

# Pharmacognosy

*Third stage*

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*2<sup>nd</sup> semester*

*Lec: 4*

## 1.B Erythroxyton (Coca) Alkaloids

Occurance:- Coca leaves contain about 2% total alkaloids.

Main Alkaloids are:

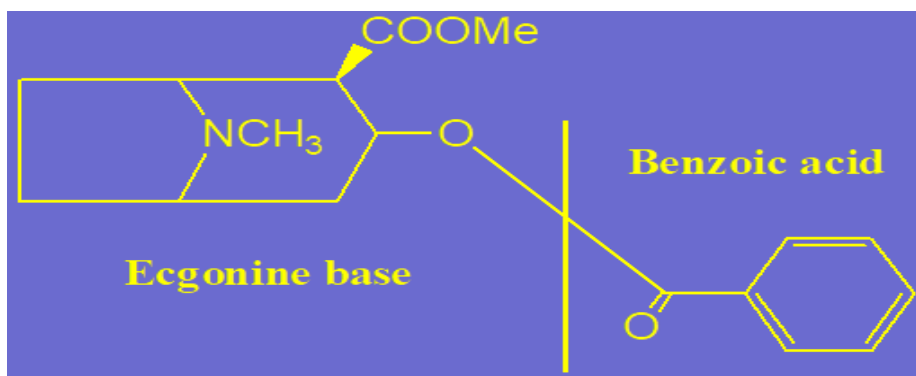
- 1- Cocaine.
- 2- Cinnamylcocaine.
3. a- truxilline.

The base for Coca Alakloid is called “Ecogonine”

Cocaine:- It is the major Alkaloid in Coca leaves

Cocaine is diester Alkaloid.

Heating at 160 0C in conc. HCl leads to hydrolyses of cacaine to MeOH, Benzoic acid and Ecogonine base.



## Pharmacological Properties :

Cocaine is a local anesthetic. As a contact anesthetic, it blocks ion channels in neuronal membranes, and interrupts the propagation of action potentials corresponding to the sensory message. Cocaine is also a parasympathomimetic : it acts as an adrenergic stimulant by blocking the reuptake of dopamine and noradrenaline at the presynaptic neuron by binding to their transporters. This adrenergic stimulation causes hyperthermia, mydriasis, and vasoconstriction of most of the blood vessels, which increases resistance and contributes to increasing blood pressure. The heart rate increases.

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Centrally, the stimulation results in a sensation of euphoria with intellectual stimulation, decreased hyperactivity and other effects sought by drug addicts. Therefore, it is one of the widely abused drugs. The principal routes of cocaine administration are oral, intranasal, intravenous and inhalation. Cocaine use ranges from occasional use to repeated or compulsive use, with a variety of patterns between these extremes.

There is no safe way to use cocaine. Any route of administration can lead to absorption of toxic amounts of cocaine, leading to acute cardiovascular or cerebrovascular emergencies that could result in sudden death. Repeated cocaine use by any route of administration can produce addiction and other adverse health consequences.

## **Lidocaine**

Lidocaine (lignocaine) is an example of an amino amide analogue and is perhaps the most widely used local anaesthetic, having rapid action, effective absorption, good stability, and may be used by injection or topically.

Lidocaine, although introduced as a local anaesthetic, was subsequently found to be a potent antiarrhythmic agent, and it now finds further use as an antiarrhythmic drug, for treatment of ventricular arrhythmias especially after myocardial infarction.

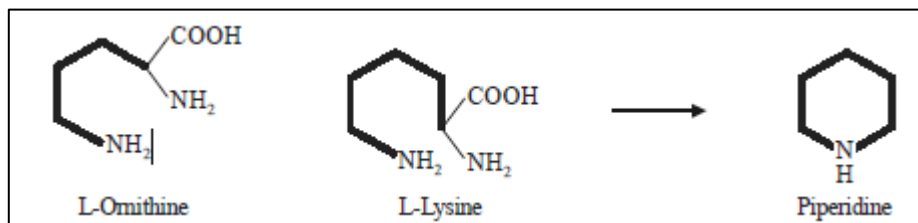
Other cocaine related structures also find application in the same way, including tocainide, procainamide, and flecainide.

Tocainide is a primary amine analogue of lidocaine, whilst procainamide is an amide analogue of procaine.

## **Alkaloids Derived from Lysine**

The amino acid L-lysine happens to be the homologue of L-ornithine, and it also caters as an alkaloid precursor, employing pathways that are analogous to those known for ornithine. The 'additional methylene moiety' present in lysine affords the formation of six-membered piperidine ring systems, very similar to ornithine that provided five-membered ring systems, as shown below:

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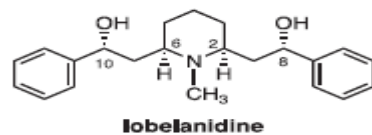
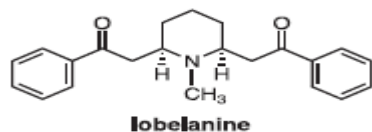
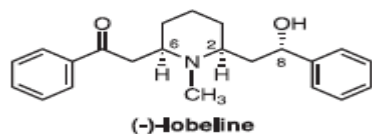


## Piperidine Alkaloids

The various important alkaloids that essentially have the piperidine nucleus are, namely: Coniine, Lobeline, Lobelanine and Piperine, which shall be discussed individually in the sections that follows:

### *Lobelia inflata* (Indian Tobacco) AND Lobeline

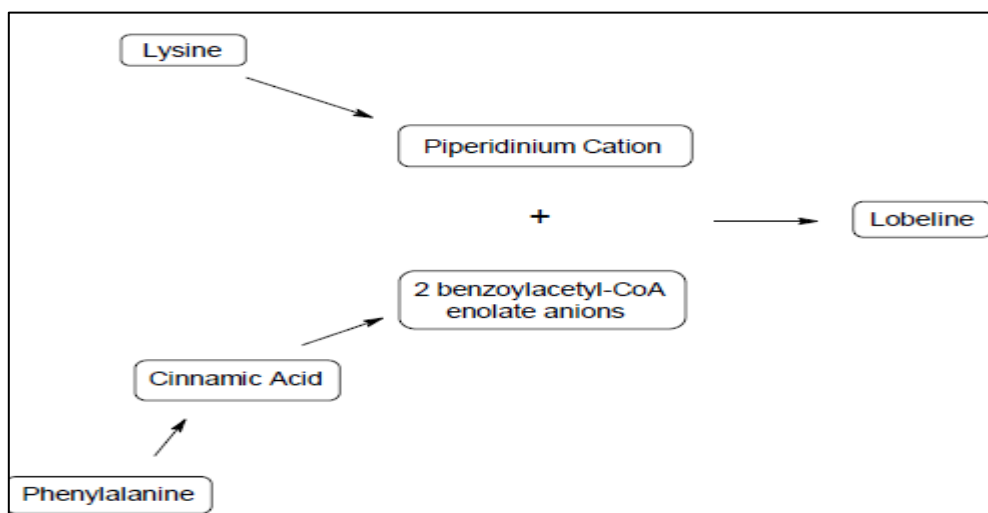
*Lobelia inflata* (Campanulaceae) grows wild in the U.S.A., the eastern and central part of Canada. The leaf has been used by Native Americans as an emetic since ancient times. From this plant, a large number of piperidine and N-methylpiperidine derivatives were obtained, and the main alkaloids are lobeline, lobelanine, and lobelanidine



## Biosynthesis of lobelia alkaloids

Biosynthetically, these alkaloids may be formed by a double Mannich reaction between two molecules of phenylalanine (via cinnamic acid and benzoylacetate-coenzyme A) and one  $\Delta^1$ -piperidinium cation arising from lysine .

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## Lobeliae herba, Pharmacological activity

### Lobeline

- It is a respiratory stimulant which enhances and accelerates the respiratory movements . therefore, these alkaloids are used clinically as respiratory stimulants in the case of non-responding newborn infants, for collapse in cases of gas poisoning and anaesthetic poisoning, and for suffocation caused by drowning.
- The North American Indians smoked lobelia rather like tobacco (*Nicotiana tabacum*; Solanaceae).Lobeline stimulates nicotinic acetylcholine receptor sites in a similar way to nicotine, but with a weaker effect. for this reason, lobeline sulfate was used for smoking cessation. Several studies show that lobeline (in smoking cessation preparations) is ineffective in helping people to quit smoking.

### Pepper (*Piper nigrum*) and Piperine

Many members of the Piperaceae are of Indian origin, and are vine-like evergreens which entwine other trees. *Piper nigrum* is cultivated in India, the West Indies, and South America.

Black pepper is prepared from the unripe fruits of *Piper nigrum* with their pericarp, and white pepper is prepared from the ripe fruits after removal of their pericarp.

Piperine is recognized as the predominant pungent principle of pepper. Piperine possesses a structure in which a piperidine moiety is combined with piperinic acid through an amide function.

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Piperine is a CNS depressant and an anticonvulsant in rats. Some of its synthetic derivatives have been used in china as anti-epileptics.

