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

Dietary folate: folic acid (meats, green veggies) *requires* the intestinal enzyme ‘Conjugase’ for absorption.

Para-aminobenzoic acid (PA.BA)

Sulfanilamide
Folic acid

Dihydrofolate

Tetrahydrofolate
Inhibitors of DHFR are important therapeutics:
Methotrexate - chemotherapy
Trimethoprim - inhibits bacterial DHFR
Pyrimethamine - inhibits malarial DHFR
Tetrahydrofolate + serine $\rightarrow$ glycine + N$^6$, N$^{10}$ methylene tetrahydrofolate

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Methionine Cycle And Biological Methyl Groups

Methionine

S-Adenosyl Methionine

Homocysteine

S-Adenosyl Homocysteine

Serine

Cysteine

(remainder of homocysteine degraded for energy)
homocysteine $\rightarrow$ vitamin B<sub>12</sub> $\rightarrow$ methionine
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.