Vitamin B_{12}

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B_{12} (CYANOCOBALAMIN)

- Vitamin B_{12} is a cobalt complex. It is a coenzyme and occurs in liver.
- It is tightly bound to several enzymes in the body.
- It was isolated from liver extract in 1948. In 1965, Dorothy Hodgkin (Nobel laurete) determined its structure crystallographically.

The following are the important structural features of this vitamin: The cobalt in it exists as Co(III).

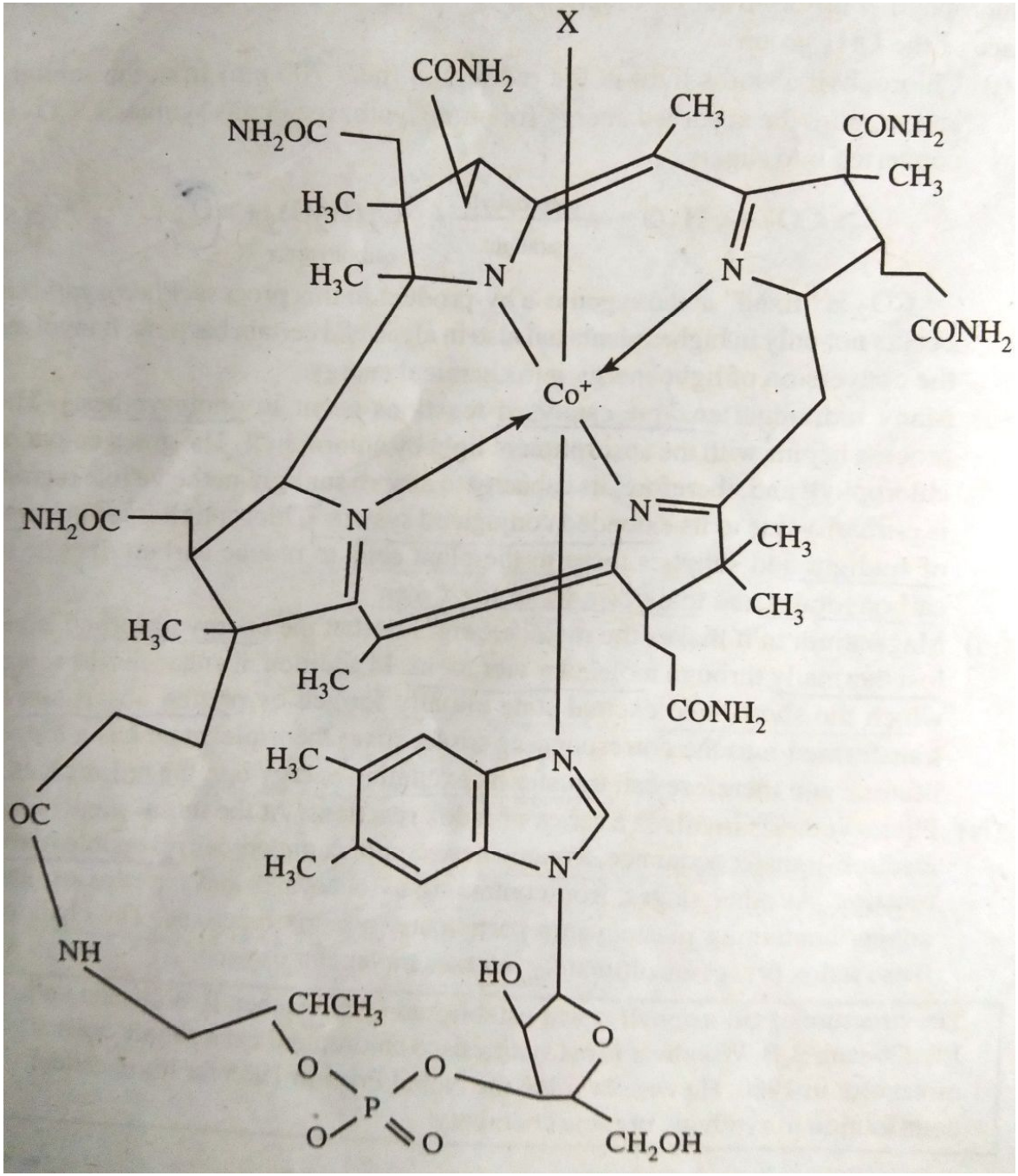
Cobalt is located at the centre of a macro cyclic ring called corrin ring; this ring resembles the porphyrin ring.

However , this ring is not conjugated like the porphyrin ring.

In addition, a complex organic portion consisting of a sugar, a phosphate group and an organic base are bonded in the molecule.

Cobalamin refers to the structure without the ligand X

X=CN-	: Cyanocobalamin
X= H_2O	: Aquacobalamin
X=CH_3	: Methylcobalamin
X=5'- deoxyadenosyl	: Coenzyme B_{12}


X
CONH2
NH2OC
CH3
CONH2
H3C
CH3
H3C
N
N
CONH2
Co+
NH2OC
N
N
CH3
H3C
CH3
H3C
CONH2
H3C
N
OC
H3C
N
NH
CHCH3
HO
O
O
O
P
O
O
O
CH2OH

Vitamin B_{12} is Cyanocobalamin

The exact role of Vitamin B_{12} in the cell processes is not clear; however , it can act only in concert with a number of enzymes.

The B_{12} co enzymes function in concert with a number of enzymes to effect several biological reactions.

One such reactions is dehydration of diols by dioldehydrases assisted by a B_{12} coenzyme.

$$RCHOHCH_2OH \longrightarrow RCH_2CHO + H_2O \qquad (R= CH_3 \text{ or } H)$$

It is of critical importance in the metabolisms of carbohydrates, fats and proteins.

In humans, deficiency of Vitamin B_{12} causes pernicious anemia.

Methylcobalamin (X= CH_3) is responsible for the environmental conversion of Hg(II) to toxic CH_3 Hg^+ through methane producing bacteria.

Similarly , it can transfer methyl groups to Tl(III), Pt (II), and Au(I).