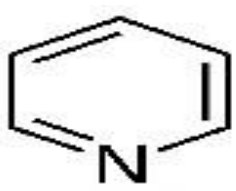
PharmacognosyIII

Lec. 2 **3rd stage 2nd semester** **Year 23-24**

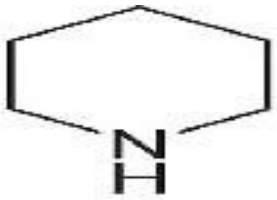
Lecturer: Dr. Jamel Fani

ALKALOIDS

Pyridine –piperidine-pyrolidine alkaloids



pyridine



piperidine

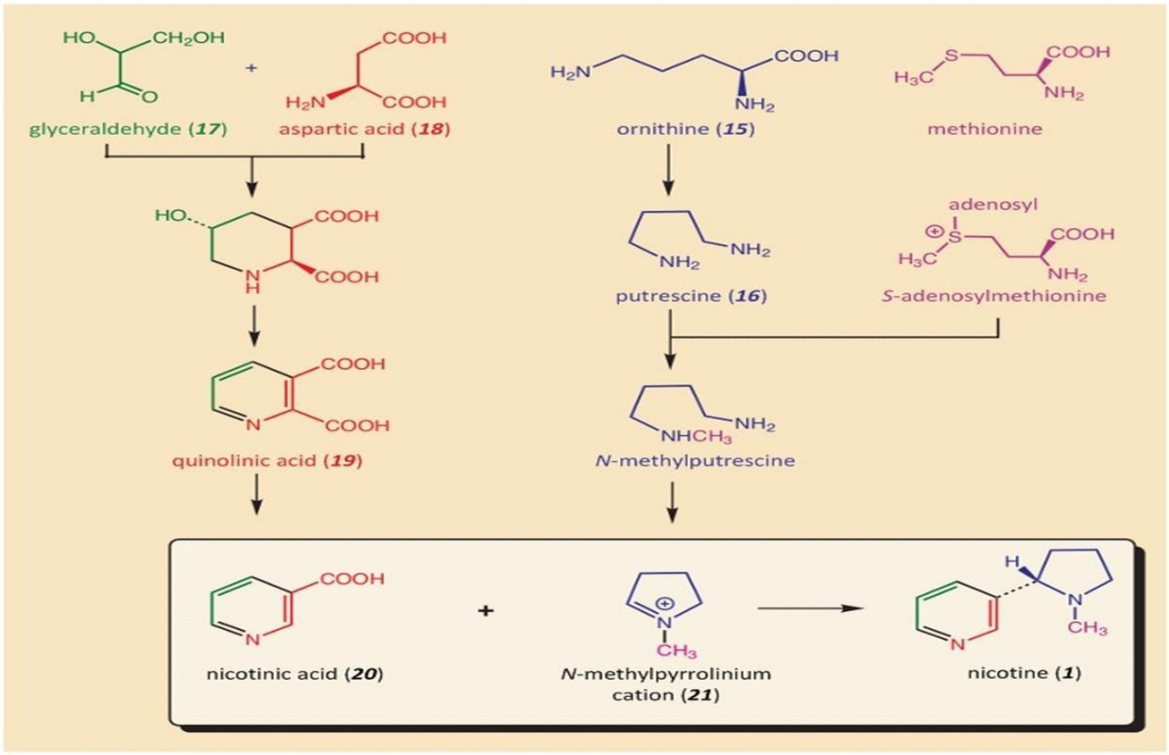
pyrolidine

- Upon reduction, the tertiary base, pyridine is converted into the secondary base piperidine.
- These two nuclei form the basis for this group which sometimes is divided into three groups:
    - Derivatives of piperidine e.g. lobeline from lobelia.
    - Derivatives of nicotinic acid e.g. arecoline from areca.
    - Derivatives of both pyridine-pyrolidine e.g. nicotine from tobacco.

Biosynthesis of pyridine- piperidine alkaloids:

Nicotine: The biosynthetic pathway leading to this compound is summarized as follows:

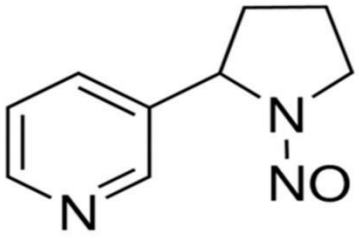
- Ornithine is incorporated into nicotine by tobacco plants. This incorporation results in a symmetric labeling pattern of nicotine.
- Putrescine, N-methyl-putrescine, and N-methyl-aminobutanal are all incorporated. The N-methylpyrrolinium ion is the key intermediate which, through electrophilic aromatic substitution attached to C-3 of the pyridine ring of nicotinic acid.



Drugs containing pyridine-piperidine alkaloids:

Tobacco:

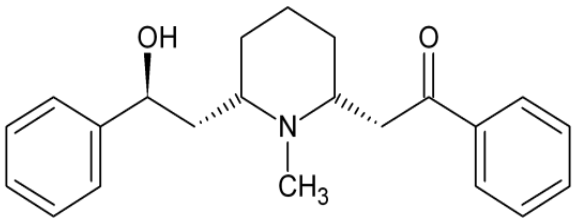
- It is the dried leaves of *Nicotiana tobacco* F: Solanaceae.
- It is cultivated for smoking, it contains alkaloids from 0.6-0.9%, the main one is nicotine, which is an oily liquid alkaloid, it is colorless liquid but when oxidized converts to yellow color.
- Nicotine has pronounced effects on the cardiovascular system, where peripheral vasoconstriction, atrial tachycardia and an increase in both systolic and diastolic blood pressure are observed.
- It is worth noting that 50% of all smokers die of heart disease and 20% of lung cancer.
- The carcinogenicity of tobacco is probably not due to nicotine but rather to a far more potent carcinogen (N-nitroso nor nicotine)
- It is found in cigarettes, cigars and chewing tobacco at levels in the range of 290pp, parts per billion concentrations of N-nitrosamines are considered hazardous to health.



N-nitroso nor nicotine

Lobelia or (Indian tobacco):

- It is the dried leaves and tops of *Lobelia inflate* F: Lobeliaceae (Campanulaceae).
- The drug contains 14 alkaloids, of which lobeline is the major and most important.



Lobeline

- Lobeline occurs in colorless crystals very slightly soluble in water, but readily soluble in hot alcohol.

Uses and Dose

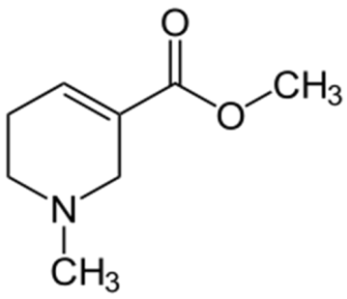
Galenical preparations of Lobelia were formerly used for expectorant purposes. Lobeline is a respiratory stimulant, but its action is somewhat unreliable and of brief duration. Other effects resemble those of nicotine. For this reason, 0.5 to 1.5 mg doses of lobeline sulfate are incorporated in tablets or lozenges which are intended to aid in breaking the tobacco habit.

Areca:

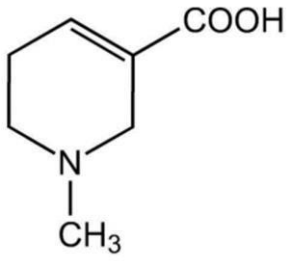
Is the dried and ripe seed of *Areca catechu* (Fam. Palmae). Areca contains several alkaloids which are reduced pyridine derivatives. Among them are arecoline (arecaidine methyl ester), arecaidine (N-methyl guvacine), guvacine (tetrahydronicotinic acid) and guvacoline (guvacine methyl ester). The content of total alkaloids ranges up to 0.45%.

Uses

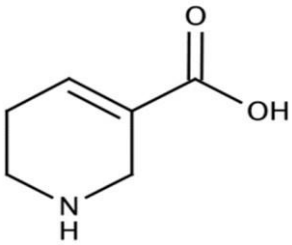
Arecoline Hydrobromide is used worms especially in veterinary medicine as an anthelmintic drug against parasitic tinea.



Arecoline



Arecaidine

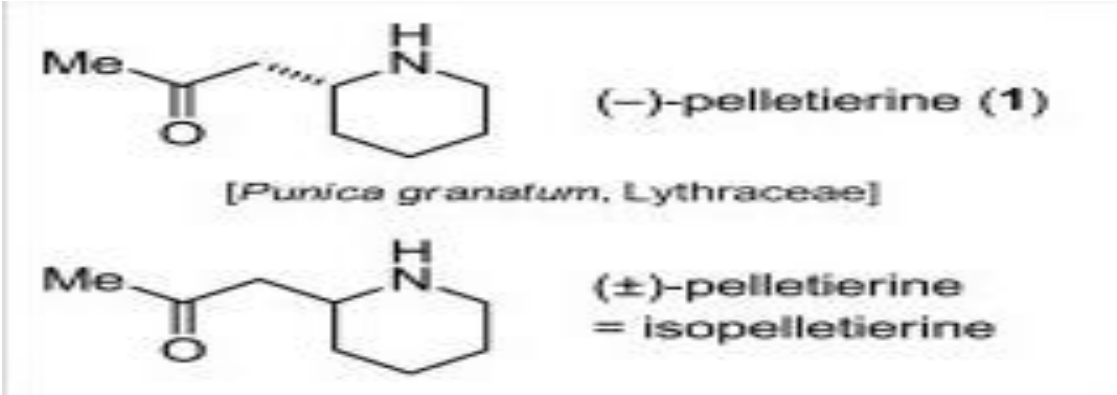


Guvacine (tetra hydro nicotinic acid)

Pomegranate:

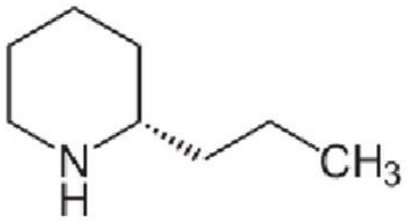
Pomegranate Root and Stem Bark or Granatum are derived from *Punica granatum* (Fam. Punicaceae). They contain about 0.5–0.9% of volatile liquid alkaloids, the chief of which are pelletierine and pseudopelletierine, together with about 22% of tannin.

Pelletierine tannate, a mixture of the tannates of the alkaloids, was included in the BP 1948 and was used as an anthelminthic with a specific action on tapeworms.

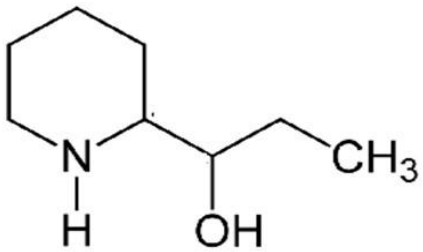


Conium (poison hemlock):

- It is the full-grown but unripe fruit of *Conium maculatum* F: Umbellifareae.
- It contains number of alkaloids, the most important of which is coniine and conhydrine.

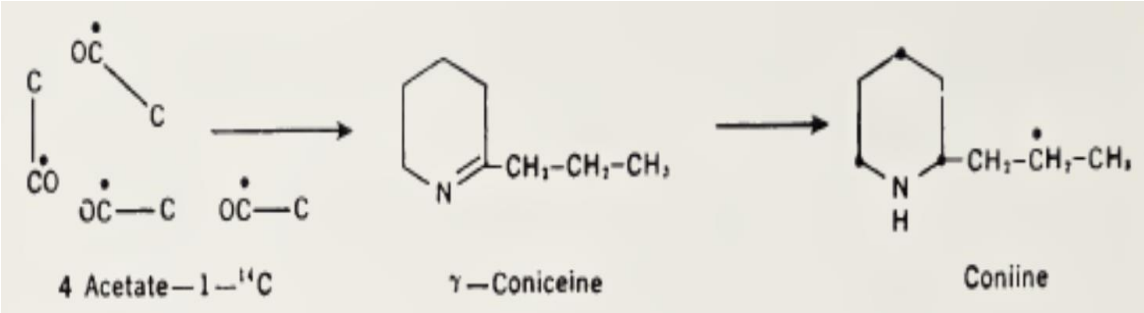


coniine



conhydrine

- It is used as anti-spasmodic.



Biosynthesis of coniine

Piper:

- It is the dried full-grown unripe fruit of *Piper nigrum* F: Piperaceae.
- It contains up to 4.5-8% of piperine.
- Mainly used as a condiment.
- It has an irritant, stimulant and febrifuge activity (decrease body temperature).
- On hydrolysis of piperine, we get another alkaloid piperidine which is a liquid alkaloid.