HYGRINE

Characteristic features of Hygrine

1) It is a liquid having B.pt 193-195°C
2) It is miscible in dilute mineral acids, chloroform and ethanol; and is slightly soluble in water

Biological source of Hygrine

It is one of the Coca alkaloids and occurs in the leaves of Erythroxylon coca lam, (Erythroxylaceae)(coca).

Biological Source of Hygrine

In the roots of withania somniferum(L.)Dunal(Sol anaceae)(Ashwagandha).

Uses of Hygrine

It is broadly used as a

- Sedative
- Hypnotic
- laxative
- diuretic.

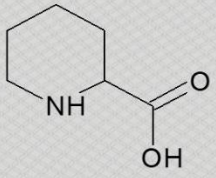
Structure elucidation of Hygrine

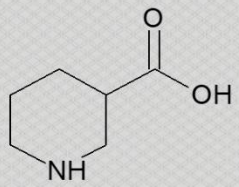
1) Its Molecular formula is $C_8H_{15}NO$
2) Its reactions show the presence of a keto group i.e it reacts with hydroxylamine to yield an oxime C=N-OH which shows evidently that it has ketonic functional moiety.
3) Its reactions show the presence of a tertiary nitrogen atom

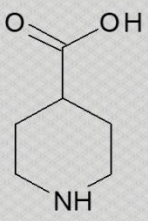
4)When oxidized with chromic acid, hygrinic (hygric)acid is formed.

$$\underset{\text{Hygrine}}{C_8H_{15}NO} \xrightarrow{[O]} \underset{\text{Hygrinic acid}}{C_6H_{11}NO_2}$$

5)Hygrinic acid was believed to be piperidine carboxylic acid



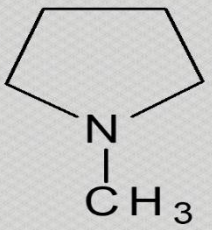




But comparison with 3 piperidine acids showed that this was incorrect.

6)When subjected to dry distillation Hygrinic acid gives *N*-methylpyrrolidine : hence hygrinic acid is an *N*-methylpyrrolidine carboxylic acid

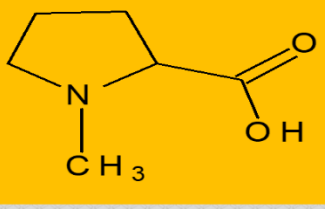
Hygrinic acid

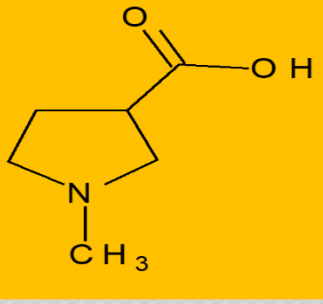


+ CO_2

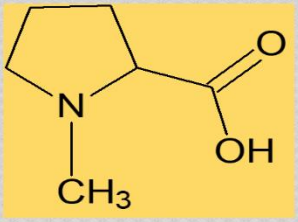
N-methyl pyrrolidine

Furthermore since the decarboxylation occurs very readily, the carboxyl group was assumed to be in the 2-position(by analogy with α-aminoacid)I



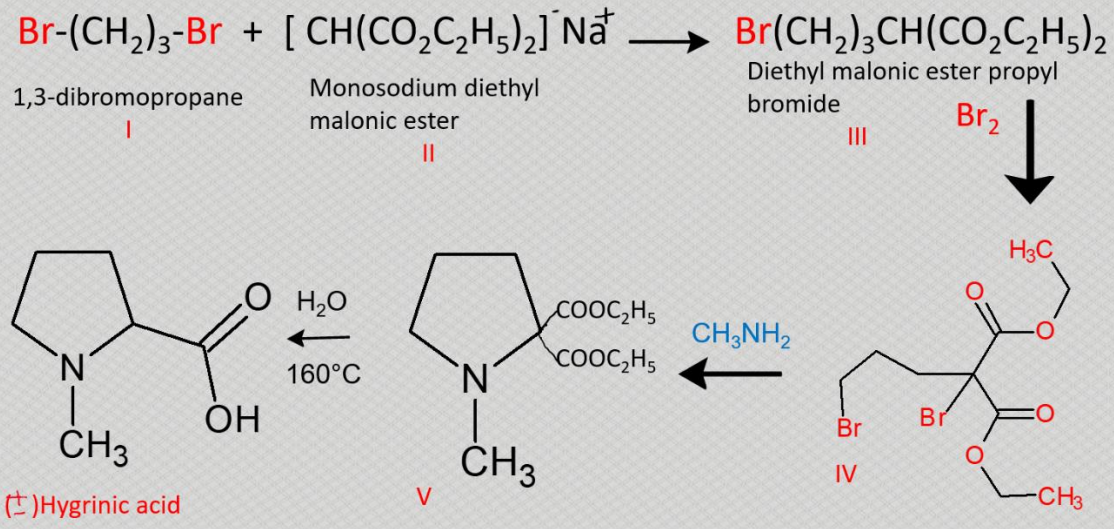


This structure 1-methylpyrrolidine-2-carboxylic acid for Hygrinic acid was confirmed by synthesis



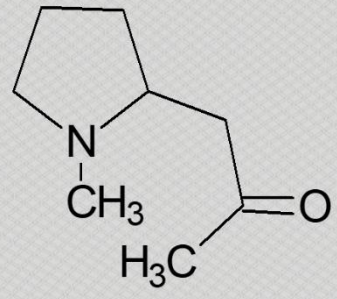
Hygrinic acid

Synthesis of Hygrinic acid (Willstatter,1900)

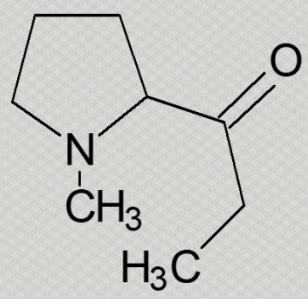


Possible structures for Hygrine

I

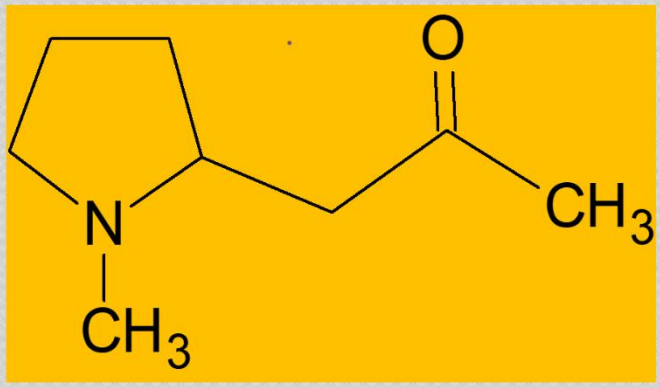


II

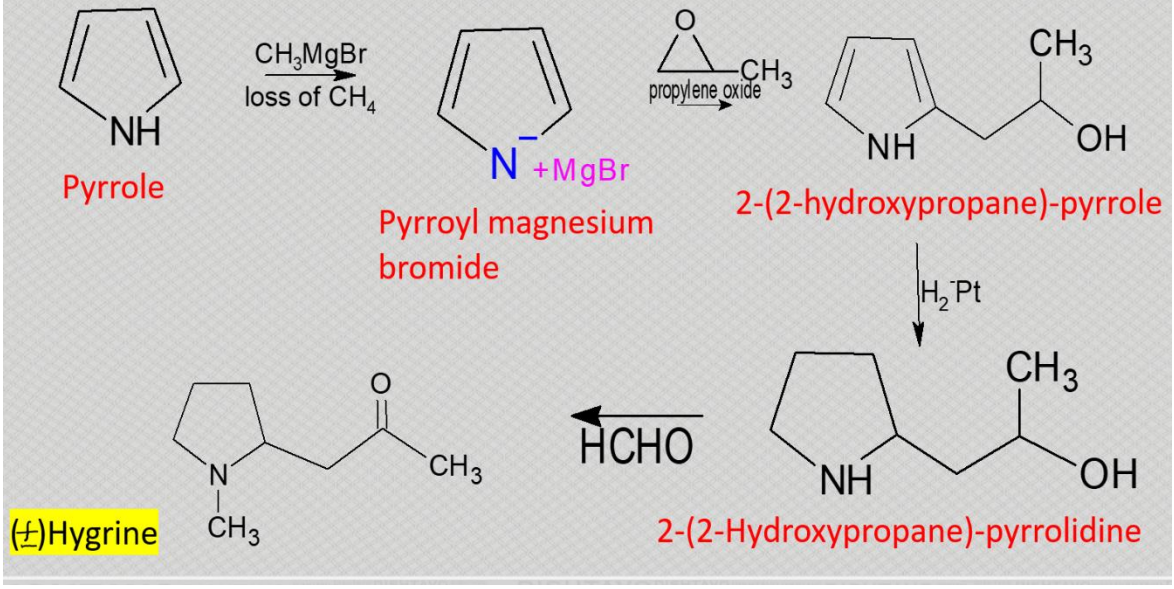


Hess (1913)claimed to have synthesized I and II and concluded that I was the structure of Hygrine

Structure of Hygrine

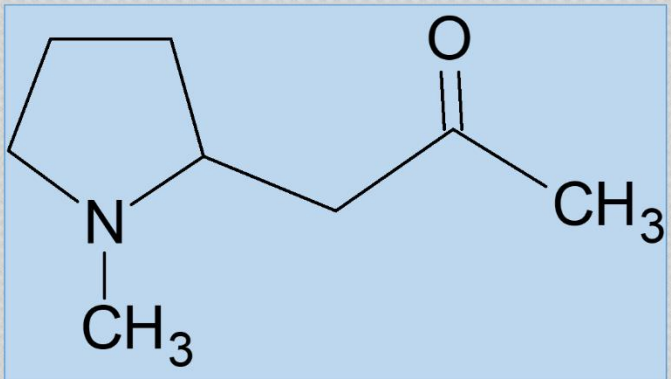


Synthesis of Hygrine (Hess in 1913)



The Eschweiler –Clarke methylation involves oxidation of the alcoholic group as well as methylation

HYGRINE



Thus the structure elucidation of Hygrine was done .