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Viewer discretion advised: Material may contain medical images that may be disturbing to some viewers.

# Amino Acid metabolism

Amino acids



Glu, Gln,  
Asp, NH<sub>3</sub>



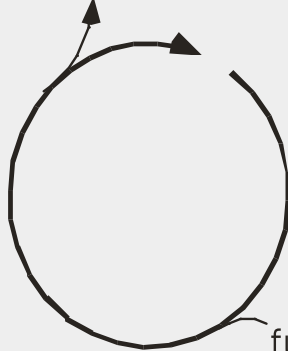
Urea

# Folate metabolism

Methylene  
THF

Met  
Cycle

oxaloacetate



fumarate

TCA Cycle

Purines

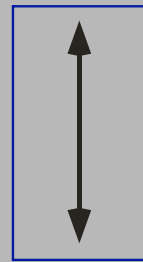
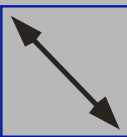
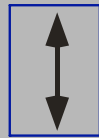
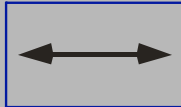
DNA  
RNA

Pyrimidines

Uric Acid

(energy)

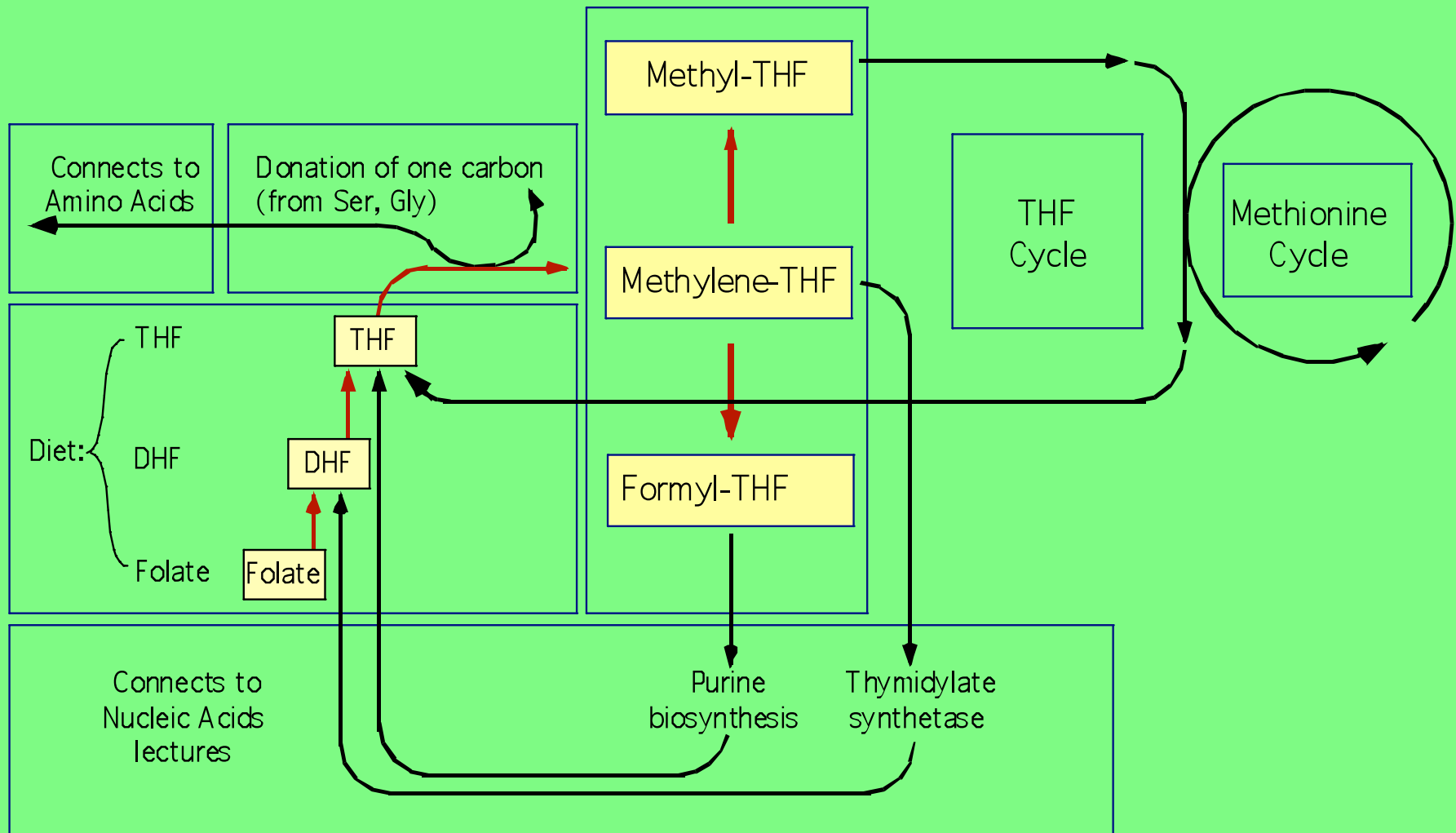
Nucleic Acid metabolism



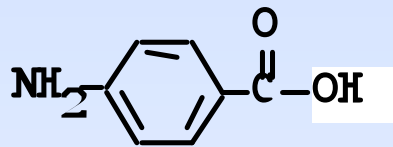
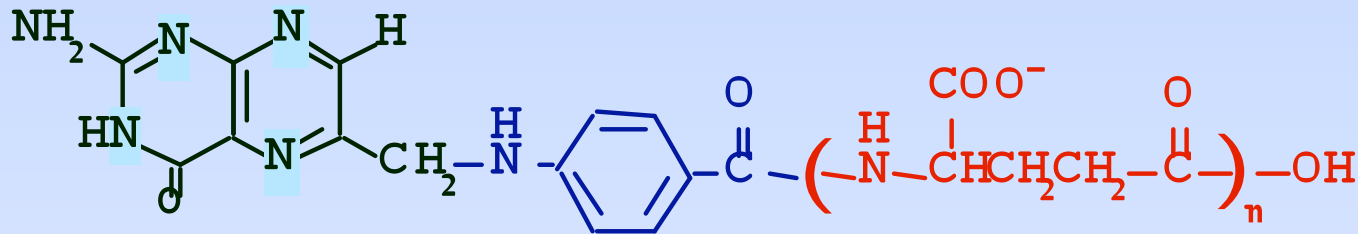
# Folate (“One-Carbon”) Pathways

Click on any blue box to see details

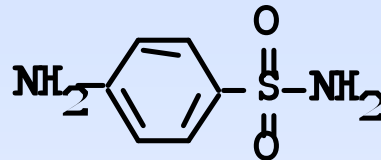
(Start with the section with ‘Diet’ and follow the paths with red arrows)



## Folic Acid is Synthesized By Bacteria



Para-aminobenzoic acid (PABA)

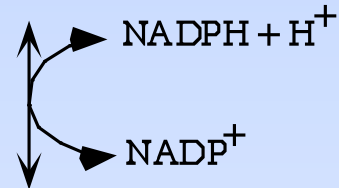
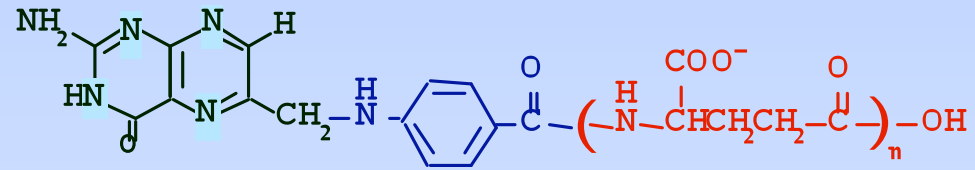


sulfanilamide

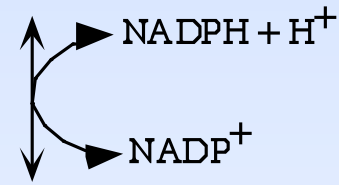
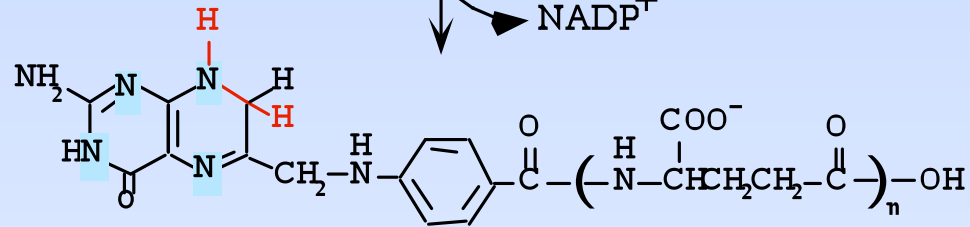
Dietary folate: folic acid (meats, green veggies)

\*requires\* the intestinal enzyme 'Conjugase' for absorption.

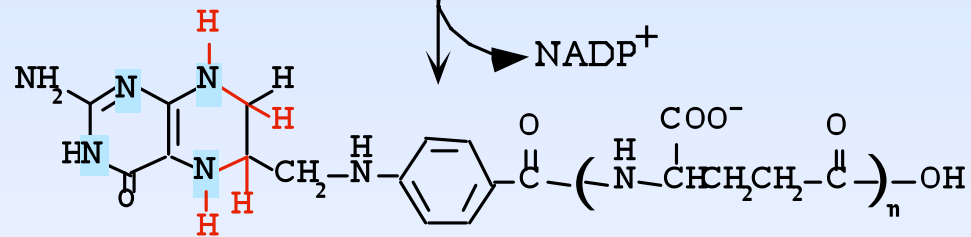
Folic acid

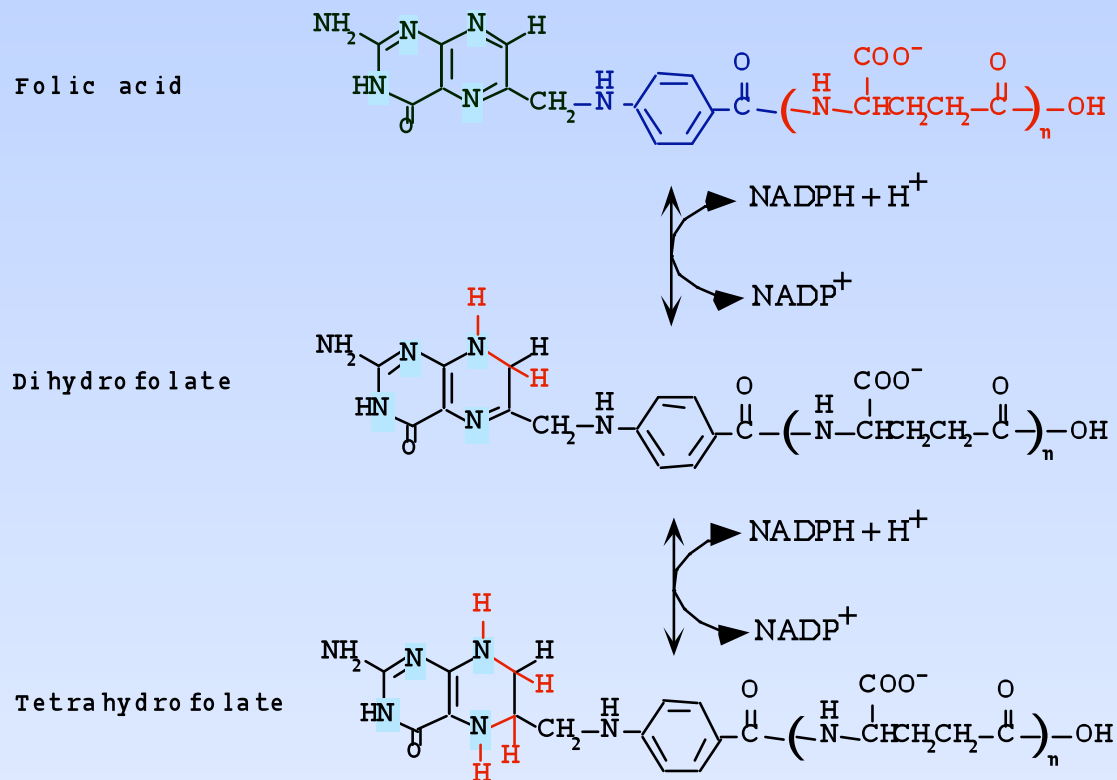


Dihydrofolic acid



Tetrahydrofolic acid



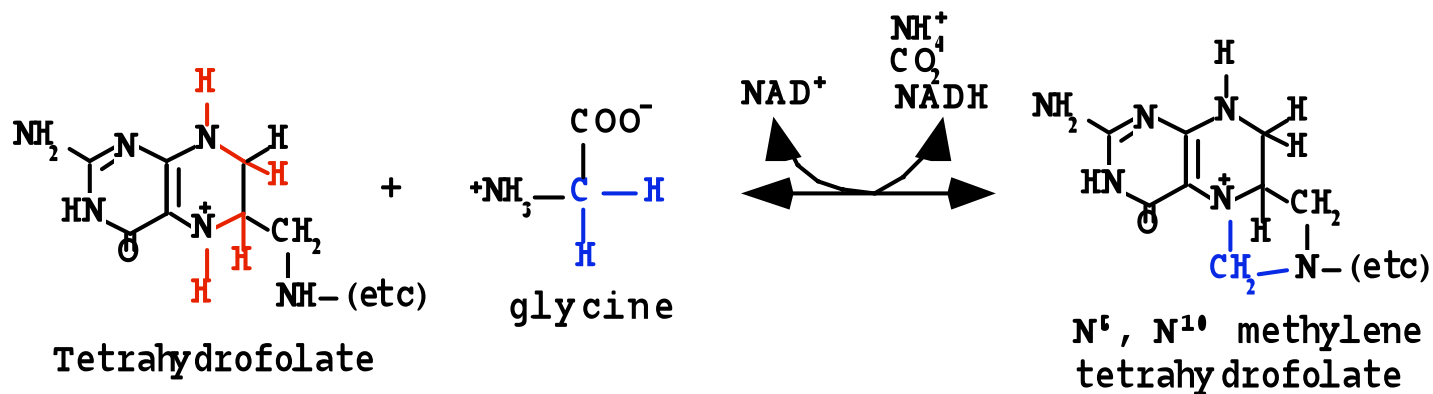
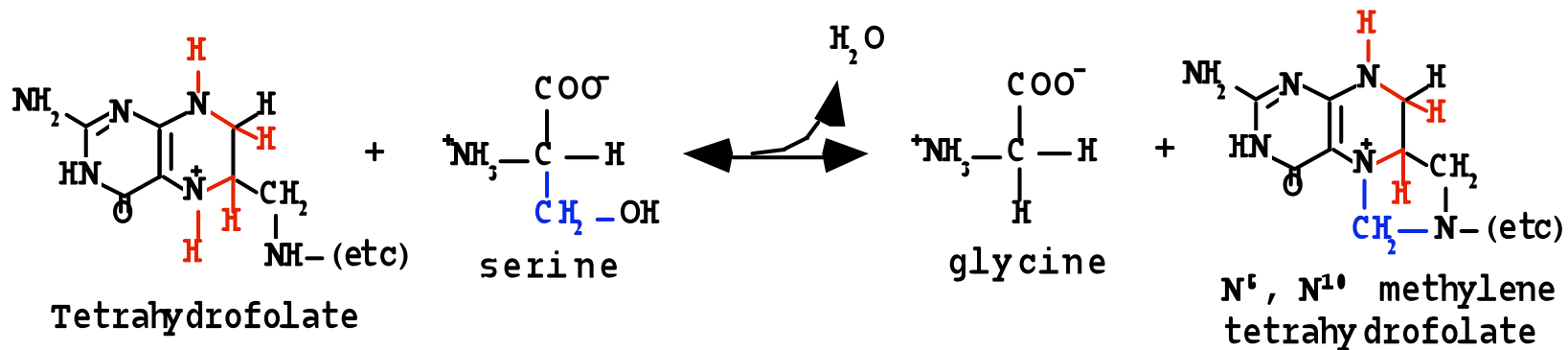


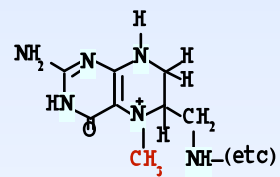
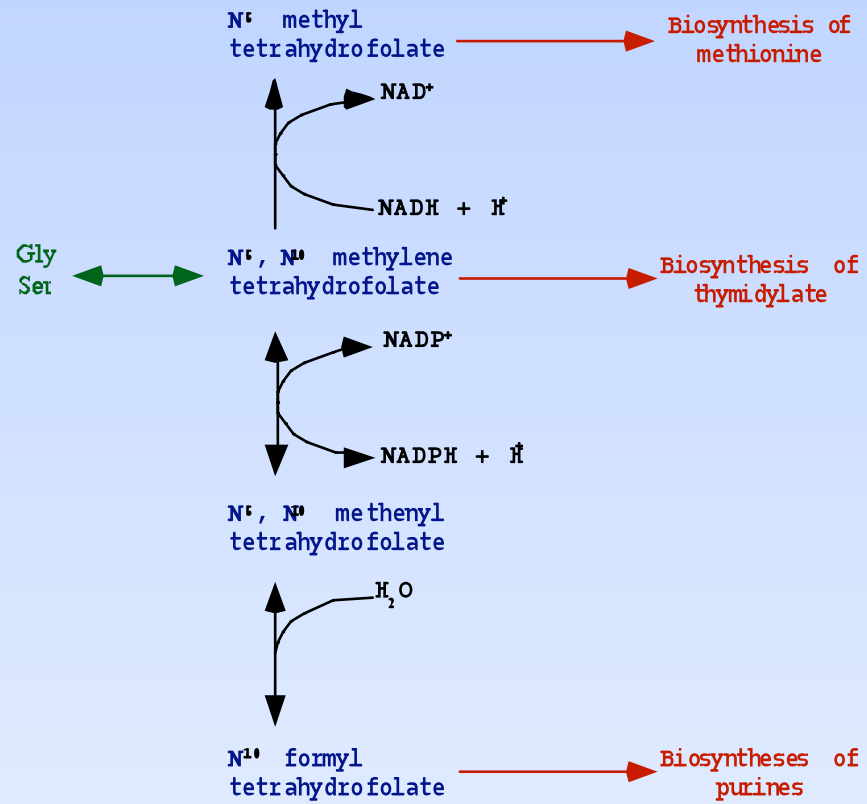
Inhibitors of DHFR are important therapeutics:

Methotrexate - chemotherapy

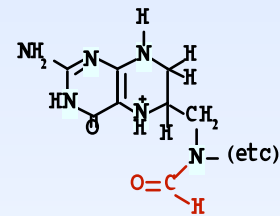
Trimethoprim - inhibits bacterial DHFR

Pyrimethamine - inhibits malarial DHFR





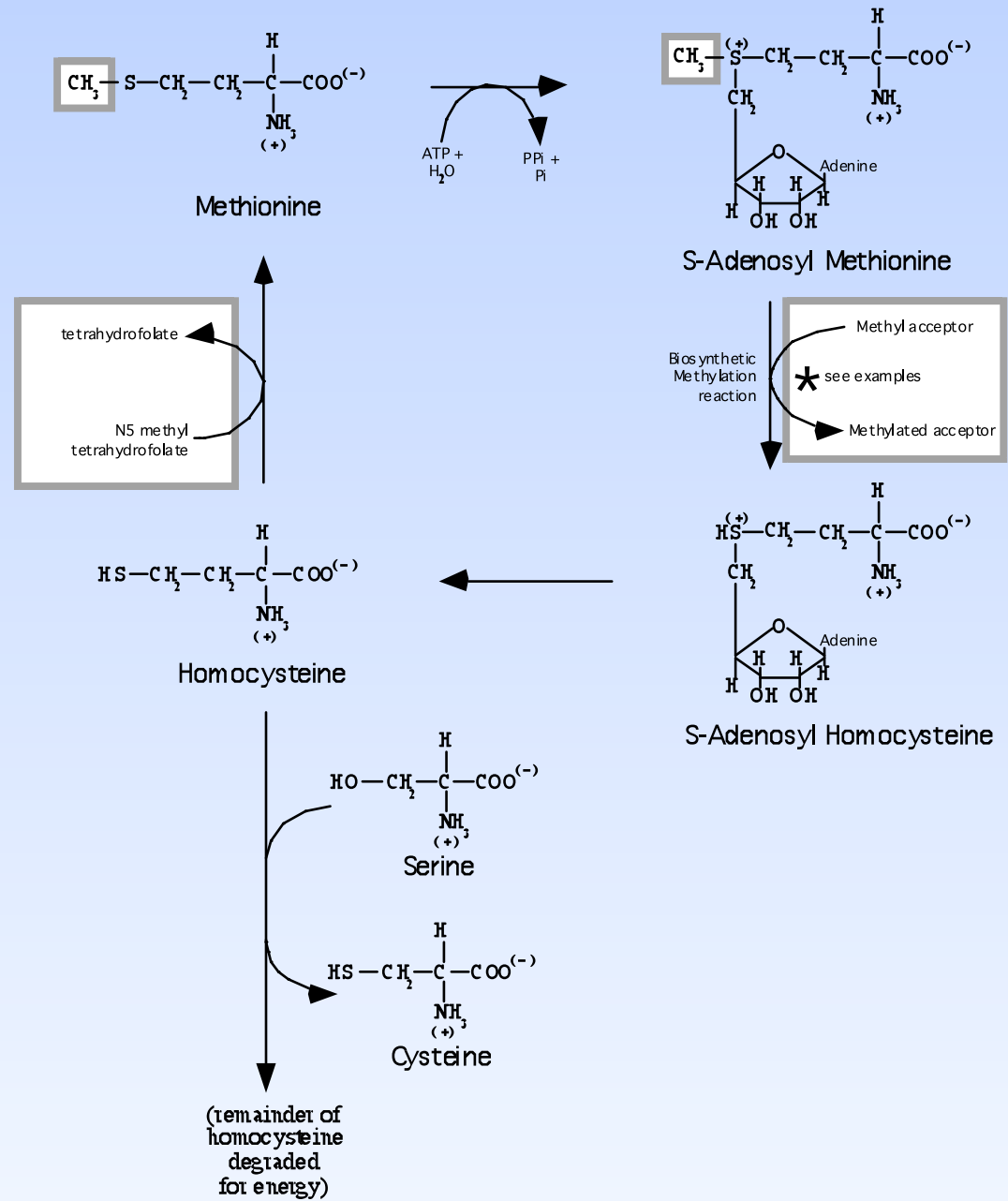
$N^5$ -methyl tetrahydrofolate

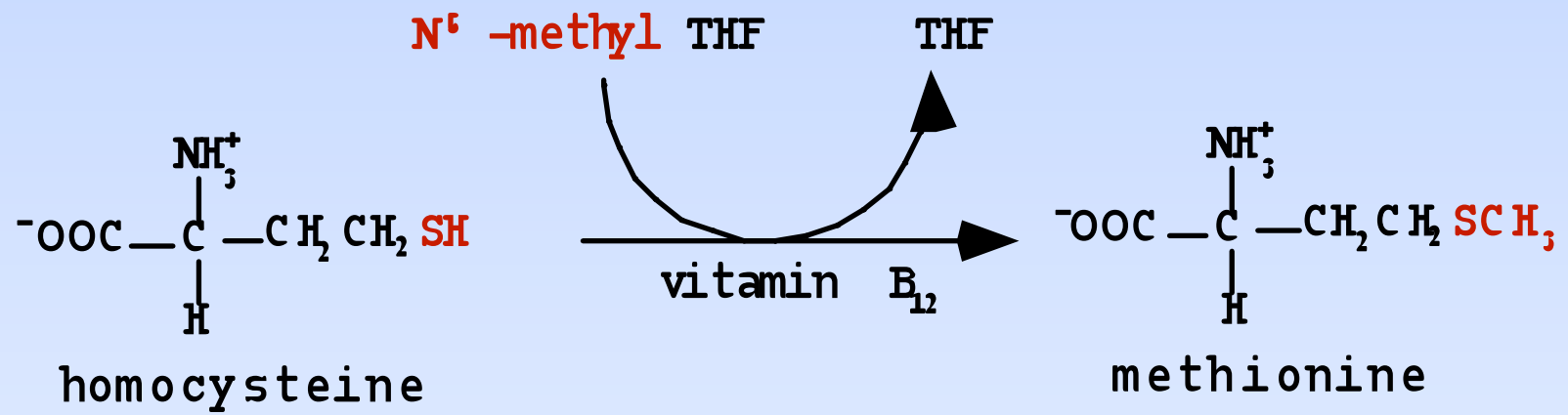


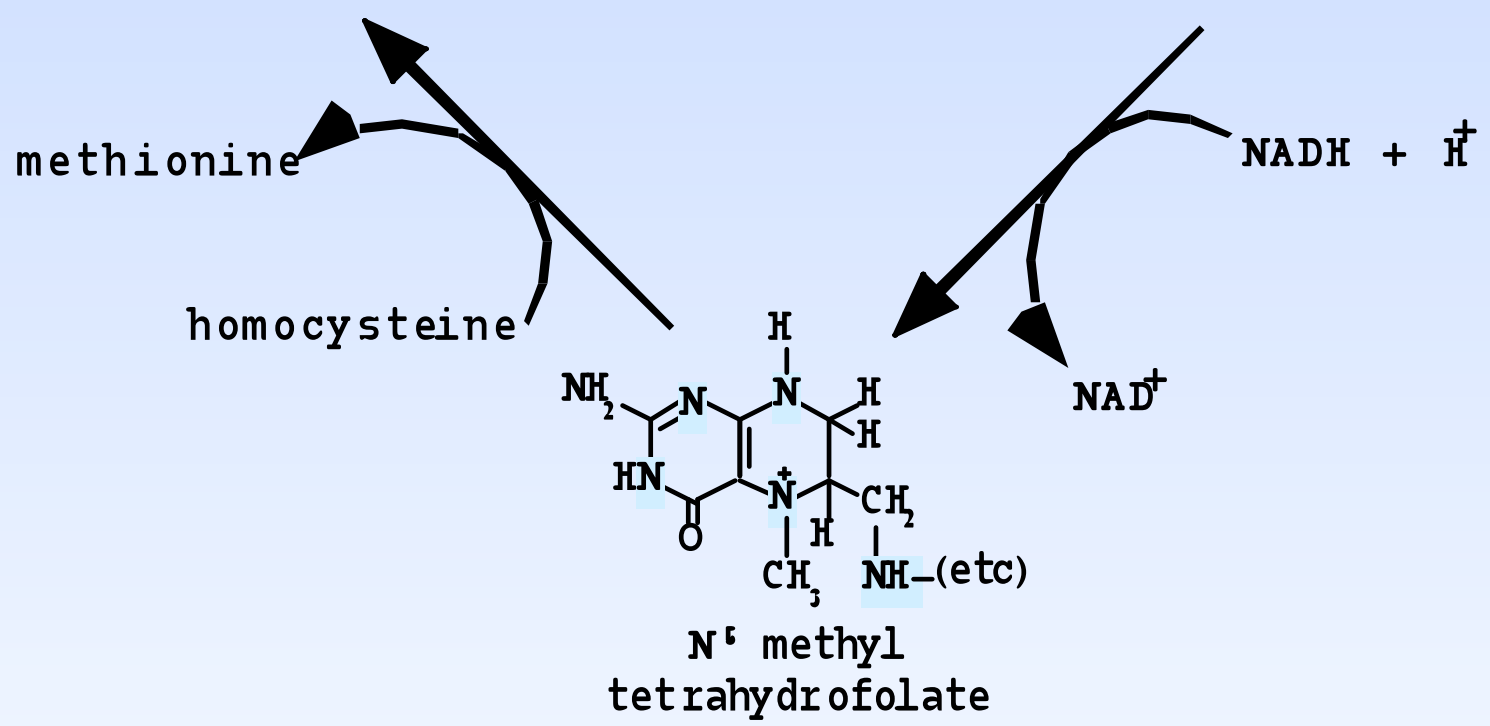
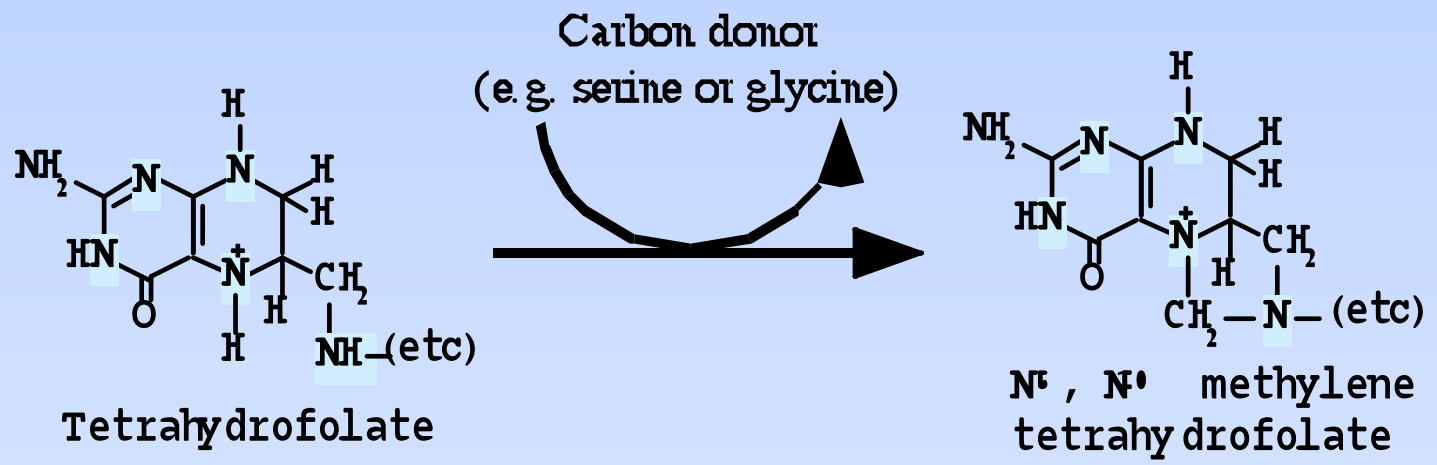
$N^{10}$ -formyl tetrahydrofolate

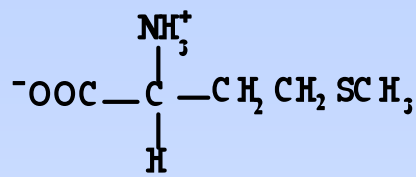


# Methionine Cycle And Biological Methyl Groups

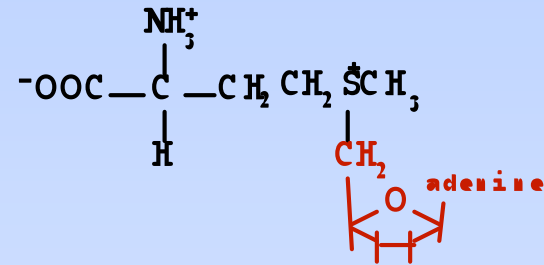
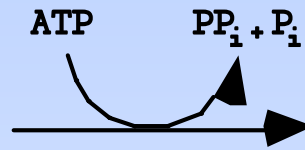




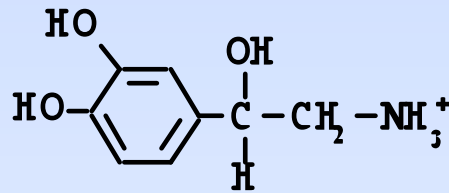




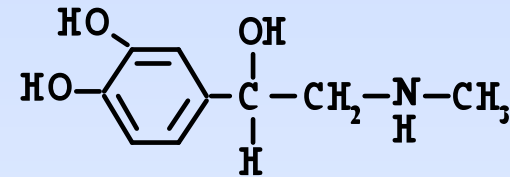
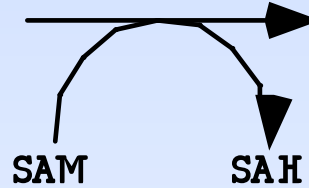
Methionine



S-Adenosyl methionine



Norepinephrine

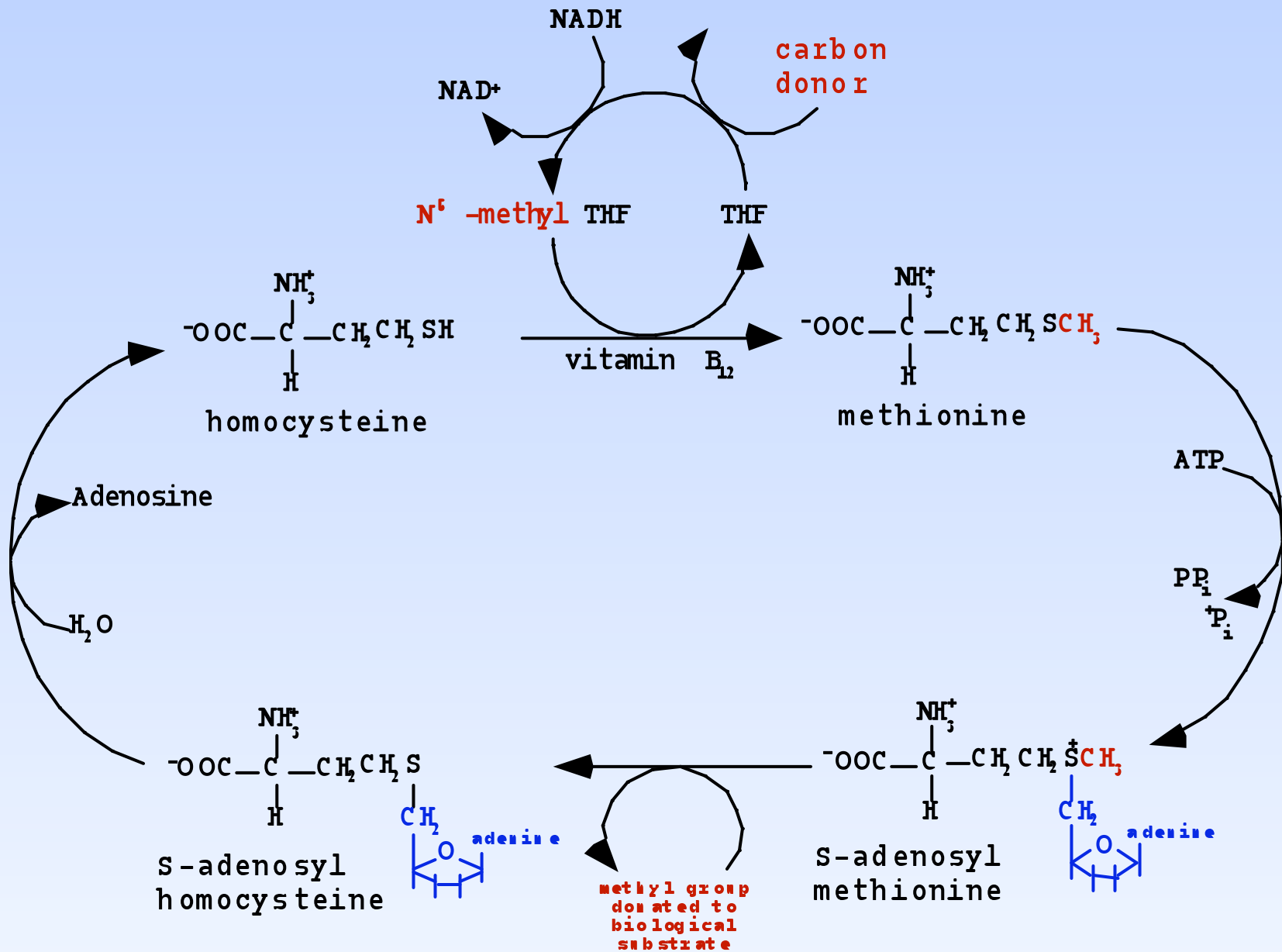


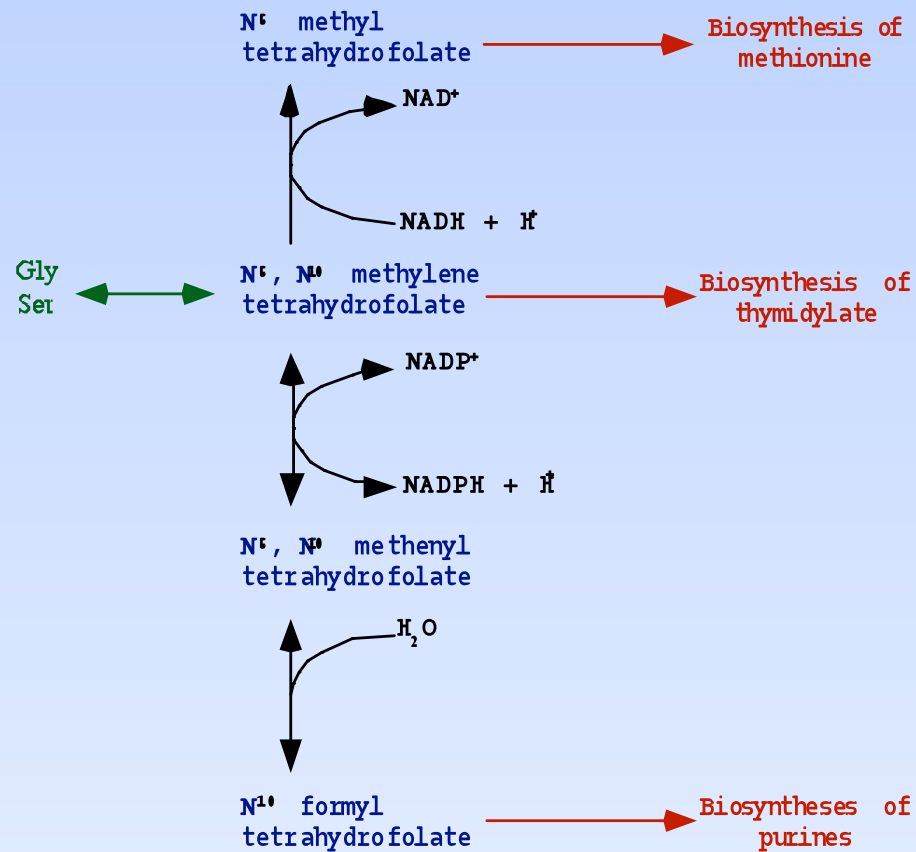
Epinephrine

Other methyl acceptors:

DNA (“CpG Islands”)

RNA





## Folate Deficiencies: Symptom: megaloblastic anemia

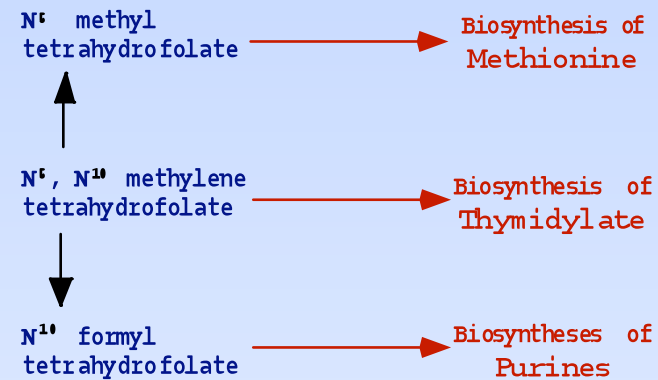
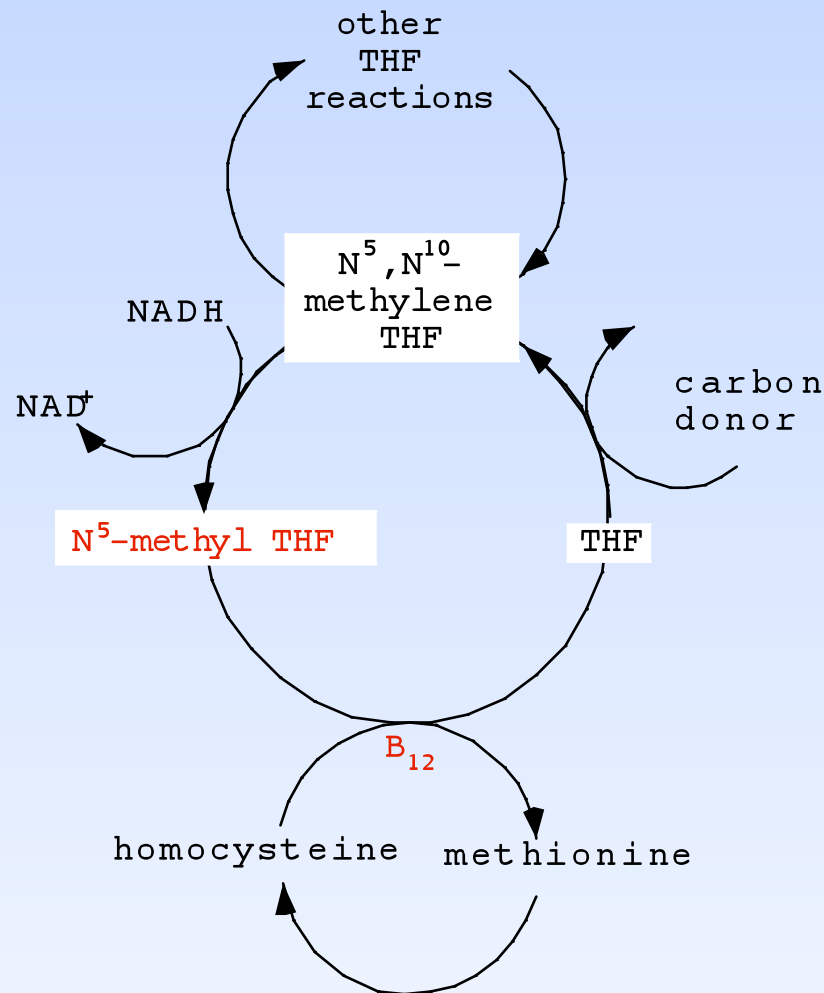
Dietary deficiency:

Common especially in developing countries, lower socioeconomic classes

## **Folate deficiency secondary to bowel irritation:**

- Conjugase is essential for adequate absorption of dietary folates
- Conjugase production may be compromised by bowel irritation:
  - ‘Tropical Sprue’ - bowel irritation probably arising from bacterial origin, causes intestinal inflammation and malabsorption.
  - ‘Celiac Sprue’ - similar outcome, but the original irritation is due to an allergic response, for example to gliaden (a component in gluten)

# Folate Deficiency Secondary to B12 deficiency: the 'methyl trap' hypothesis



B12 is also critical in other reactions, ones for which the deficiency has serious neurological consequences.