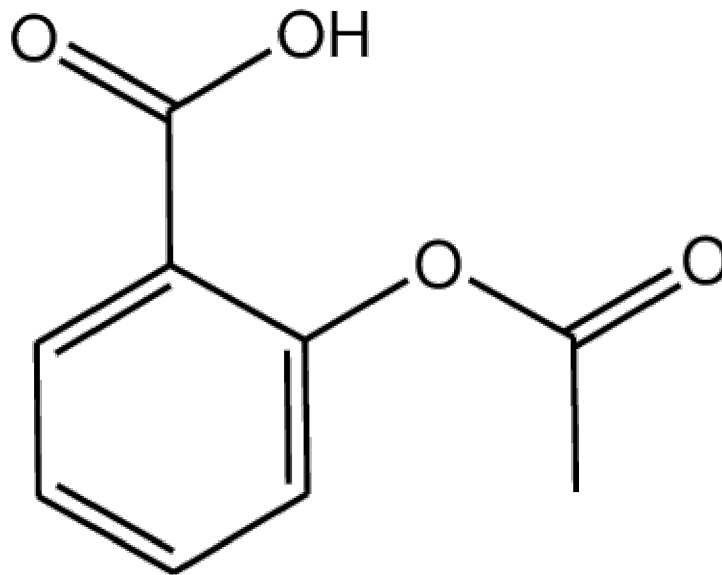
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**Analgesics: Analgesics reduce or abolish pain without causing impairment of consciousness,**

Aspirin is the most familiar example. Aspirin inhibits the synthesis of chemicals known as **prostaglandins** which stimulate inflammation in the tissue and cause pain

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**Aspirin (Acetylsalicylic Acid )** is also antipyretic and preventing platelet coagulation. Because of its anti blood clotting action, aspirin finds use in prevention of heart attacks.



**Acetyl on  
Salicylic acid**

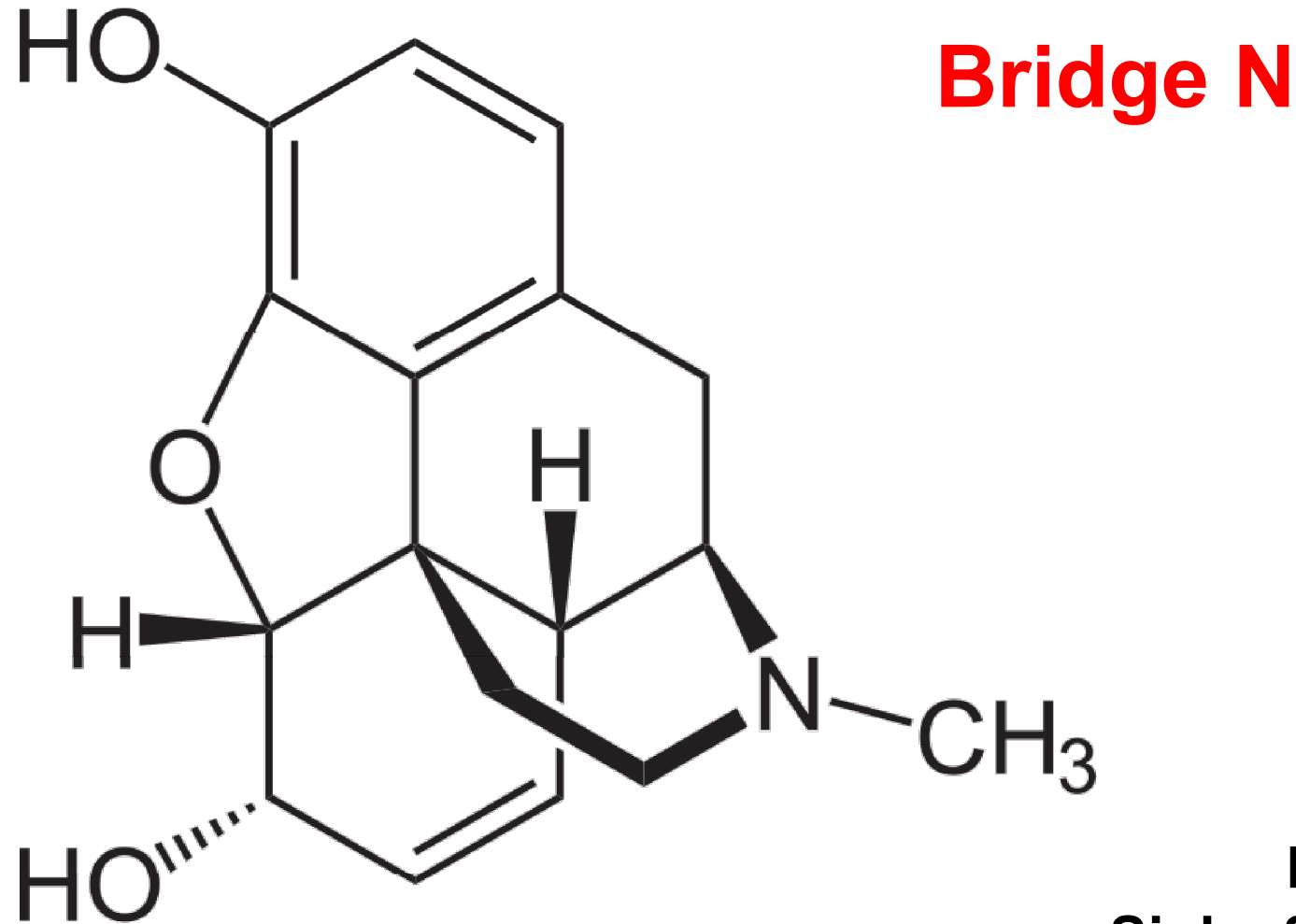
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Narcotic analgesics: Morphine, Codeine , Heroin  
narcotics (opiates)

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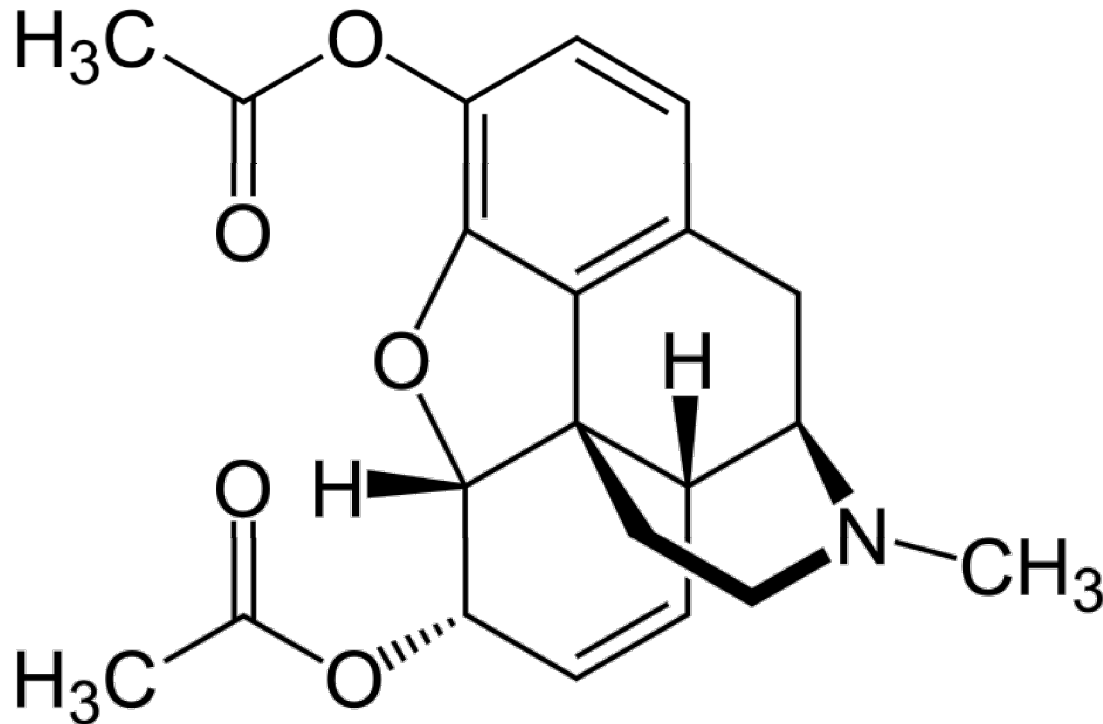
# Morphine



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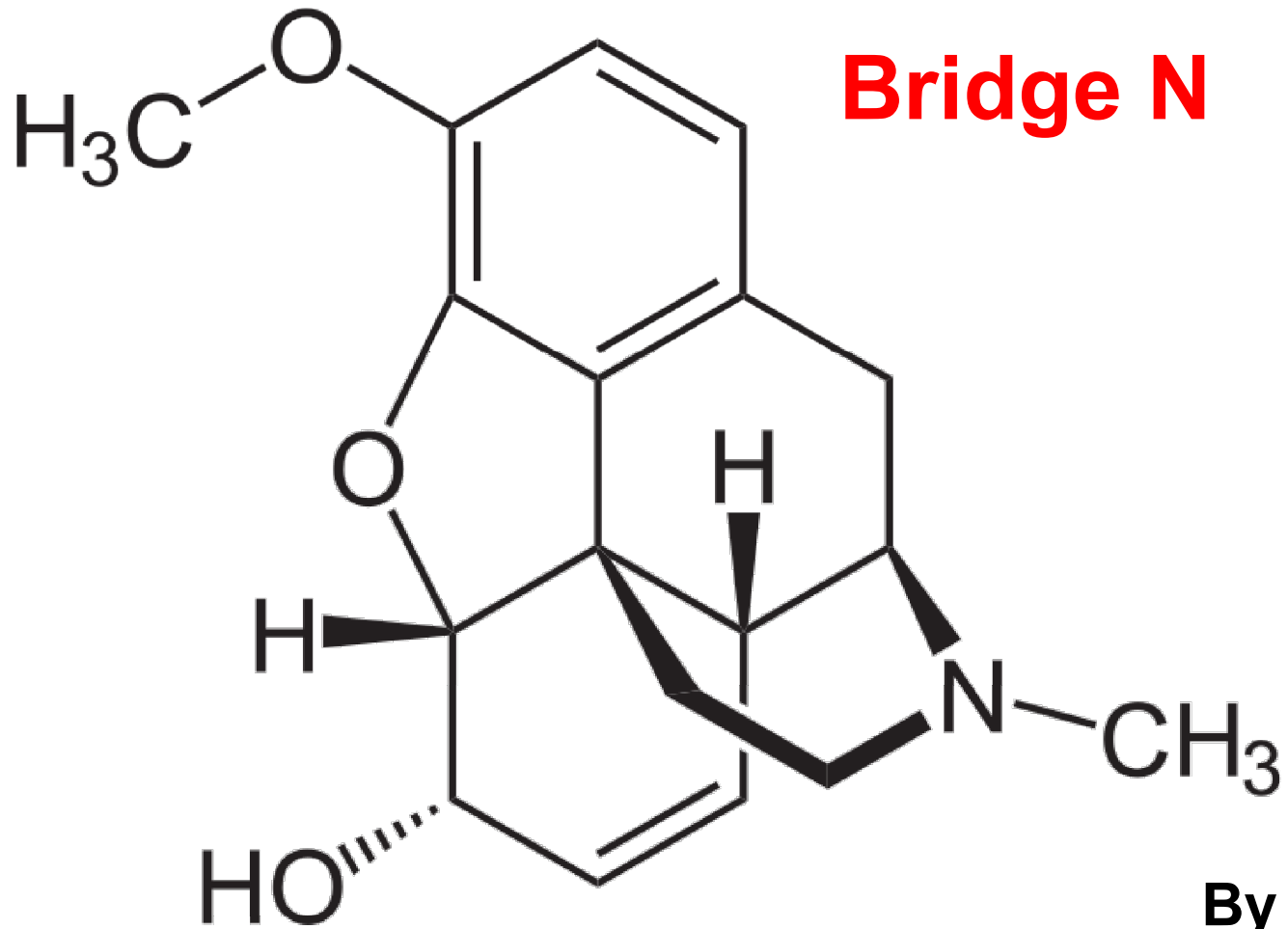
# Heroin

Bridge N



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# Codein



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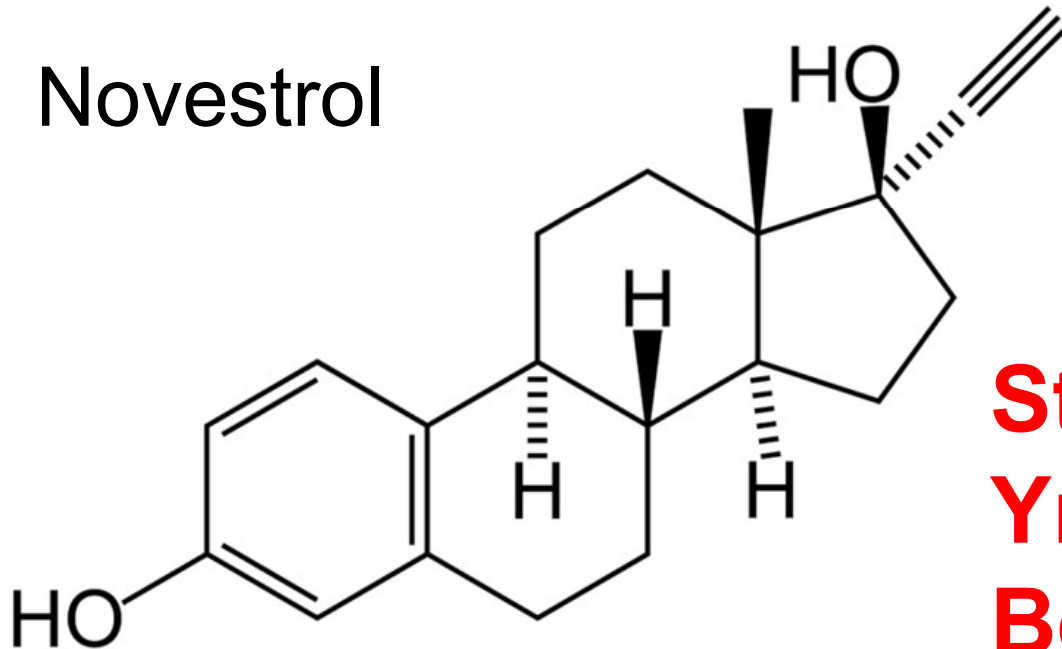
**D) Antifertility drugs** : Antifertility drugs are used to control population (**such as family planning**). It is a mixture of synthetic estrogen and progesterone derivatives. Which are hormones.

•eg. **Novestrol** and **Norethindrone**.

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# Antifertility Drugs

Novestrol



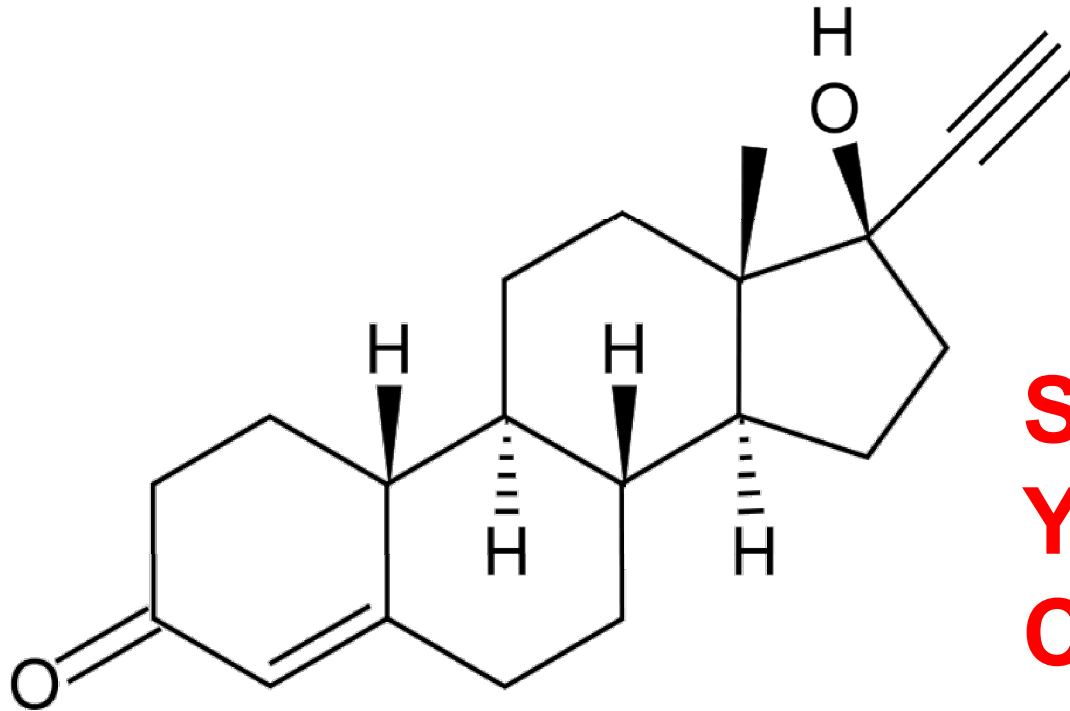
**Steroid  
Yne  
Benzene  
ol**

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# Antifertility Drugs

Norethindrone

**Steroid**



**Steroid**

**Yne**

**Cyclohexene**

**one**

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# Antibiotic

**Antibiotic: A substance produced wholly or partly by chemical synthesis, which in low concentrations inhibits the growth or destroys microorganisms by intervening in their metabolic processes**

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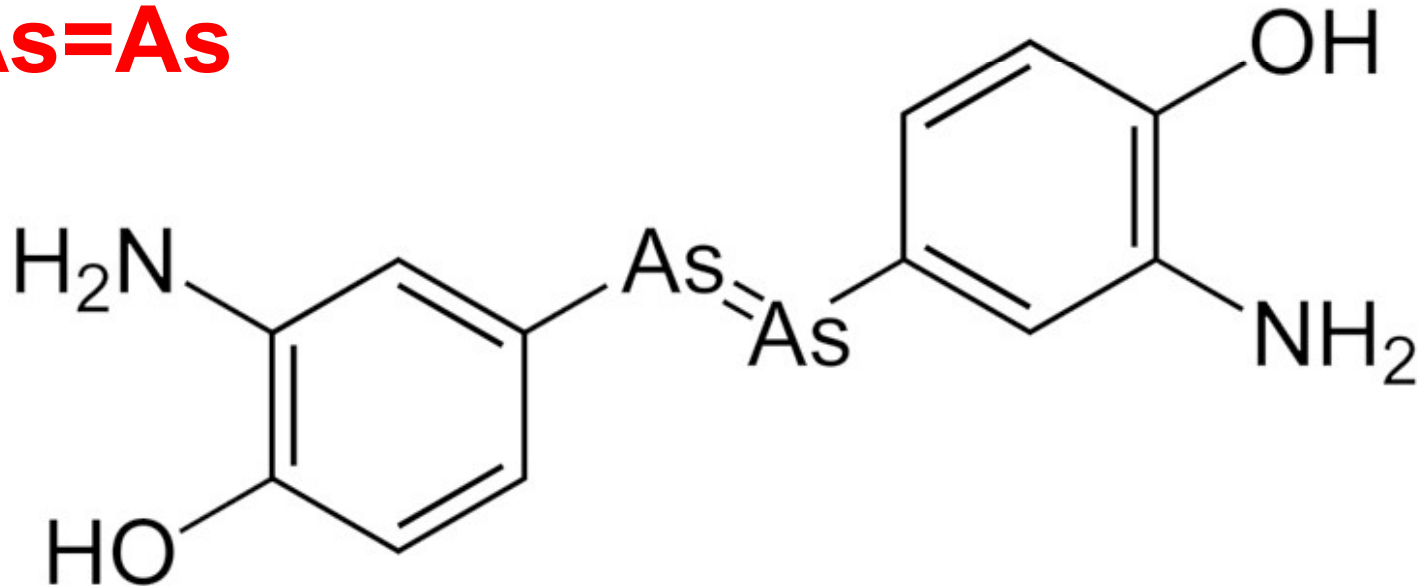
# salvarsan

Arsphenamine, known as salvarsan.  
discovered for Syphilis.

Arsenic drug : Poisonous to human also

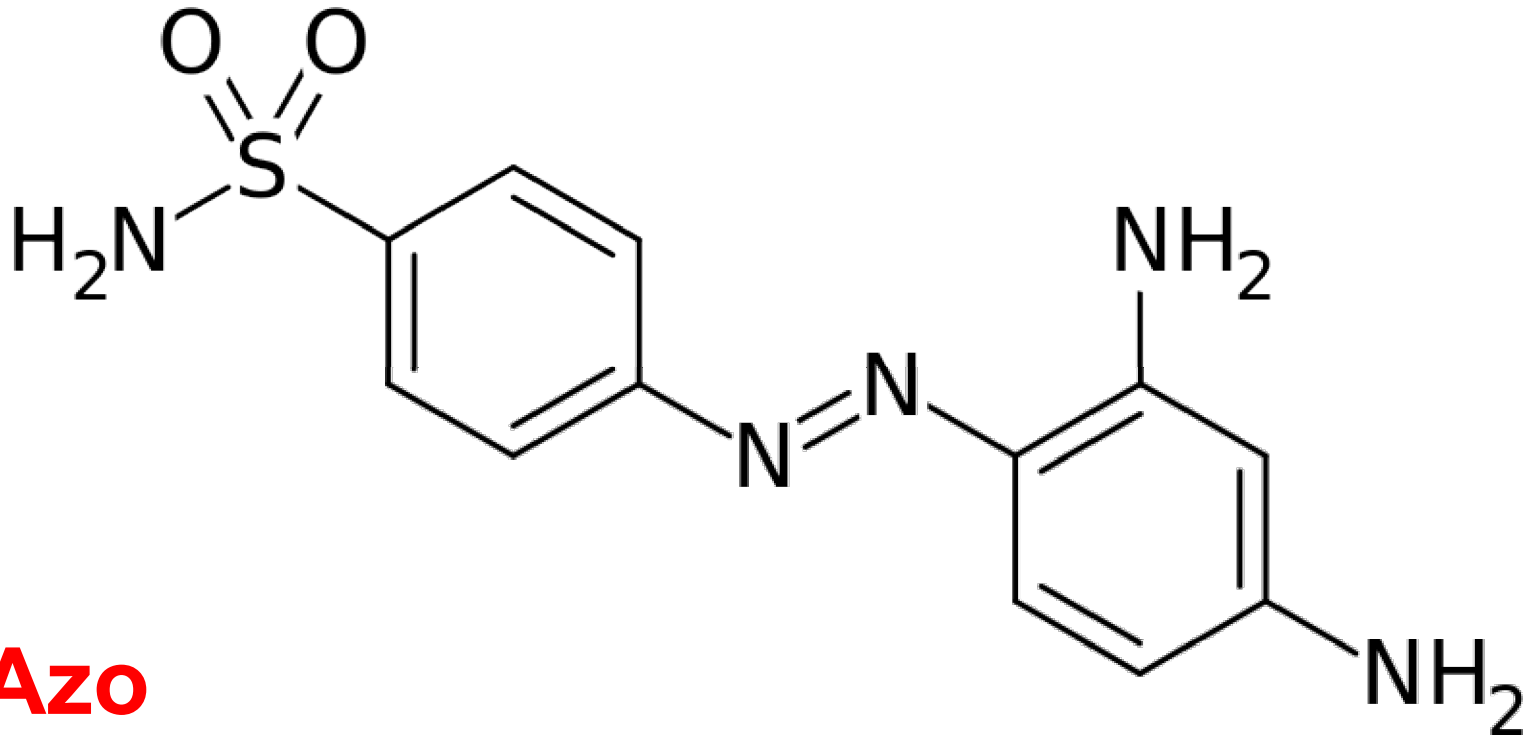
**Arsan=**

**As=As**





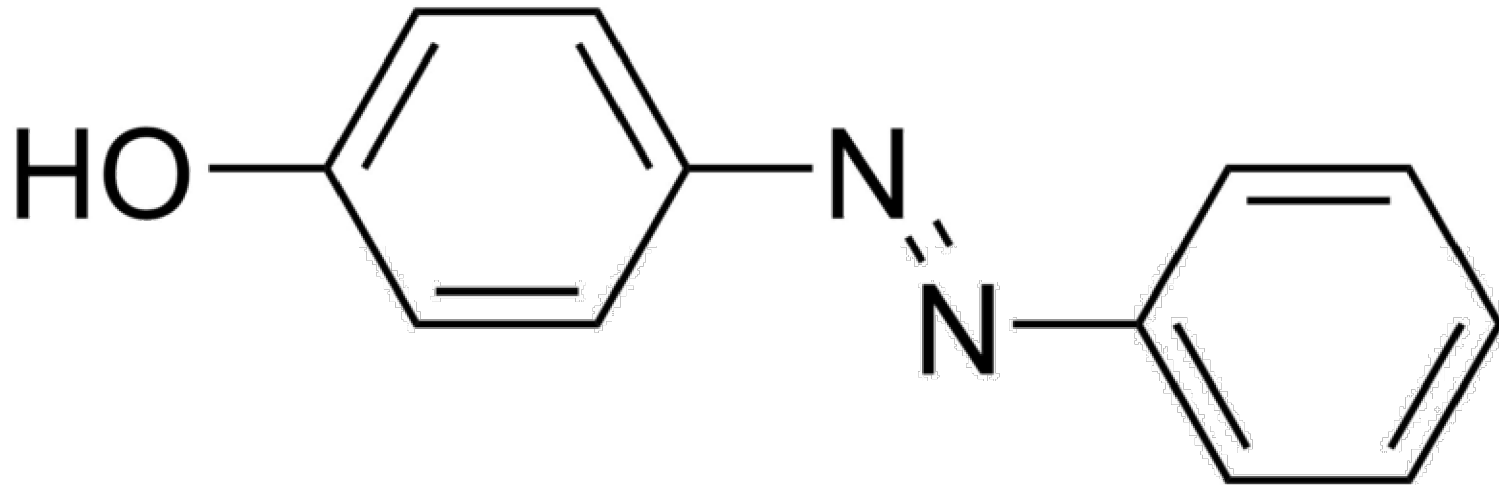
# Prontosil



**Azo**  
**N=N**

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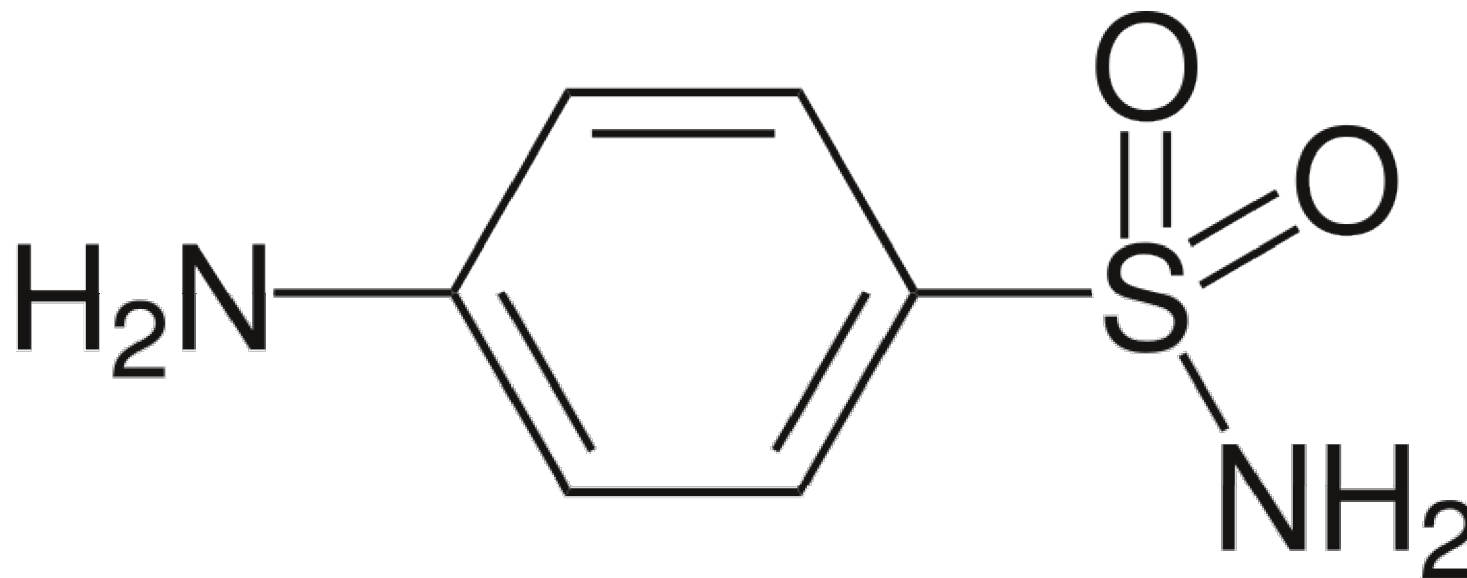
# 4-hydroxyphenylazobenzene



**Azo**  
**N=N**

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# Sulfanilamide

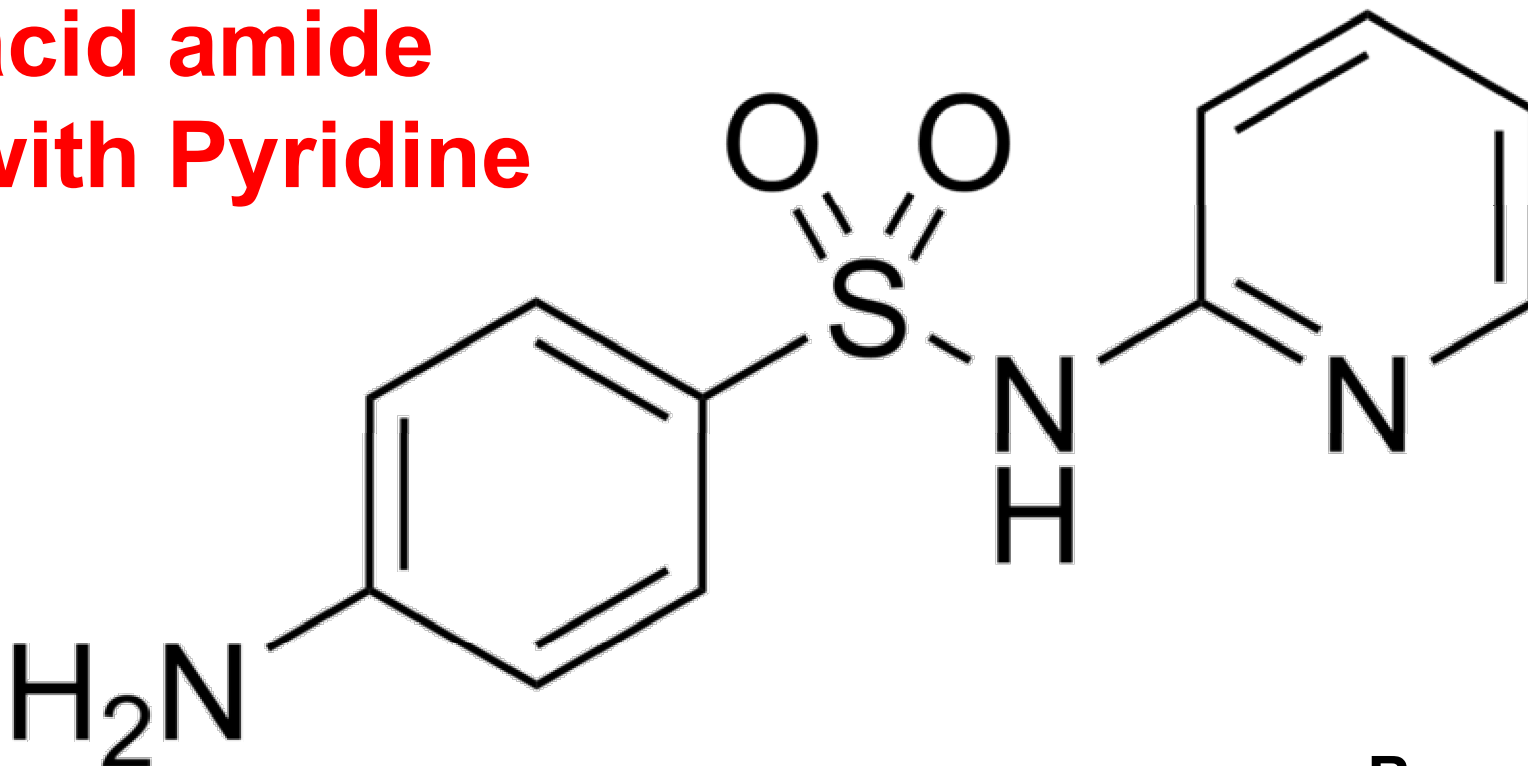


**Sulpaanilic  
acid amide**

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# Sulfapyridine

**Sulpaanilic  
acid amide  
with Pyridine**



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# Antibiotic

Antibiotics have either cidal (killing) effect or a static (inhibitory) effect on microbes. A few examples of the two types of antibiotics are as follows:

## **Bactericidal**

**Penicillin**

**Aminoglycosides**

**Ofloxacin**

## **Bacteriostatic**

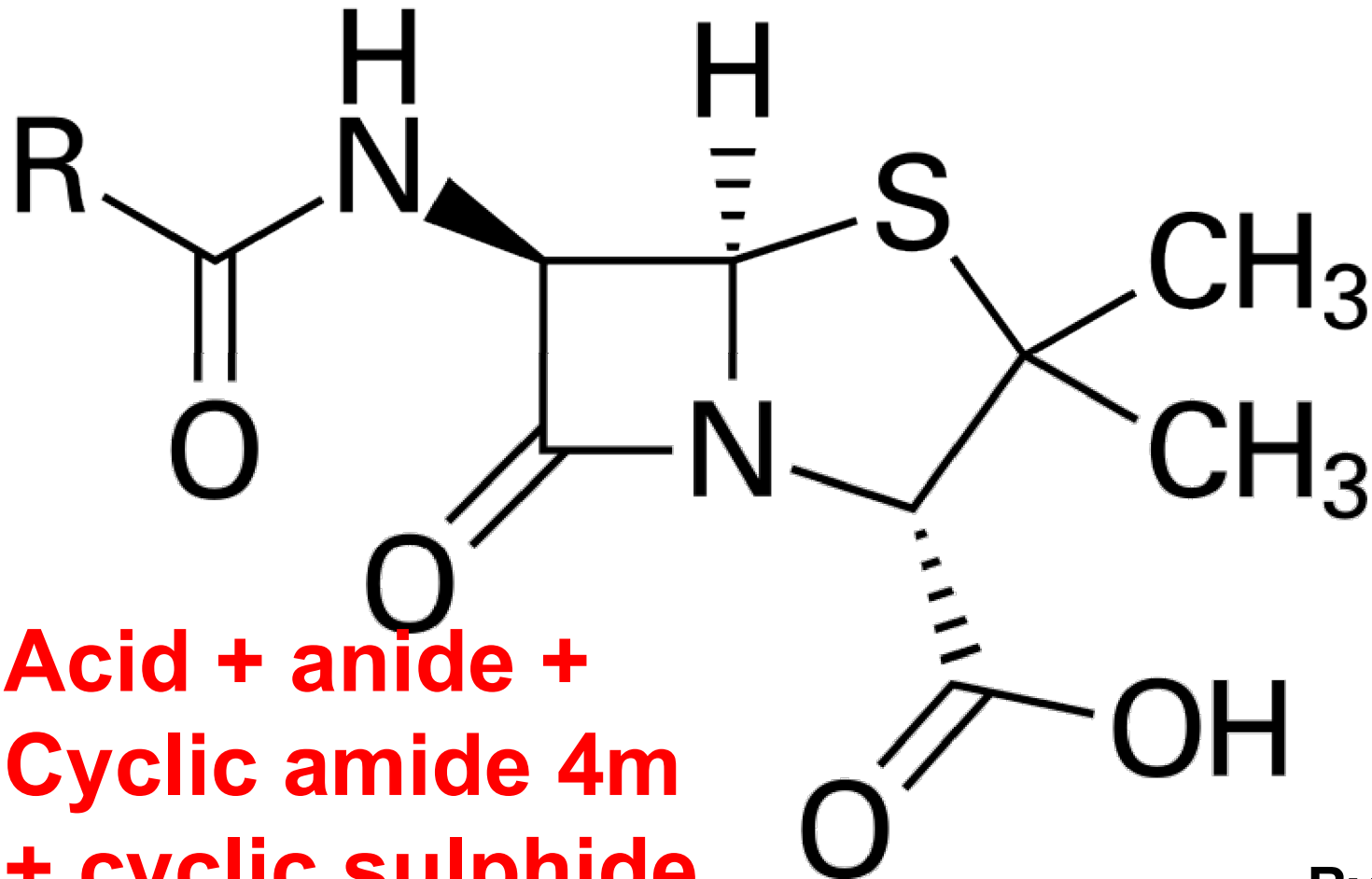
**Erythromycin**

**Tetracycline**

**Chloramphenicol**

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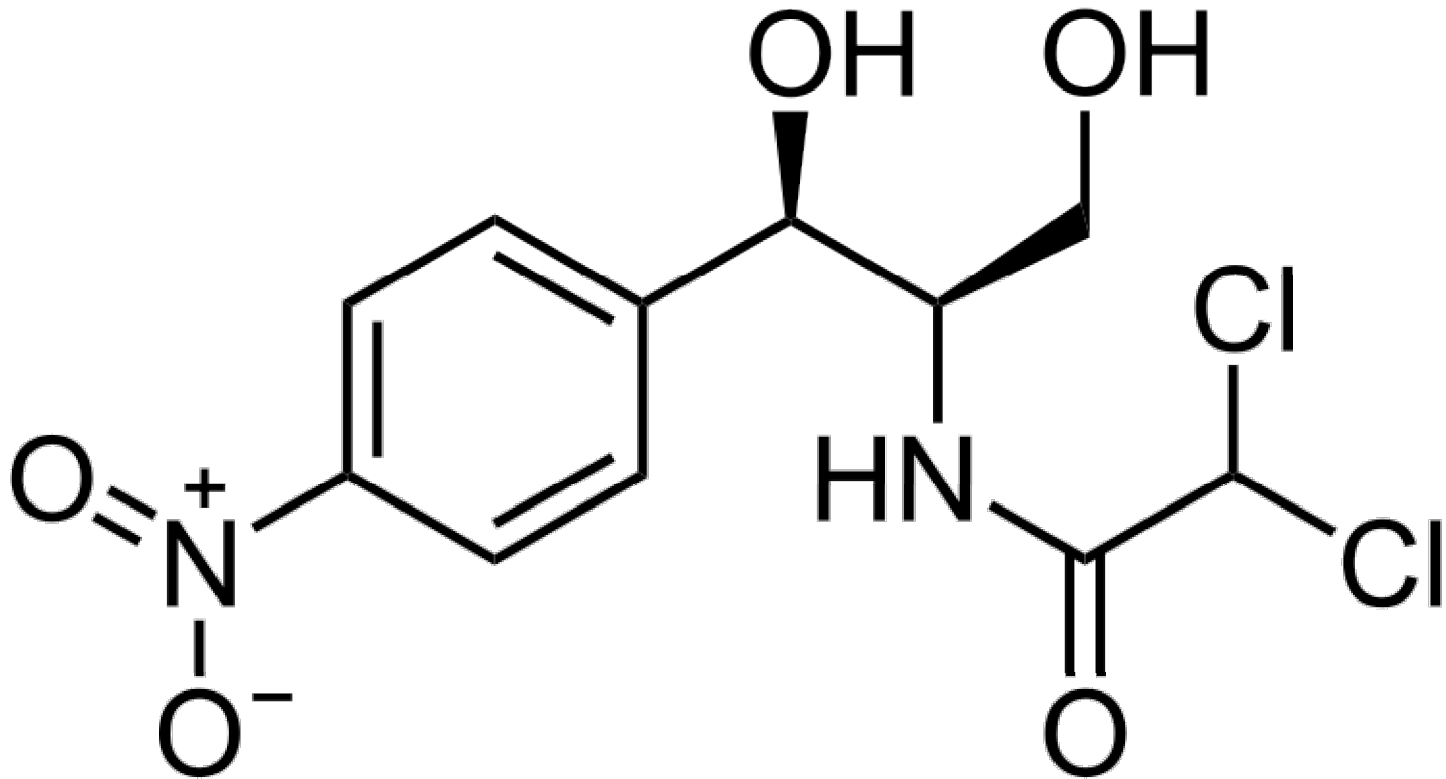
# Penicillin\_core



**Acid + anide +  
Cyclic amide 4m  
+ cyclic sulphide**

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# Chloramphenicol



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# Antiseptics

Antiseptics : (External ). applied to the living tissues such as wounds, cuts, ulcers and diseased skin surfaces

Examples

furacine,

Soframicine

dettol is a mixture of chloroxylenol and terpineol.

Bithionol : Used in soaps to impart antiseptic properties.

tincture of iodine : 2-3 per cent solution of I<sub>2</sub> in alcohol It is applied on wounds.

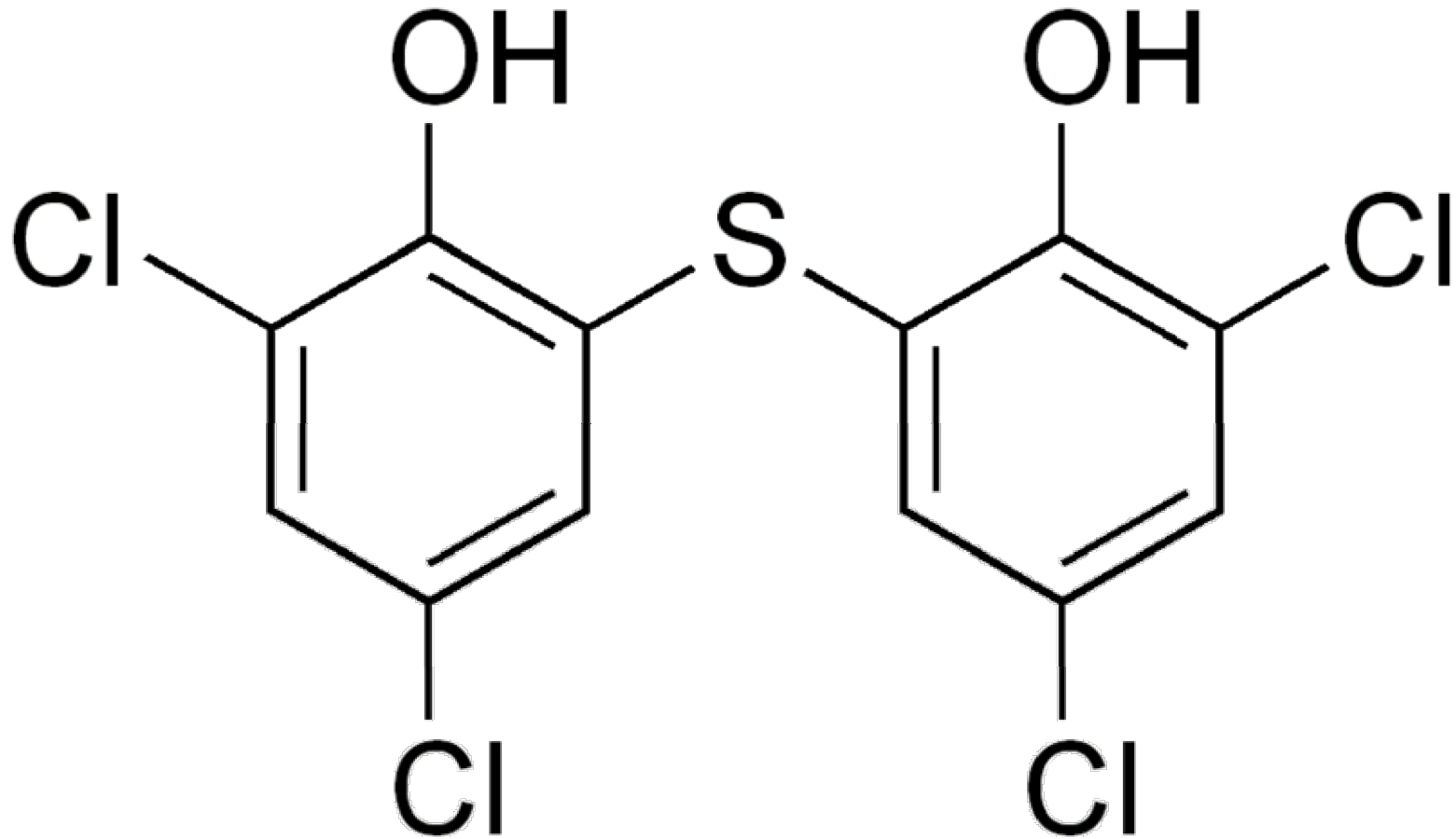
Iodoform : antiseptic for wounds.

Boric acid: dil. Aq. solution is weak antiseptic for eyes.

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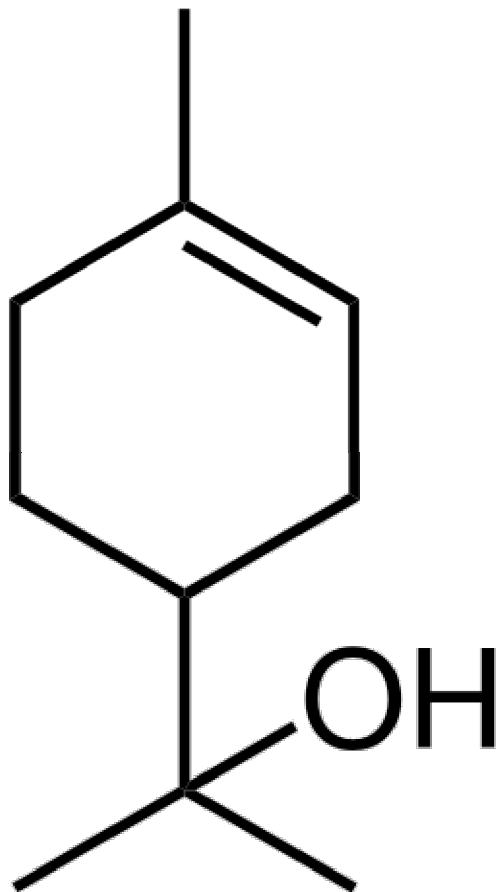


# Bithionol



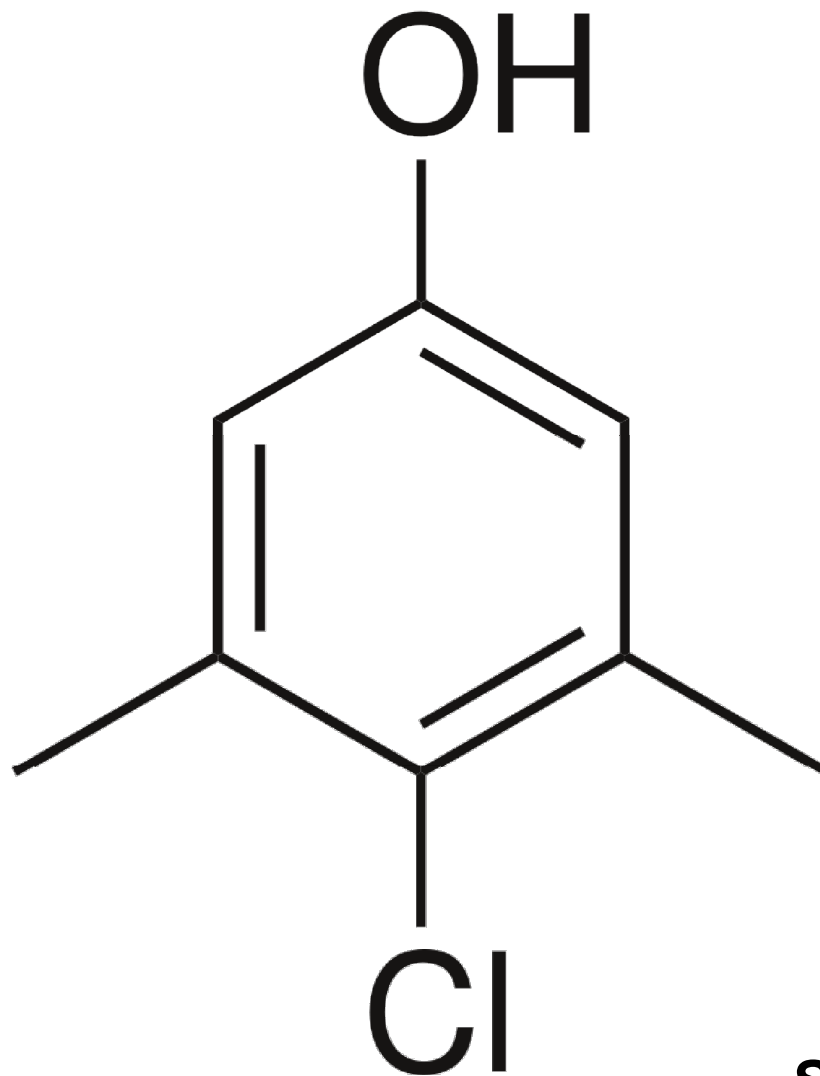
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# Terpineol



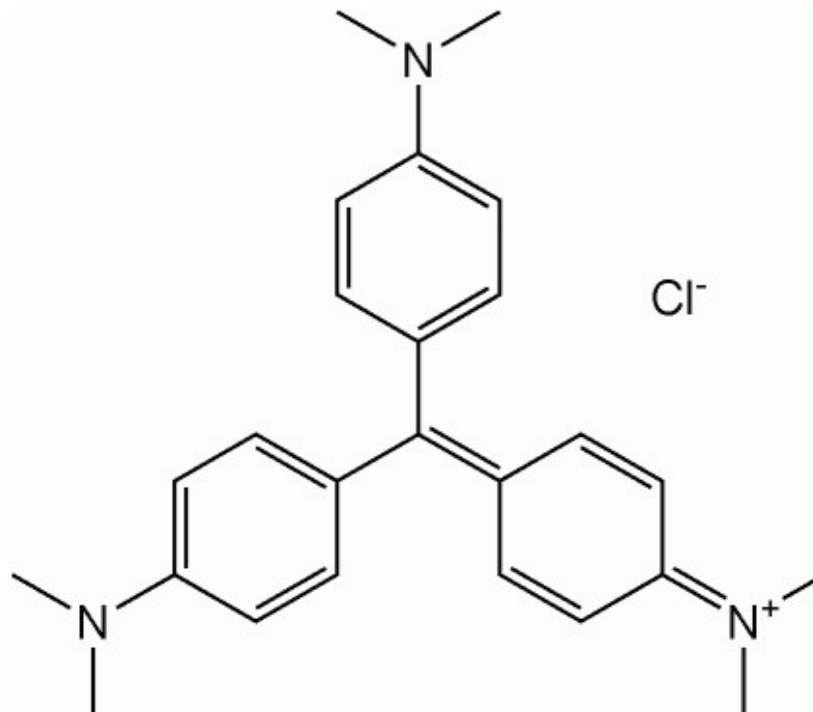
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# Chloroxylenol



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# Methyl\_Violet



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# Disinfectants

**Disinfectants:** Chemicals applied to nonliving object to kill/prevent microorganisms.

**Phenol :** 0.2 per cent solution of phenol is an antiseptic while its one percent solution is disinfectant.

**Chlorine:** 0.2 to 0.4 ppm in aqueous solution and sulphur dioxide in very low concentrations, are disinfectants.

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# Antifertility drugs

Birth control pills contain a mixture of synthetic Estrogen and Progesterone derivatives.

Both of these compounds are hormones.

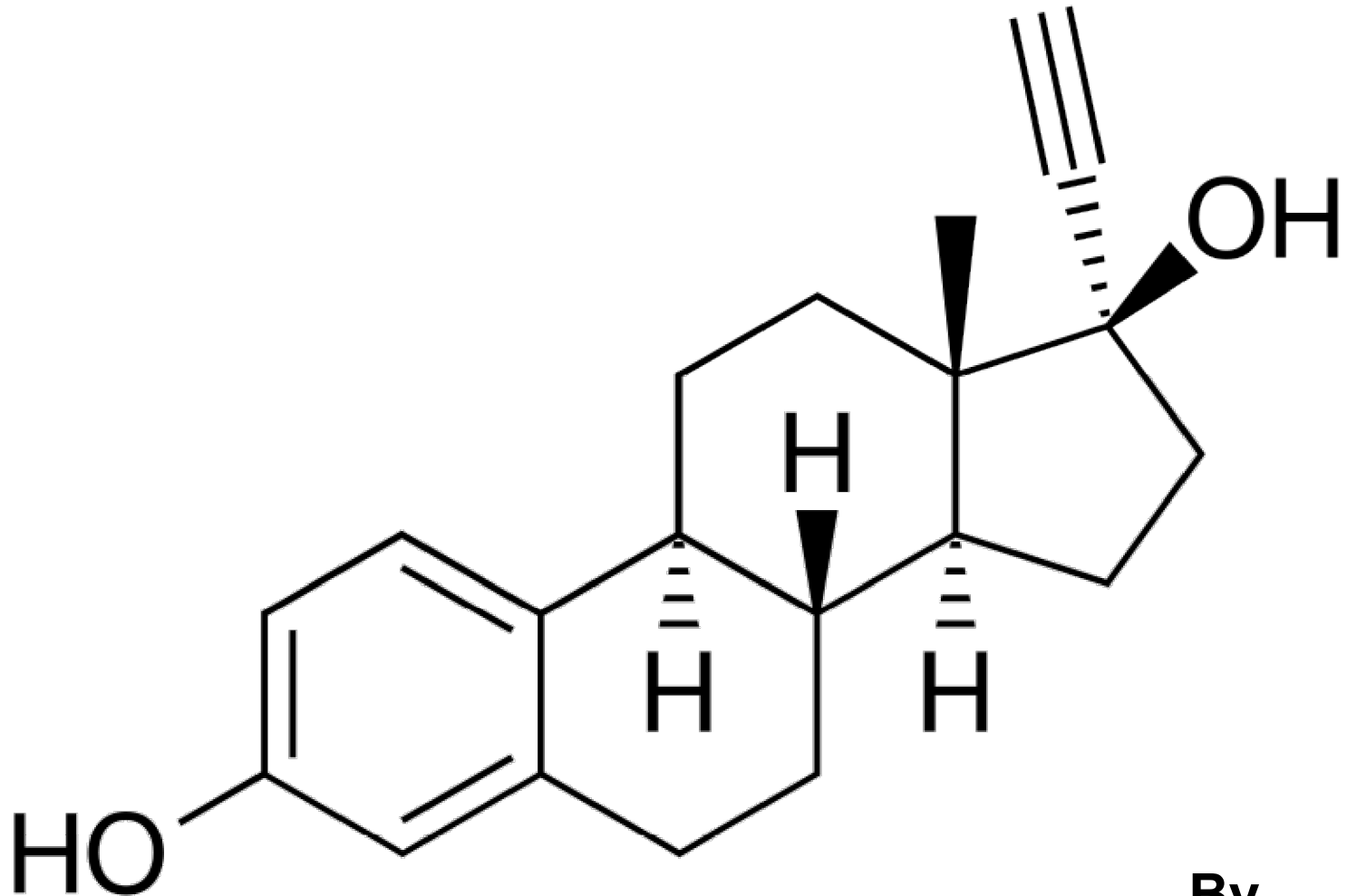
progesterone suppresses ovulation.

Norethindrone : A synthetic progesterone

Ethinylestradiol (novestrol). : Estrogen derivative

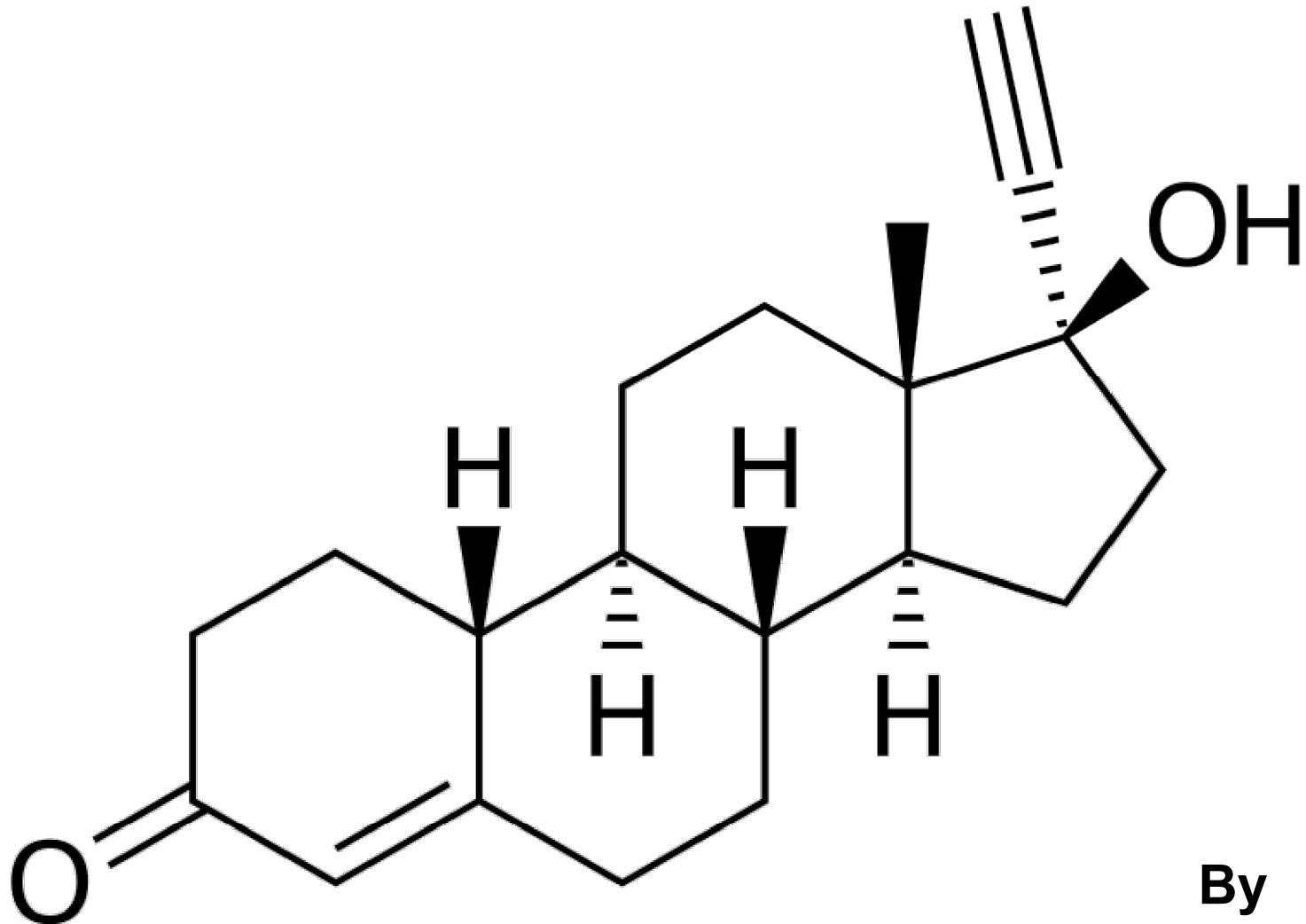
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# Ethinylestradiol



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# Norethisterone



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# Food preservatives

Food preservatives :

prevent spoilage of food due to microbial growth. Commonly used preservatives : table salt, sugar, vegetable oils and sodium benzoate,

Salts of sorbic acid and propanoic acid

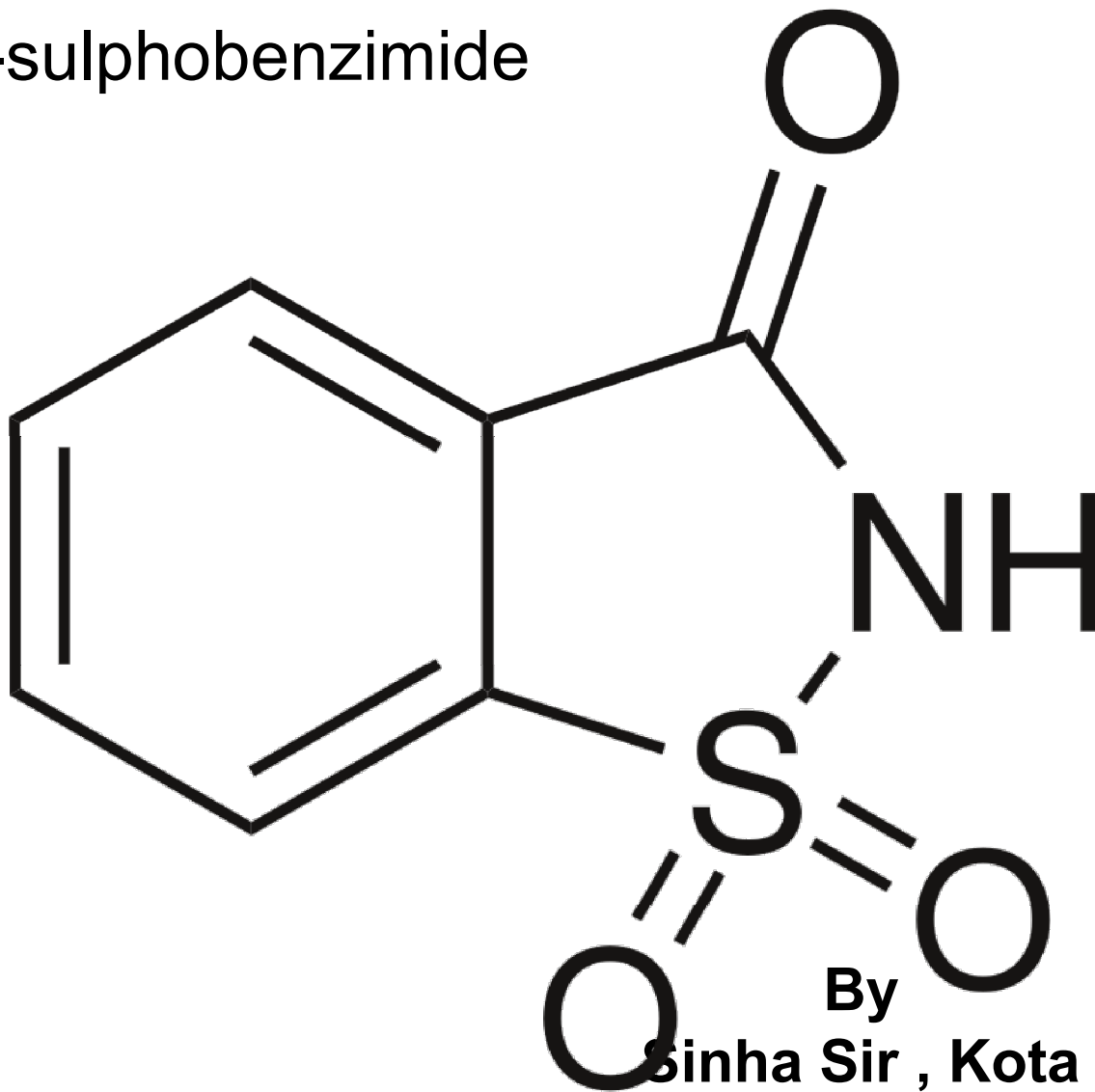
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# **Sweeteners**

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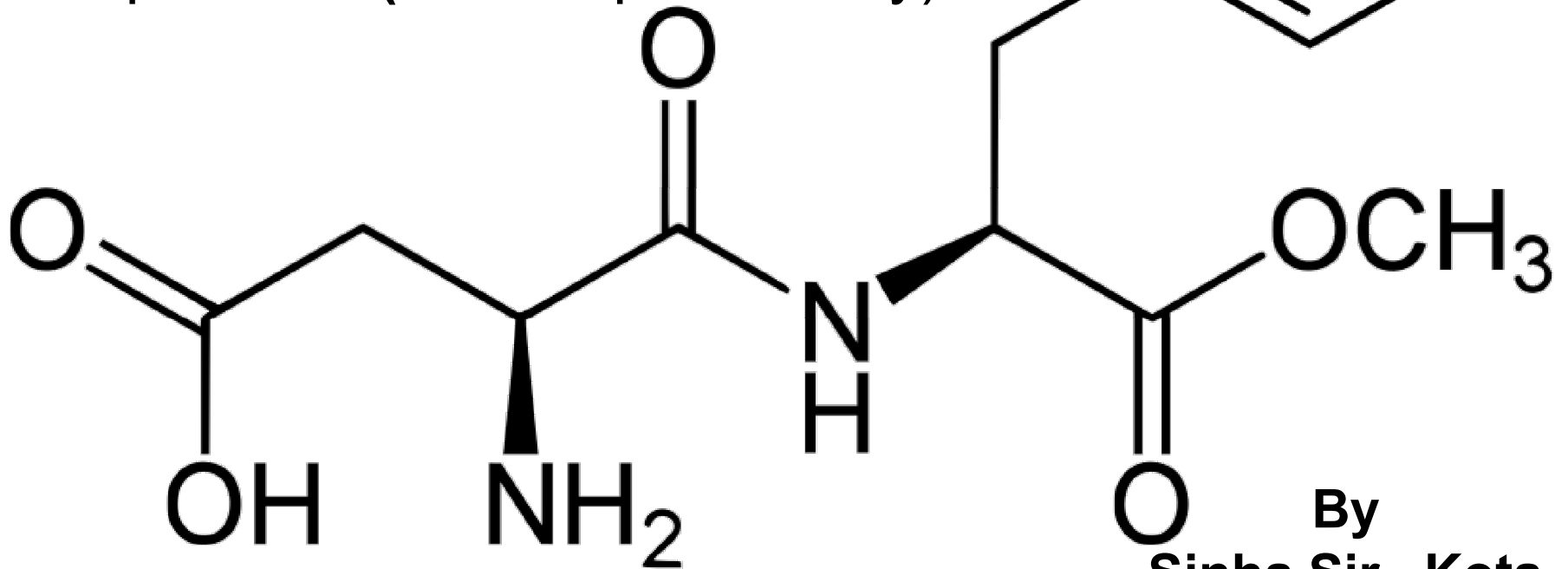
# Saccharin

Saccharine : Ortho-sulphobenzimide



# Aspartame

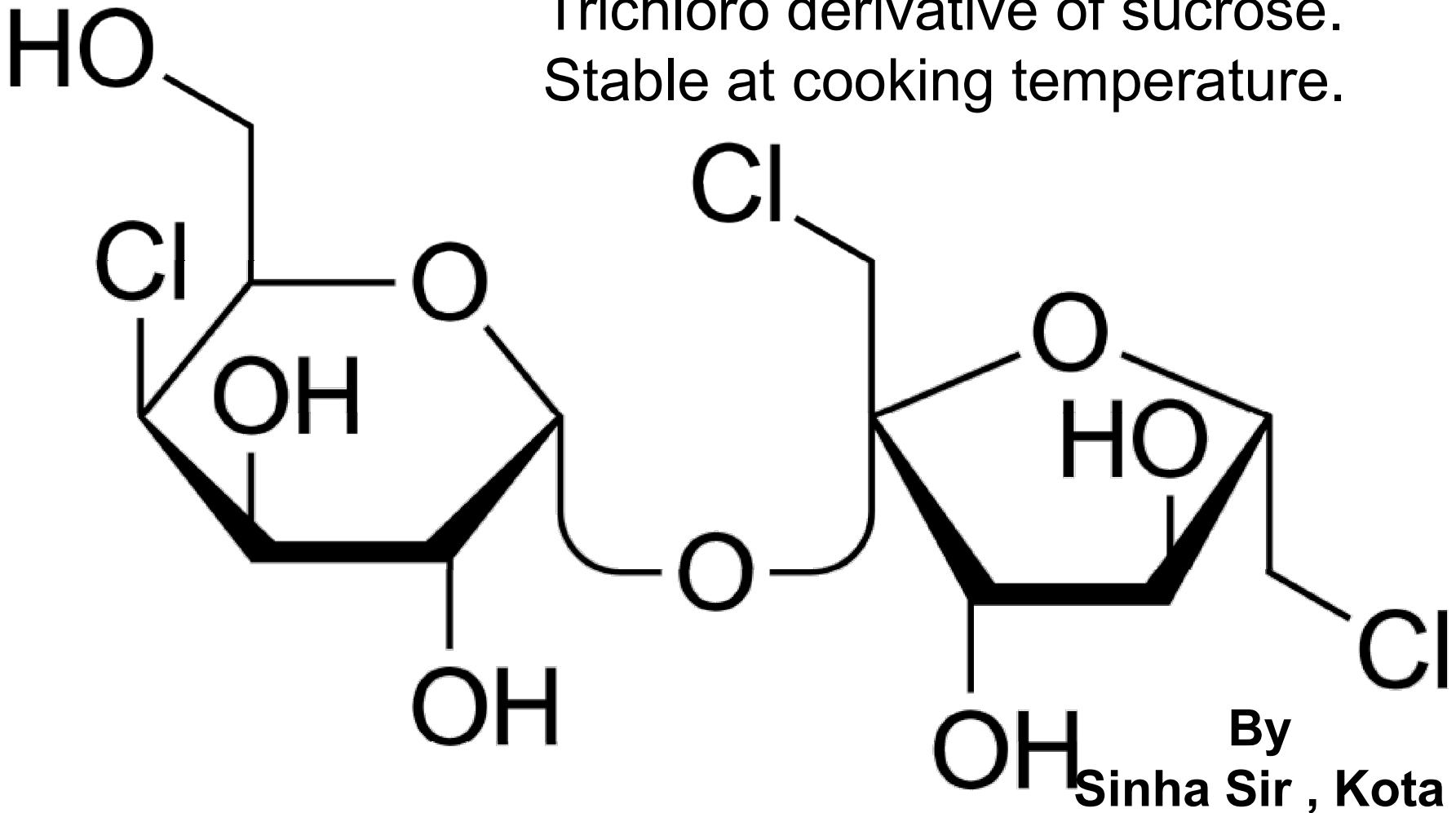
Aspartame : 100 times sweet  
Methyl ester of dipeptide aspartic acid & phenylalanine.  
unstable at cooking  
temperature.(low temp food only)



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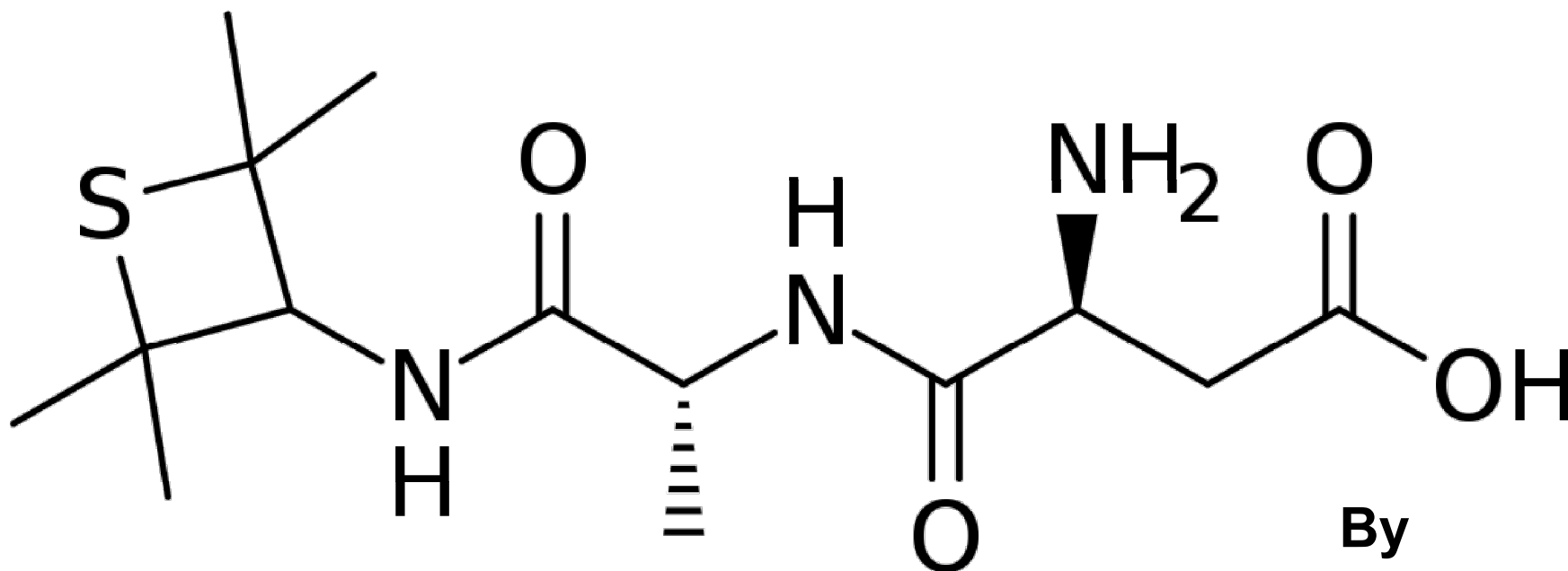
# Sucralose

**Sucralose** : 600 times sweet  
Trichloro derivative of sucrose.  
Stable at cooking temperature.



# Alitame

**Alitame** : 2000 times sweet  
high potency sweetener,  
more stable than aspartame



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## Cleansing agents:

Soaps and detergents are examples of cleansing agents.

1) Soaps

2) Detergents.

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# Soap

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1)**Soaps** : These are sodium or potassium salts of higher fatty acids containing more than twelve carbon atom.

Potassium soaps are softer than sodium soaps.

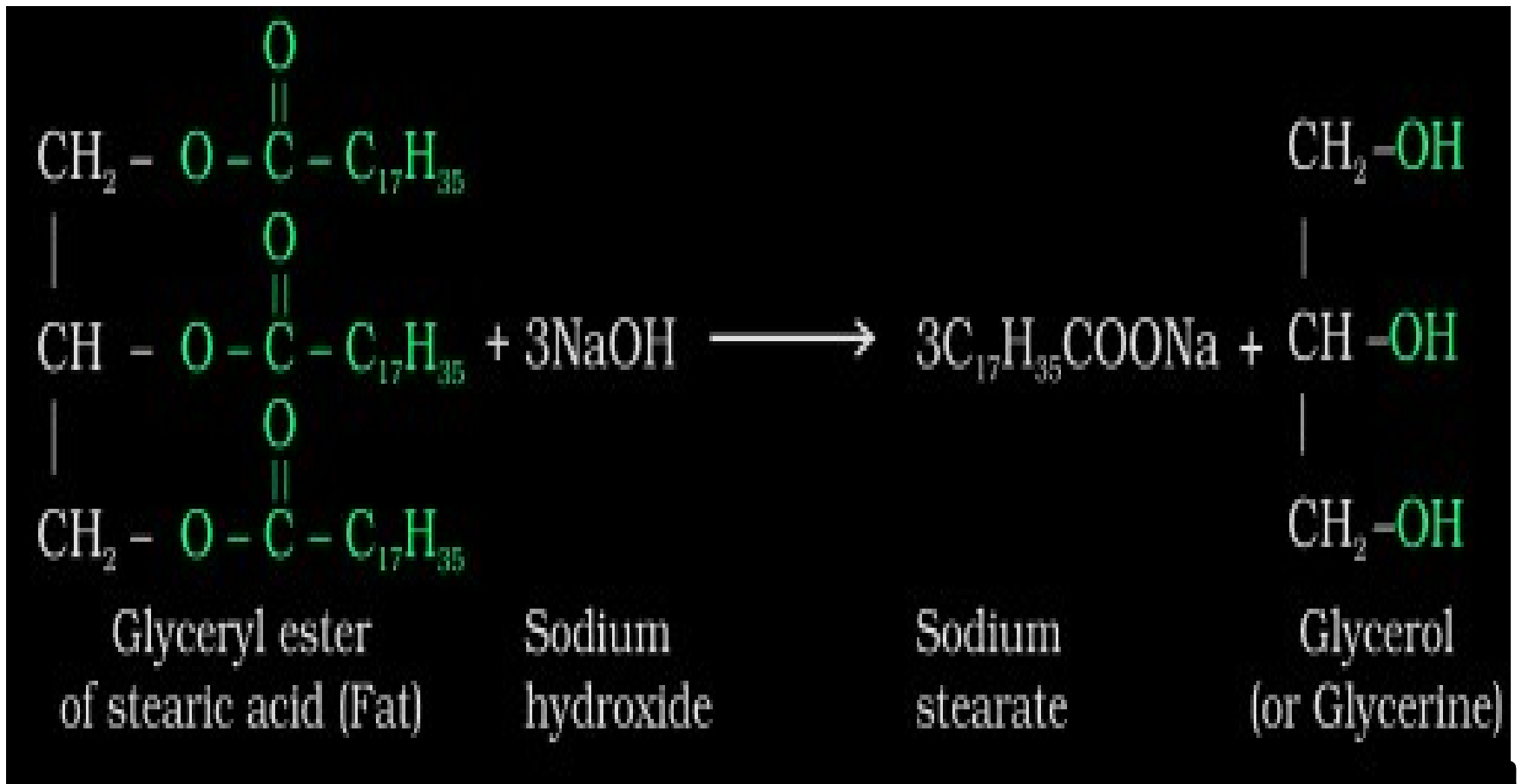
shampoo,  
shaving cream,  
bathing soaps,  
etc.

toilet soaps,  
washing  
purposes, etc.

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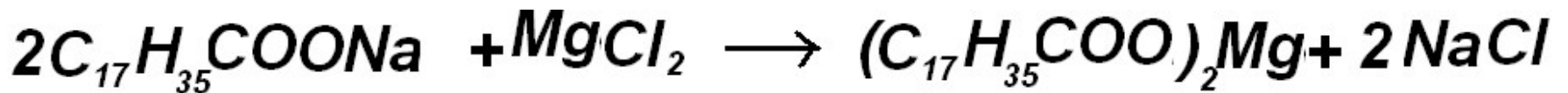
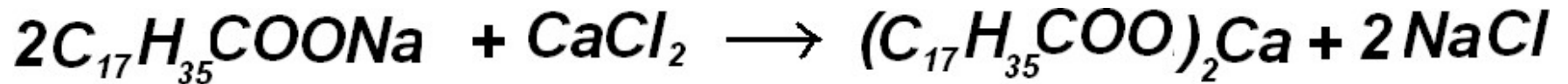
# Preparation soap

- **Soaps**- made by boiling fats or oils with suitable soluble hydroxide



# Soaps

- Soap in hard water-



Hard water contains calcium and magnesium ions. Soap react with these ions to produce calcium and magnesium salts which are insoluble in water.

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# Cleansing agents

**2) Detergents-** **P**rimarily sodium salts alkyl hydrogen sulphate or long chain alkyl benzene sulphonic acid.

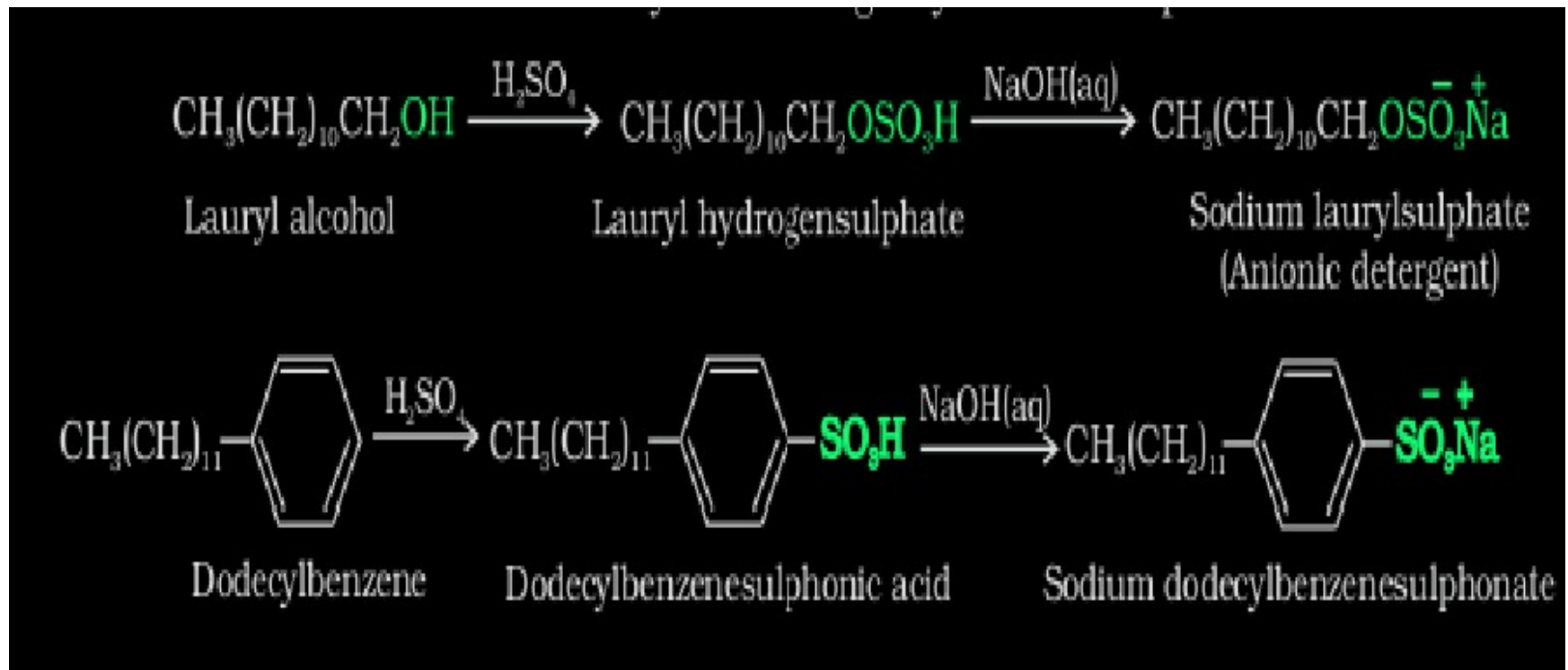
Detergents are superior to soaps,

Three types

- Anionic detergents
- Cationic detergents
- Non-ionic detergents

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1) **Anionic detergents** : They have anions at the water soluble end of chains .These are prepared from long chain hydrocarbons or alcohols with conc. Sulphuric acid followed by neutralization using sodium hydroxide to produce **sodium lauryl sulphate**

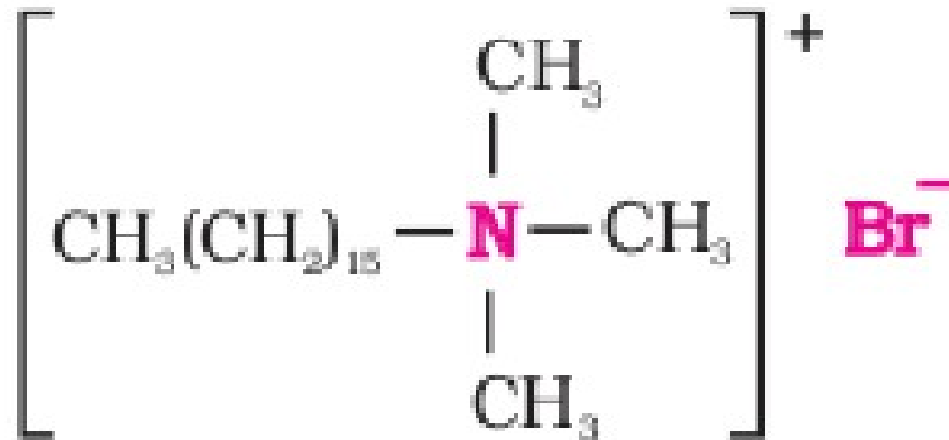


**2)Cationic detergents:** Are quaternary ammonium salts of amines with chlorides, acetate or bromides. They have cations at water soluble ends. Anions are chlorides, acetates, or bromide and cations are long chain hydrocarbons having +ve charge on nitrogen atom.

Eg.n-hexadecyl trimethyl ammonium bromide

(**cetyltrimethyl ammonium bromide** )

The cetyltrimethyl ammonium chloride is used in hair conditioners.



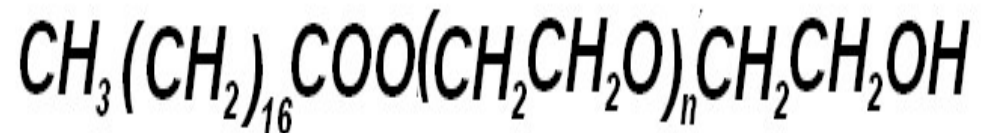
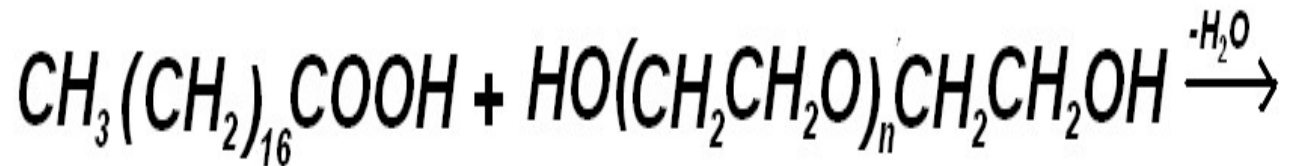
Cetyltrimethyl ammonium bromide

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3) Non ionic detergents: They have hydrogen bonding group at soluble ends of chain. These detergents are monoesters of polyhydric alcohols.eg.pentaaerythrityl stearate

Non-ionic detergents



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# Cleansing action of soap

Soap molecules has two parts, a long chain hydrocarbon **tail** soluble in oil and other part **head** water soluble end.

eg. **Sodium stearate**.

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On addition of soap over stain, hydrocarbon part of soap molecules dissolves in oil , while water soluble end dissolve in water. Big molecules of oil and soap break by rubbing into small emulsified oil droplets in water

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As a result, a stable emulsion of oil in water is formed, which can be washed away by stream of water. The anions of emulsion repel each other hence do not precipitate.

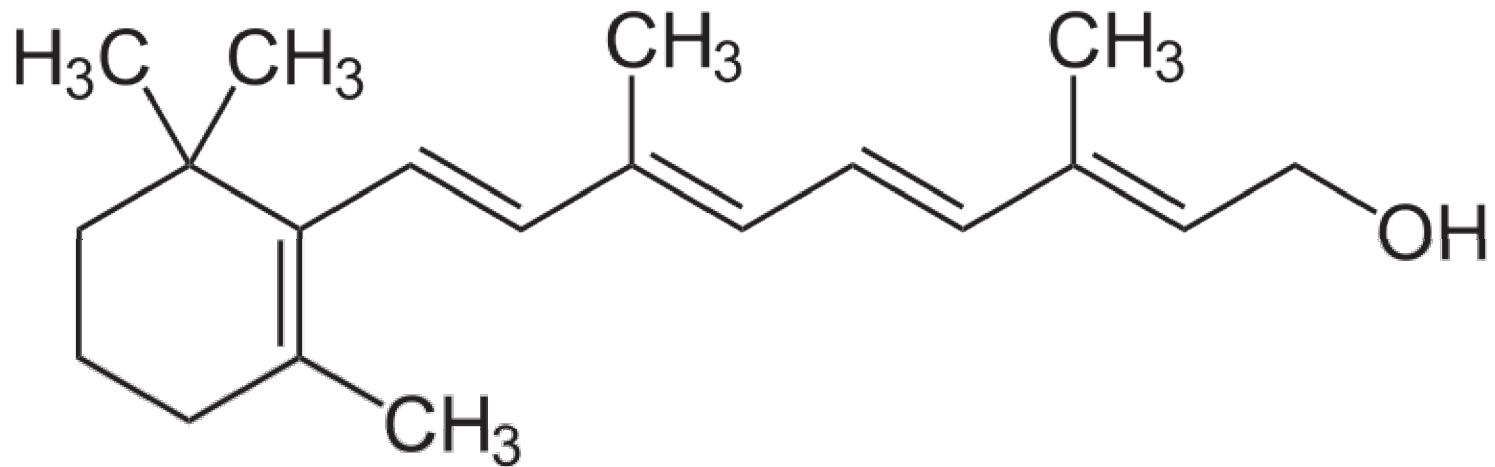
Soaps and detergents have similar mechanism of cleaning action. The detergents available in market contain 20% active ingredients and remaining are sodium sulphate, inorganic phosphate ,foaming agents, etc.

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# Vitamins

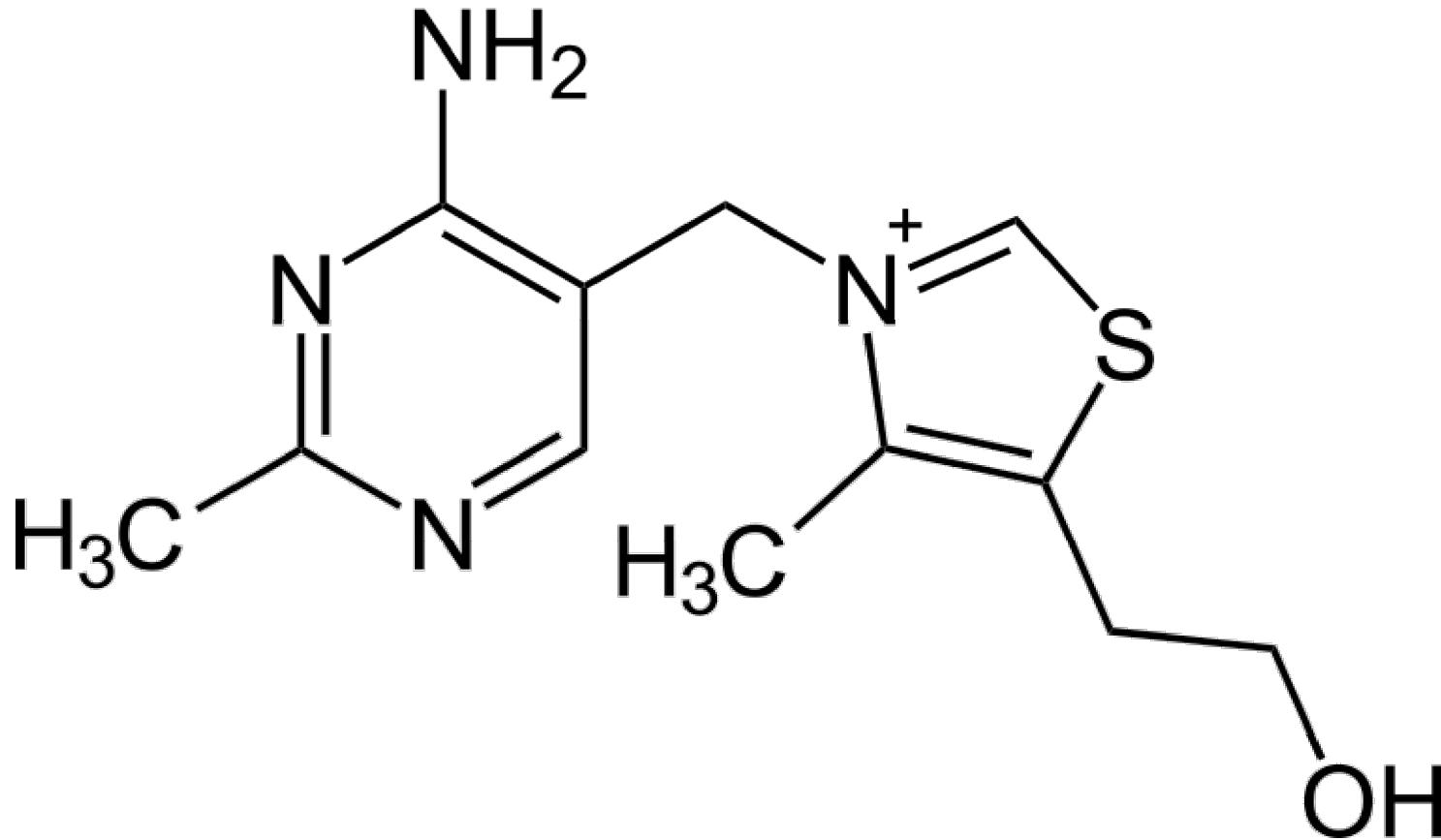
**By**  
**Sinha Sir , Kota**

# VitaminA\_All-trans-Retinol



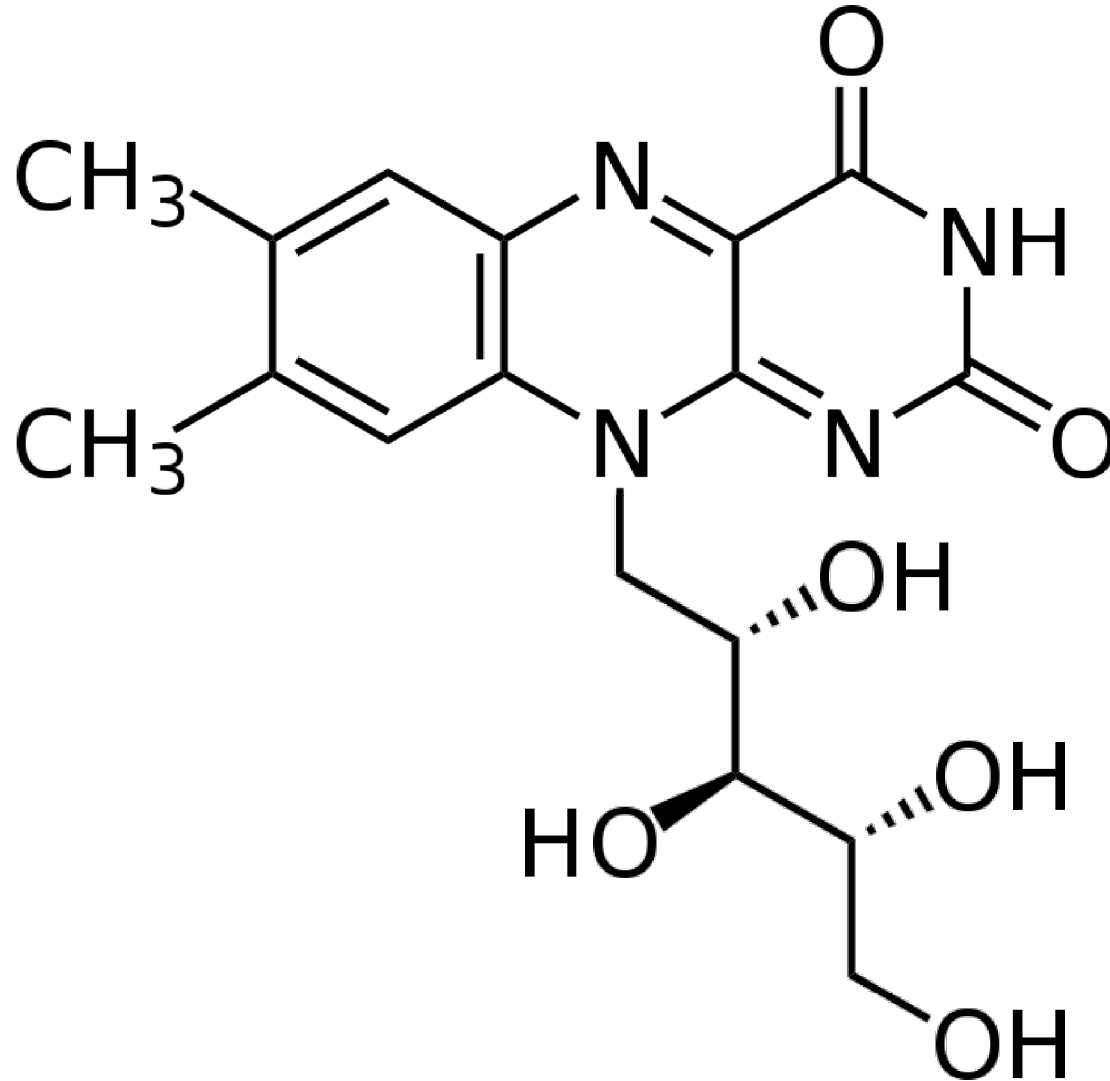
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# vitaminB1\_Thiamin



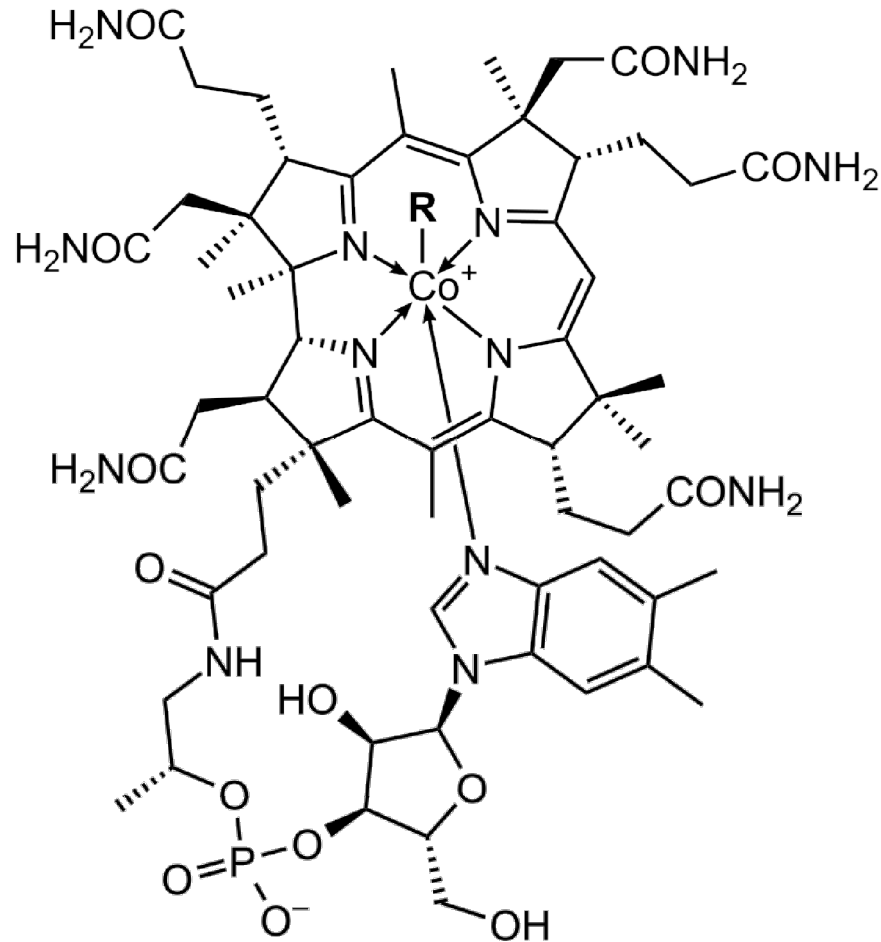
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# Riboflavin Vitamin B2



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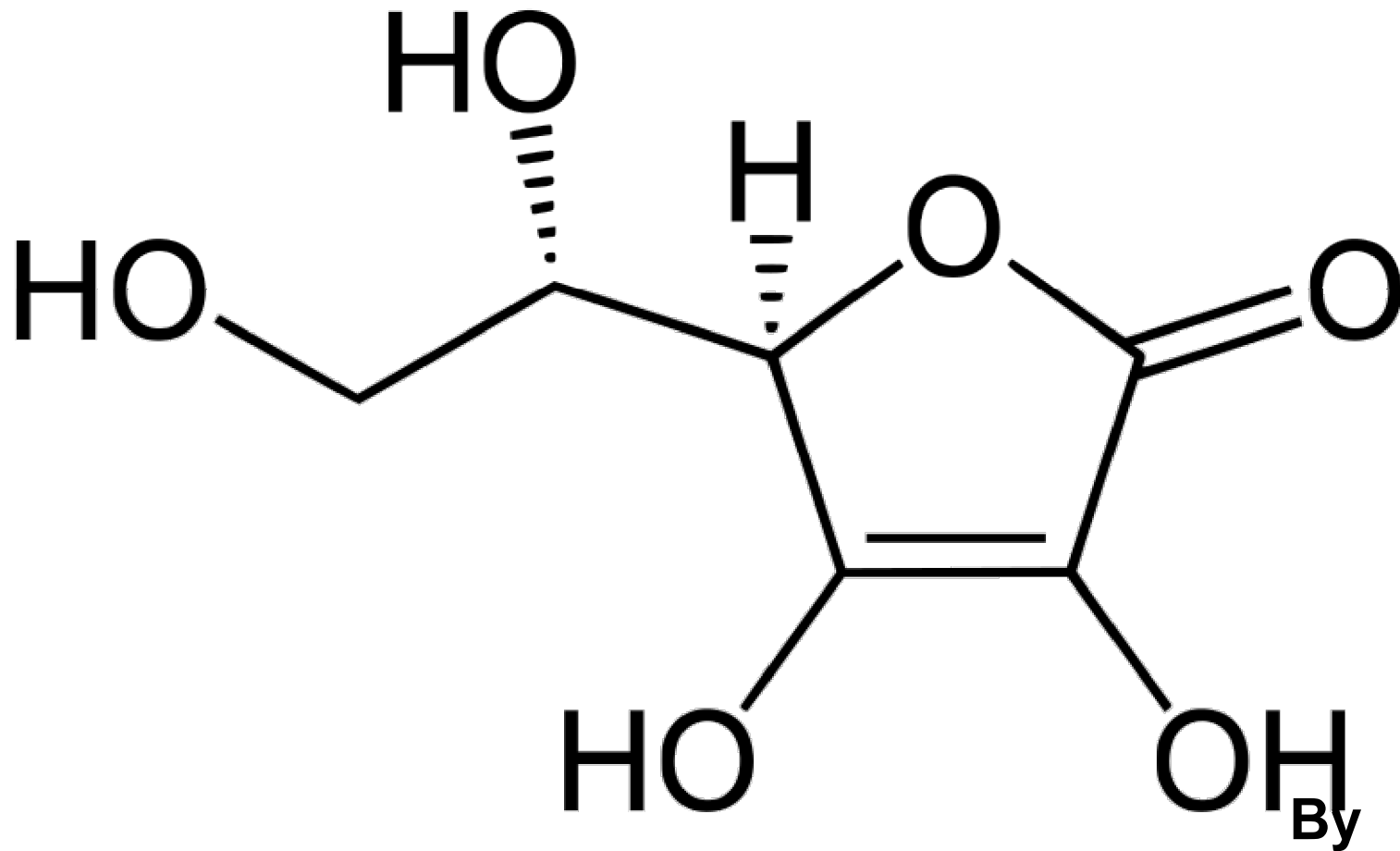
# Vitamin B12\_Cobalamin



R = 5'-deoxyadenosyl, CH<sub>3</sub>, OH, CN

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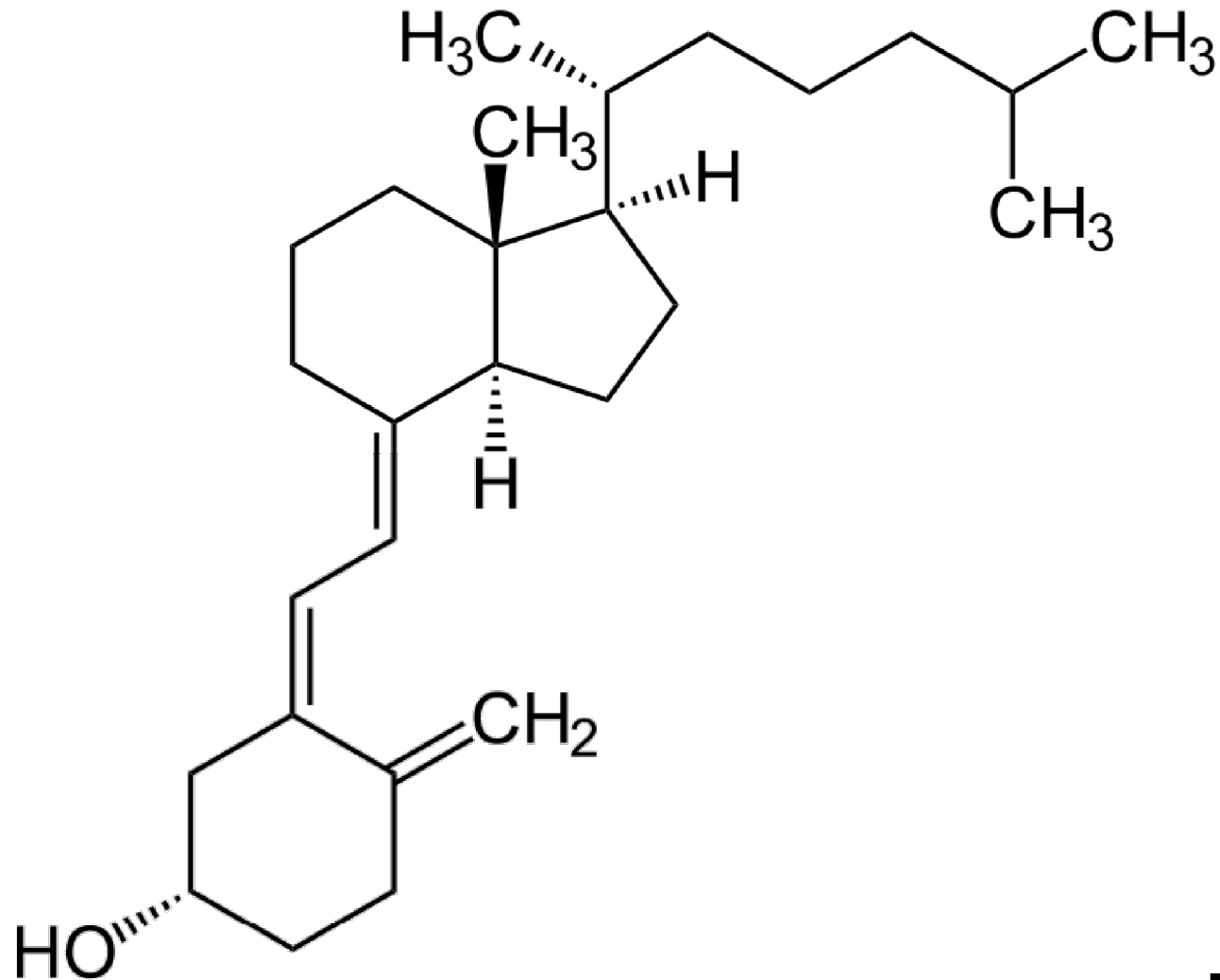
# Vitamin C\_L-Ascorbic\_acid.



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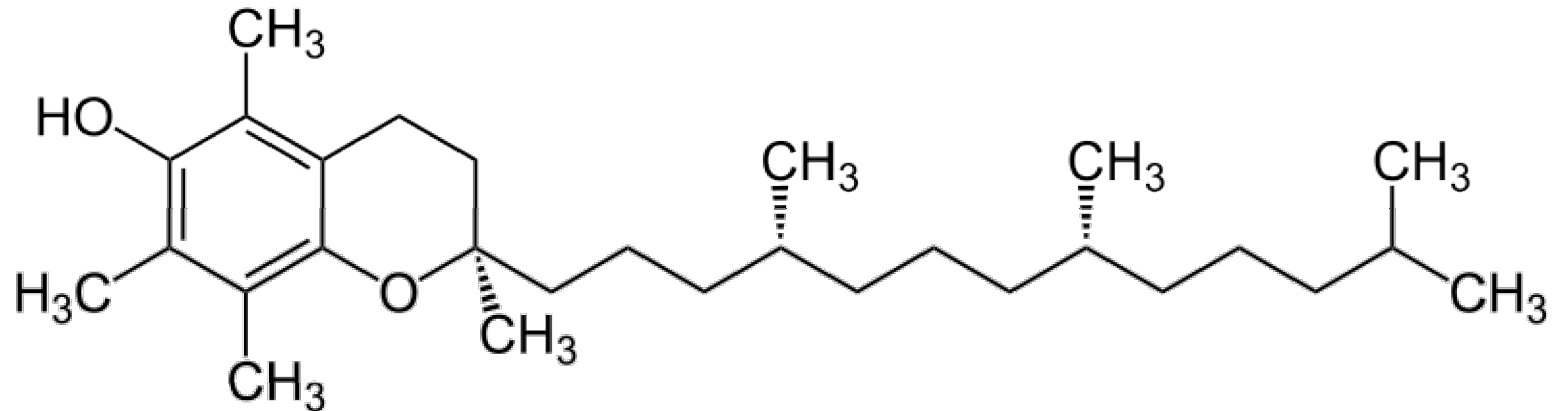


# Vitamin D-Cholecalciferol<sub>2</sub>



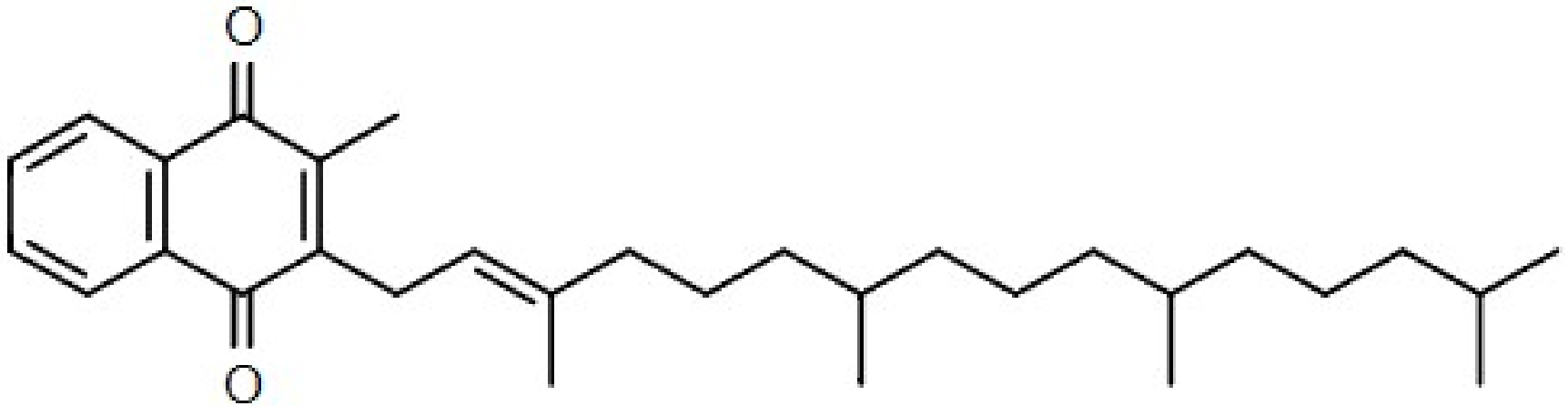
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# vitamin E\_Alpha-Tocopherol



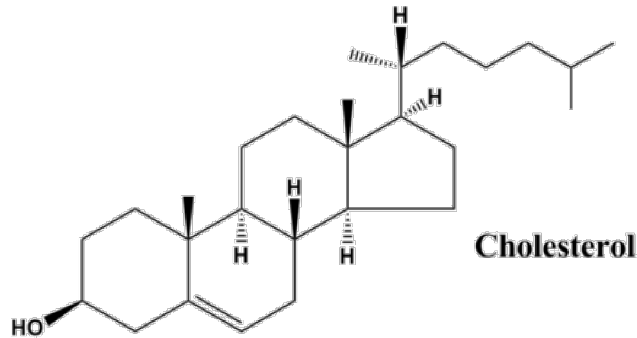
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# Vitamin K



By  
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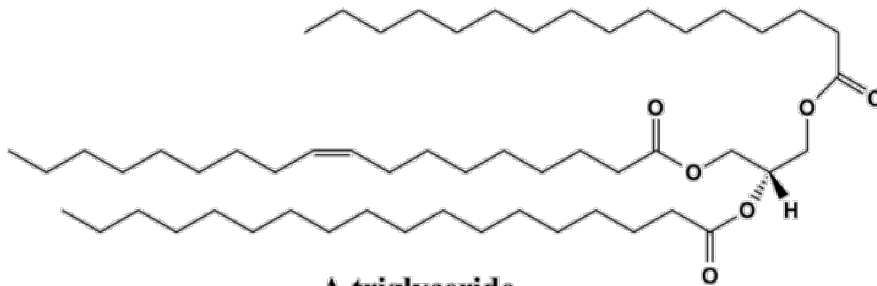
# Common\_lipids\_Imaps



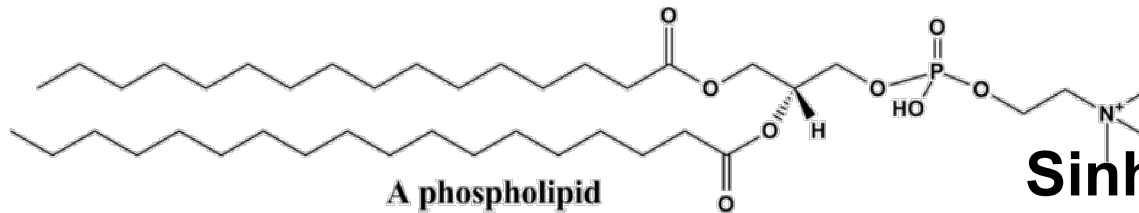
Cholesterol



A free fatty acid



A triglyceride



A phospholipid

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