

**Nutrition and Medicine, 2006**  
**Tufts University School of Medicine**  
**Water Soluble Vitamins**  
**Examples – Clinical Applications of Vitamin B<sub>12</sub> and Folate Metabolism:**  
**Lecture Outline**

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- I. Why consider these two vitamins together?
  - A. Historical reasons
  - B. The biochemical pathways of B<sub>12</sub> and folate intersect
  - C. Major biochemical functions of the two vitamins: in most instances serve as co-enzymes
  
- II. The ‘classical deficiency’ syndromes of B<sub>12</sub> and folate deficiencies
  - A. Folate: Megaloblastosis in rapidly proliferating tissues
  - B. B<sub>12</sub>: As above **and** neuropsychiatric degeneration (‘subacute combined degeneration of the spine’)
  
- III. The pathophysiology of developing a water-soluble vitamin deficiency
  - A. Chronological sequence of events: decreased serum concentration, decreased cellular concentrations, diminished enzyme activity, impaired physiology, tissue damage, death
  - B. Laboratory means of diagnosis
    1. Serum and blood cell concentrations
    2. Identification of characteristic histology
    3. Assessing substrates dependent on vitamin co-enzymes
  
- IV. How has folate metabolism impacted on modern medicine?
  - A. Blocking bacterial synthesis of folate: the sulfonamide (‘sulf’) antibiotics
  - B. Blocking a cancer cell’s ability to synthesize nucleotides: methotrexate and 5-fluorouracil
  - C. Prevention of arteriosclerotic heart disease with folate: the homocysteine hypothesis
  - D. Prevention of congenital neural tube defects with folate
  - E. Prevention of colorectal cancer: folate’s effects on the methylation and stability of DNA