In Office IV Nutrition

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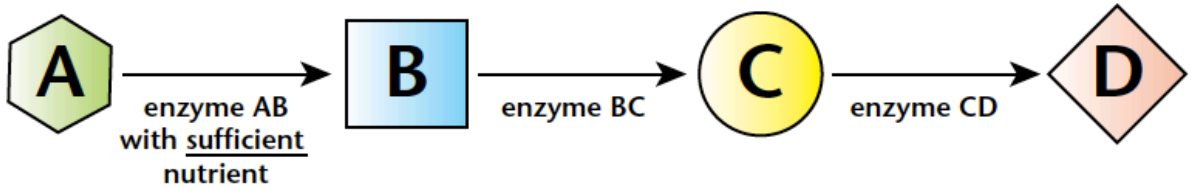
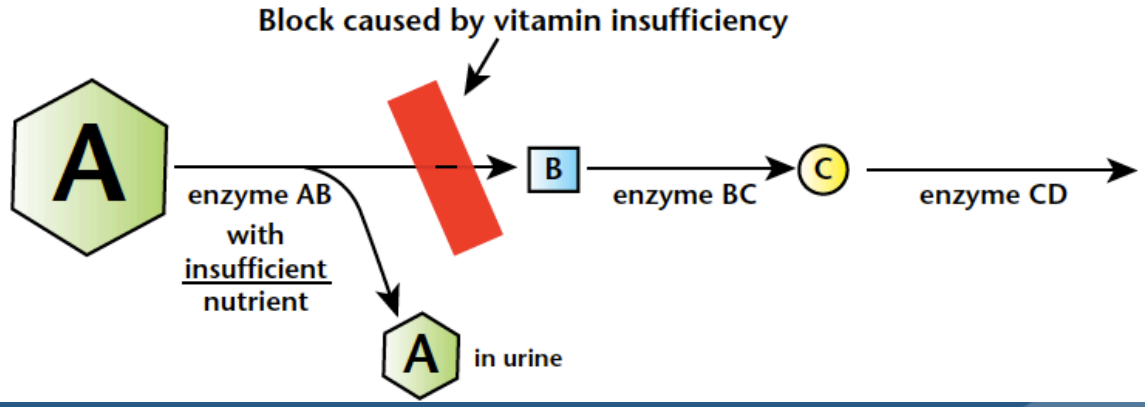
Basic Biochemistry



If specific nutrients are not available in adequate amounts, important reactions cannot occur as well as they should. The illustration below shows what happens when the nutrient is not present in adequate amounts so that enzyme AB functions inefficiently. A small amount of Molecule A is converted to Molecule B and the remainder builds up and spills into the urine. Notice that Molecules B through D downstream are also affected.



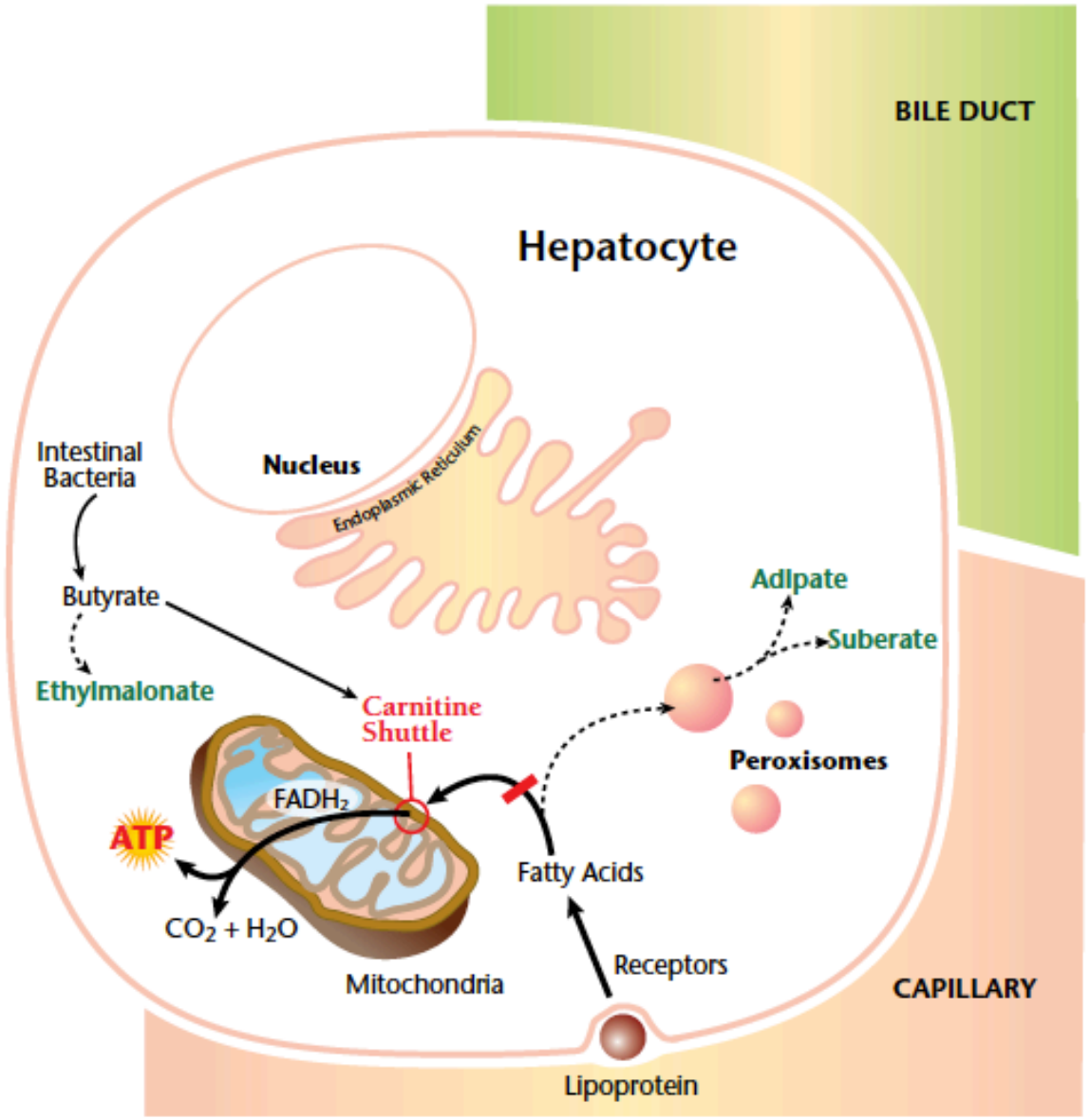


Figure 1 – Mitochondrial Fatty Acid Metabolism Markers

Fatty acids, including butyrate, go into the mitochondria via a carnitine dependent shuttle to be metabolized. If carnitine is in inadequate amounts, the fatty acids cannot get into the mitochondria and get metabolized in the peroxisomes outside the mitochondria. The by-products of this process are ethylmalonate, adipate, and suberate.

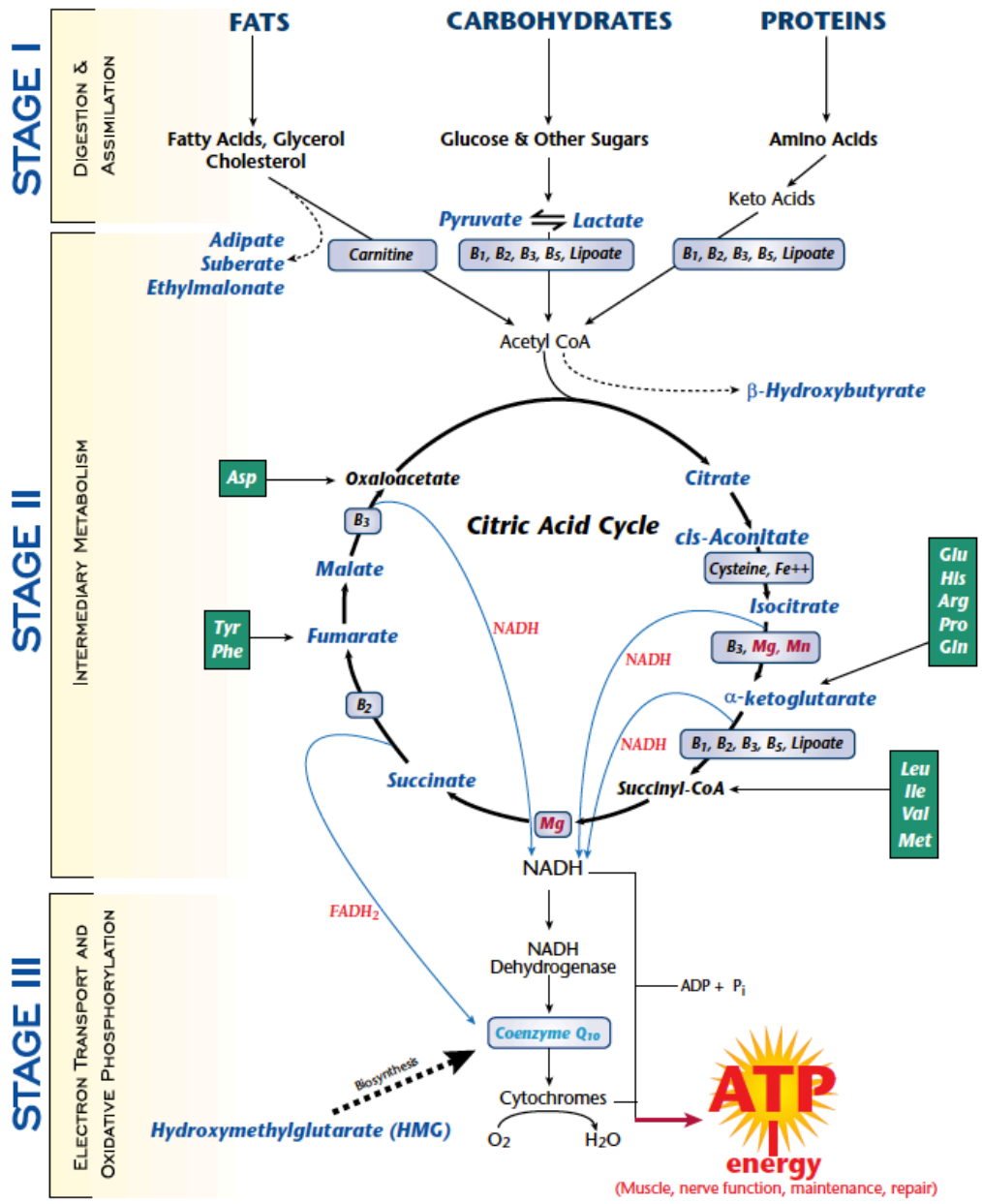


FIGURE 2 – URINARY MARKERS OF NUTRIENTS INVOLVED IN CENTRAL ENERGY PATHWAYS

The Citric Acid Cycle (CAC) and Electron Transport and Oxidation Phosphorylation pathways end in ATP or energy production, which is essential to life. A deficiency of any of the nutrient co-factors involved in these processes may lead to increases of specific compounds.

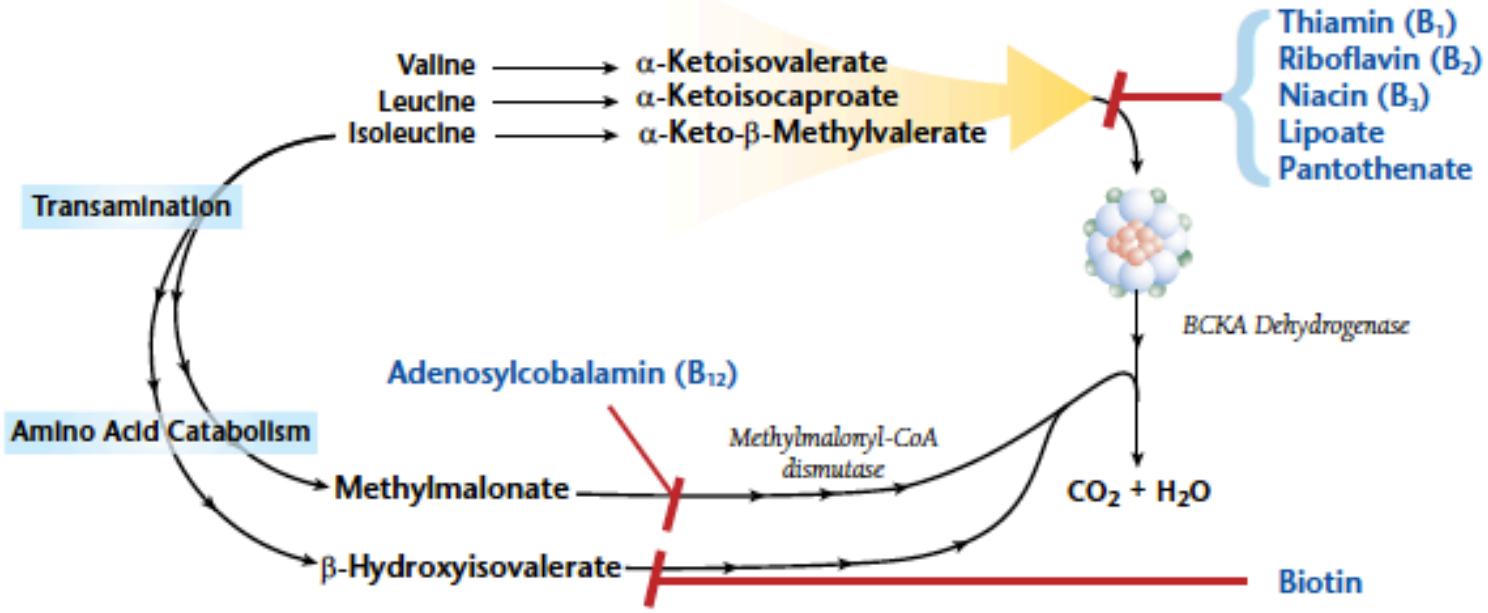


Figure 3 – Biochemical Markers For Vitamins B_1, B_2, B_3, B_5, Lipoic Acid, Vitamin B_{12} and Biotin

Many B vitamins are used as co-factors in the breakdown of amino acids. A deficiency of any of these B vitamins may lead to a block in one of more of these pathways resulting in elevations of the markers.

Folate Marker

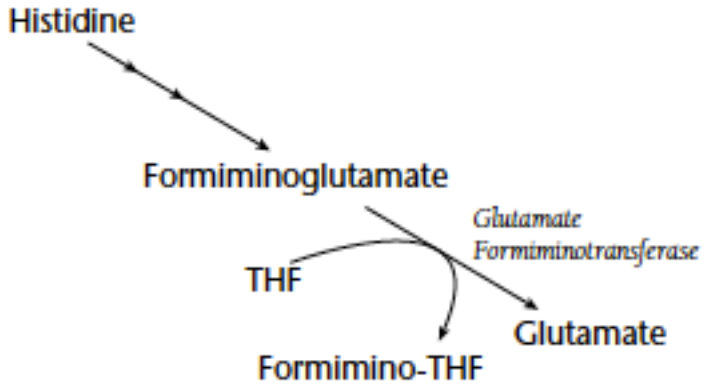


FIGURE 4 – THE FORMIMINOGLUTAMATE STEP IN THE CATABOLISM OF HISTIDINE

The essential amino acid histidine breaks down to glutamate. The enzyme glutamate formiminotransferase needs adequate folate to function properly. An elevation of formiminoglutamate could be due to a lack of folate.

Serotonin Formation

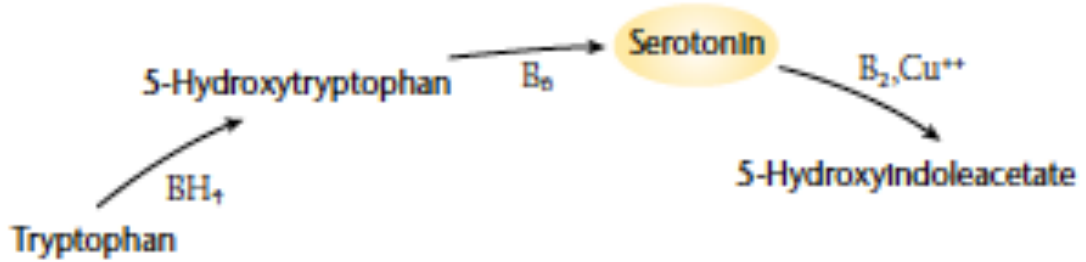


FIGURE 5 – FORMATION AND CLEARANCE OF SEROTONIN

The essential amino acid tryptophan is processed into the neurotransmitter serotonin. Serotonin is broken down and excreted as 5-hydroxyindolacetate. A high level of 5-hydroxyindolacetate may indicate a high turnover of serotonin, and a low level may identify low serotonin production.

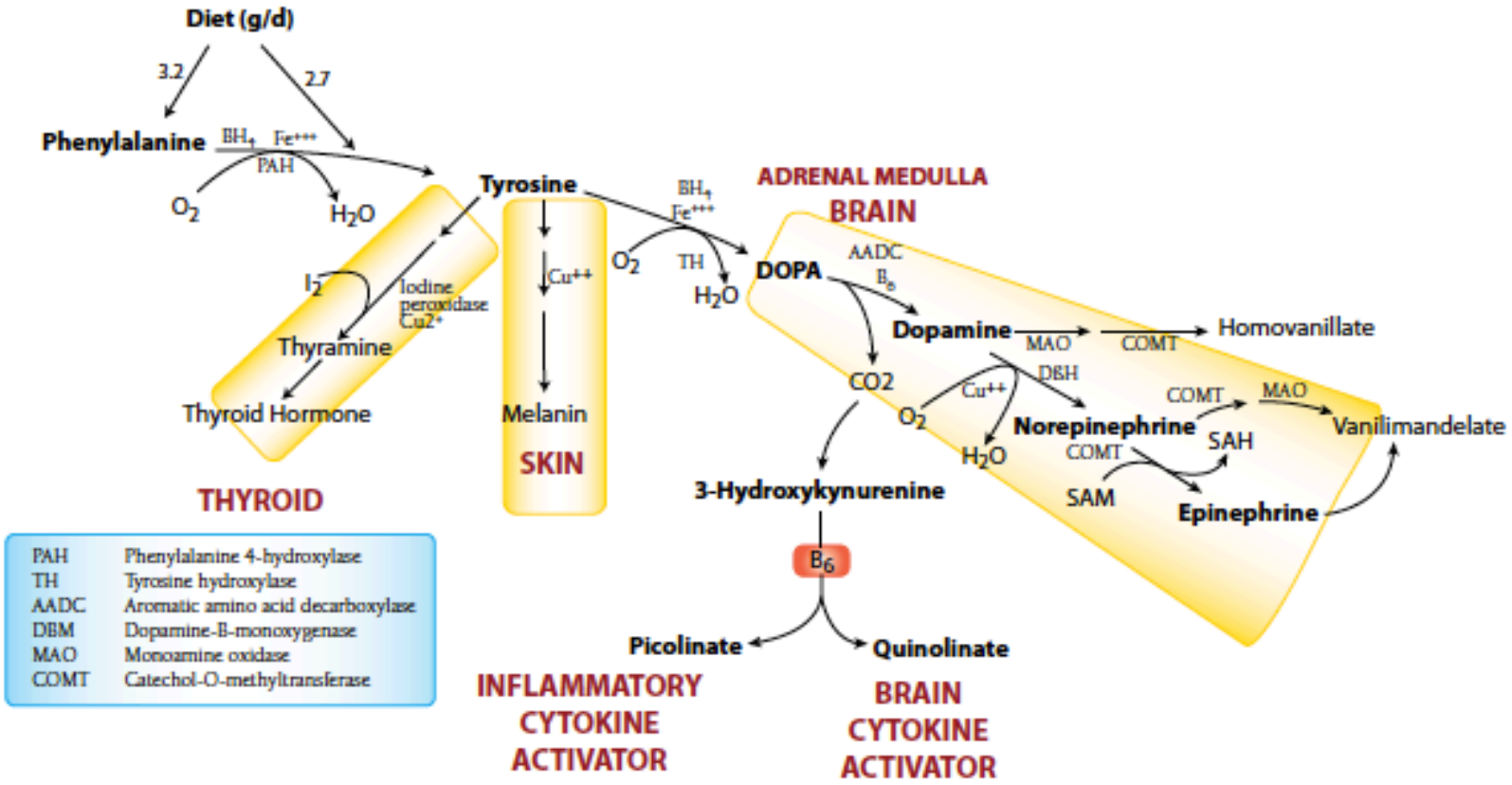


Figure 6 – Neurotransmitters and Hormones from Phenylalanine and Tyrosine

The essential amino acid phenylalanine breaks down to tyrosine. Tyrosine is used in the production of thyroid hormones, melatonin in skin, and the neurotransmitters, dopamine, norepinephrine, and epinephrine. These neurotransmitters are further broken down and excreted. Dopamine is excreted as homovanillate, and norepinephrine and epinephrine are excreted jointly as vanilmandelate. High levels of these breakdown products in the urine identify a high turnover; low levels may indicate inadequate production.

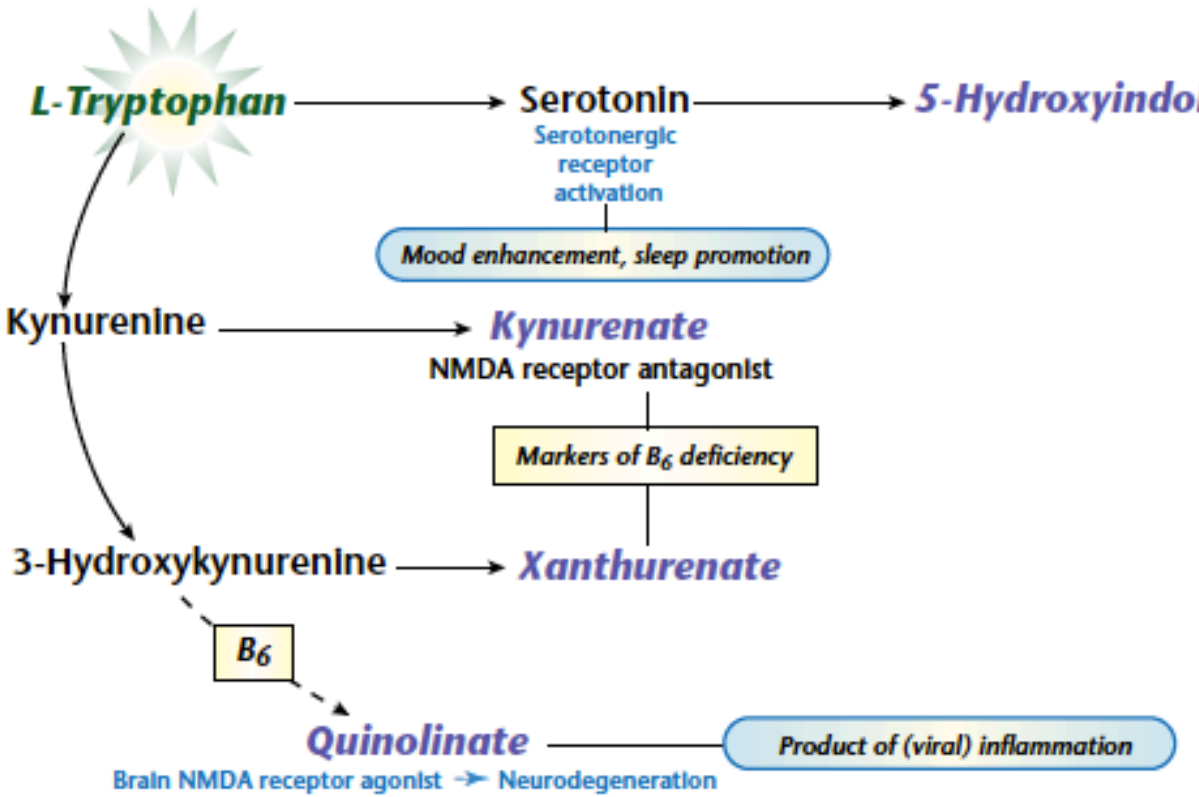


Figure 7 - Quinolinate Production

While tryptophan makes serotonin, it can also go down another pathway to quinolinate and picolinate. These steps are B6 dependent, xanthurenate has been used as a marker of need for B6. Quinolinate is a product of inflammation and is seen with oxidative stress, infections, or autoimmune disorders.

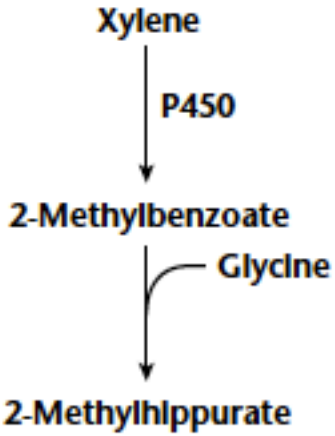


Figure 8 – Metabolism of Xylene

Xylene, a toxic environmental compound, is oxidized to 2-methylbenzoate by P450 enzymes and then conjugated with glycine to form 2-methylhippurate. High levels can indicate xylene exposure.

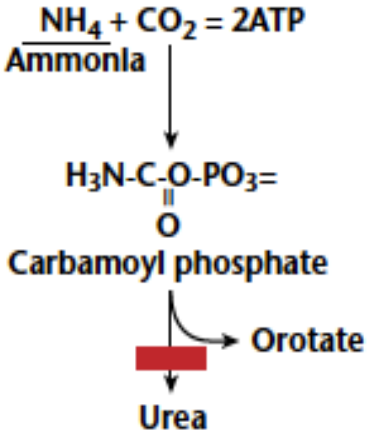


Figure 9 – Orotate and Ammonia

When ammonia, a metabolic by-product of protein, is unable to breakdown to urea to be excreted, it is converted to orotate and excreted. Elevated levels of orotate may be due to elevated ammonia, or a need for magnesium.

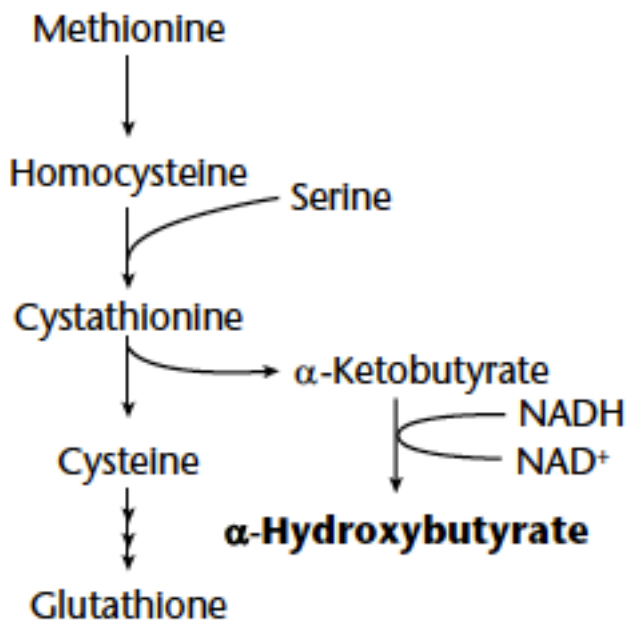


Figure 10 – Alpha-hydroxybutyrate Formation From Glutathione Biosynthesis

Alpha-hydroxybutyrate is a by-product of glutathione production. Levels of alpha-hydroxybutyrate in the urine may reflect levels of glutathione production.

Glycine and Glutathione

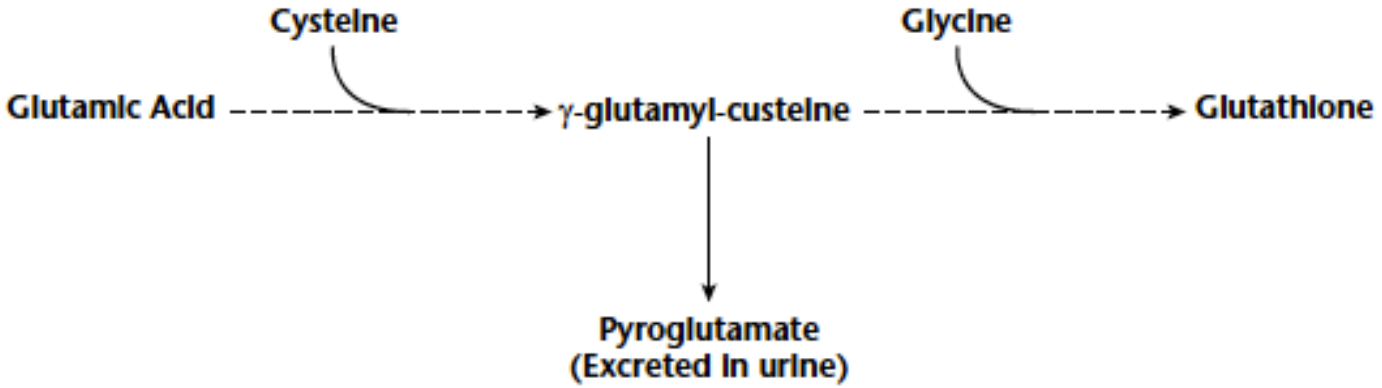


FIGURE 11 – PYROGLUTAMATE EXCRETION

Low pyroglutamate excretion can identify a need for glycine. Glycine is needed in the final steps of glutathione production. If glycine is not available, glutathione production slows and pyroglutamate gets excreted in the urine.

Dysbiosis Markers

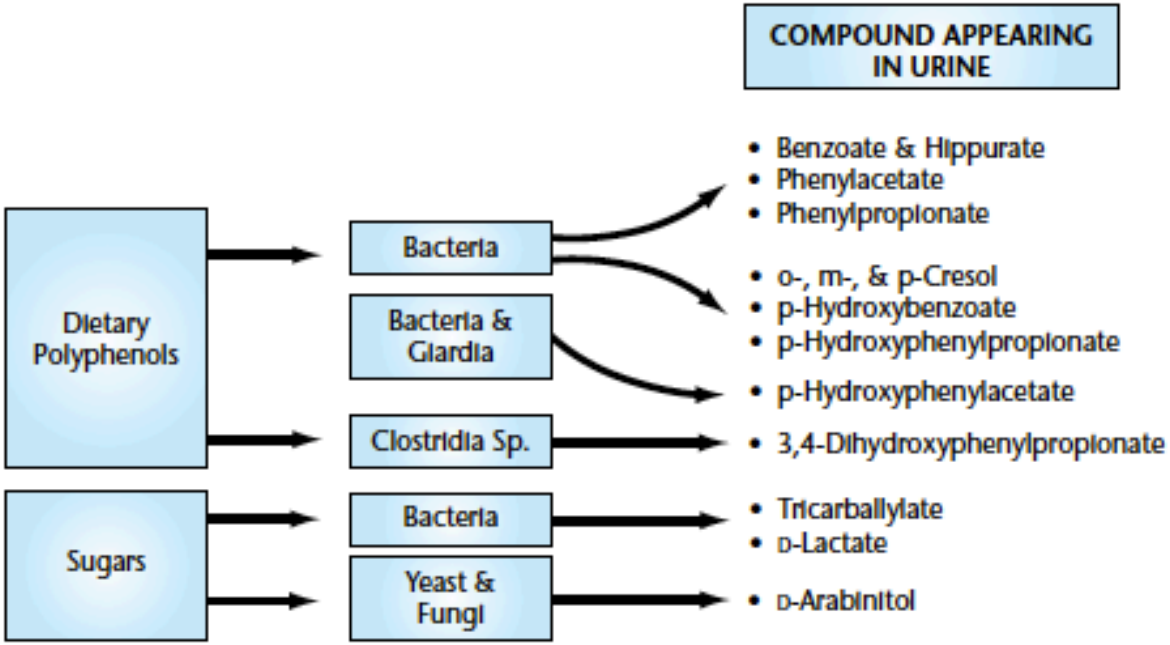


Figure 12 – Origins of Urinary Dysbiosis Markers

Bacteria and yeasts in the intestines produce by-products that are excreted in the urine. An elevated level of these by-products may identify an overgrowth of one or more bacteria or yeast in the intestine.

Supplies Needed for IV Therapy

- Have emergency equipment on hand
- Oxygen
- Epinephrine
- Steroids
- Have staff trained in CPR

IV Vitamin C

- Allergic rhinitis
- Asthma
- Bacterial illnesses
- Cancer
- Cardiovascular disease
- Chemical toxicity
- Mercury, lead, cadmium, arsenic, nickel
- Chronic Fatigue Syndrome
- COPD
- Infection
- Macular degeneration
- Migraine
- Multiple sclerosis
- Muscle Spasms
- Neurologic Disorders
- Parkinson's, Alzheimer's disease
- Viral illnesses
- Hypoadrenalism
- Immune disorders

Osmolarity

- DO NOT USE HYPOSMOLAR SOLUTIONS!! EVER!!!

Hemolysis

Why Use Nutritional IV's

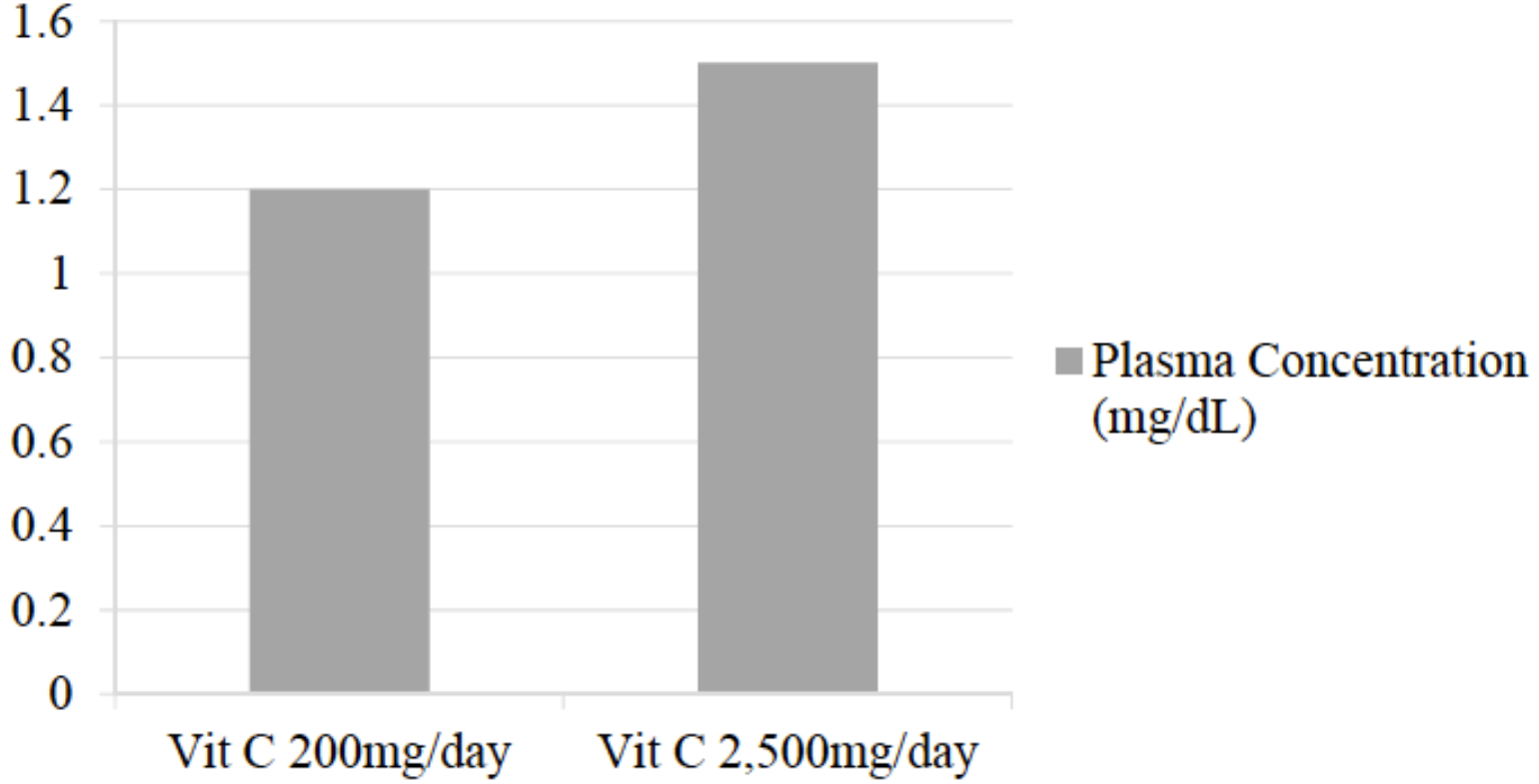
- Many patients have
- inadequate nutritional
- intake due to:
- Achlorhydria
- Food allergies or
- Intolerance
- Surgery
- Cholycystectomy
- Gastric bypass
- Lap band

- Inflammation
- Gastritis
- Crohn's disease
- Chronic use of NSAID's
- Intestinal dysbiosis
- Poor diet

Oral Vitamin C Absorption

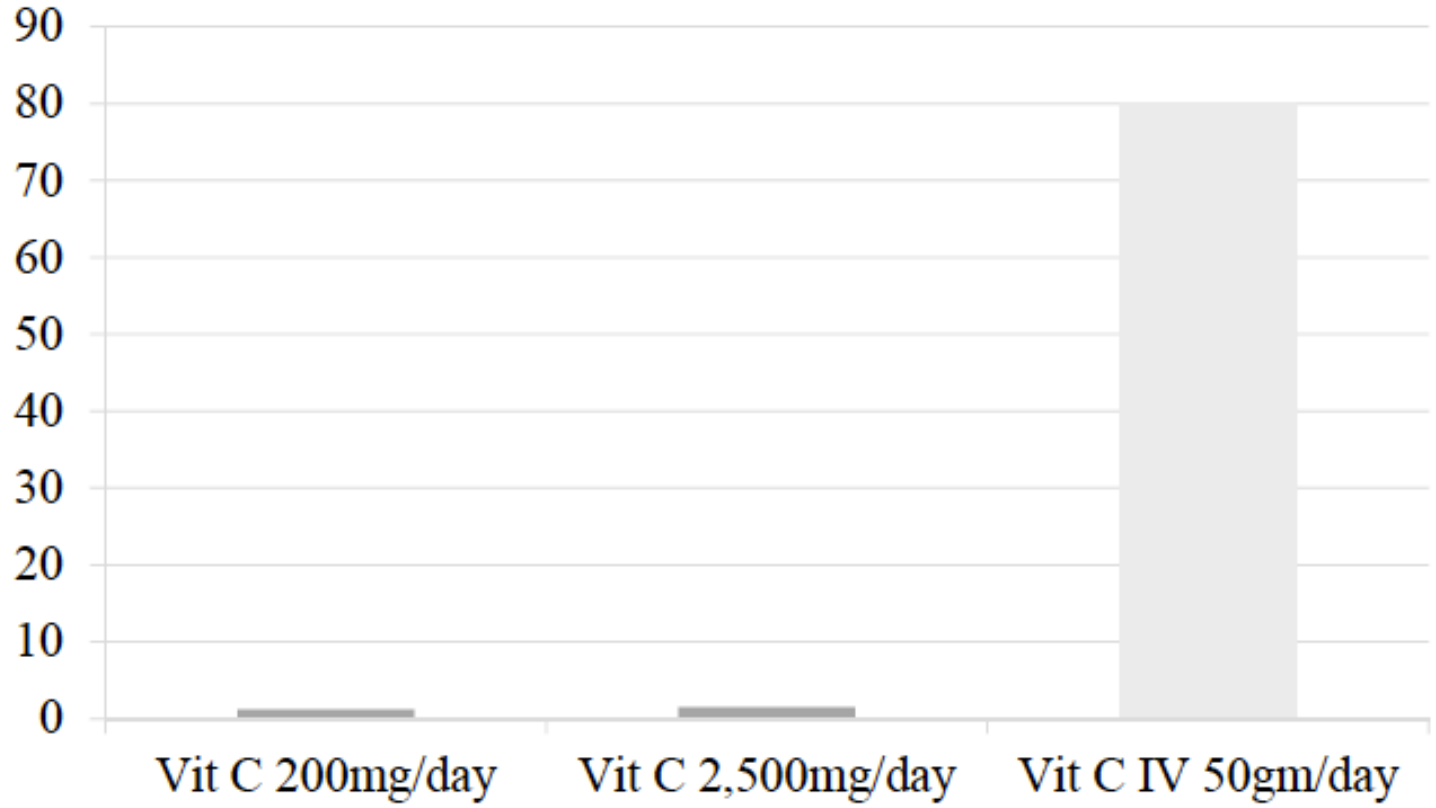
- When oral dose increased from 200mg/day to 2,500mg/day
- Plasma concentration increases only 25%
- 1.2 to 1.5mg/dL

Plasma Concentration Vitamin C with Different Oral Doses (mg/dL)



Am. J. Clin. Nutr. 1997;66:1165-71

Plasma Concentration Vitamin C with Oral v. IV Doses (mg/dL)



Am. J. Clin. Nutr. 1997;66:1165-71
Proc Natl. Acad Sci U S A 1990;87:7245-7249

Magnesium

- Oral dosing has little effect on rbc magnesium levels
- Myocardial cells have 10x more magnesium intracellular as compared to extracellular
- IV dosing has been shown to increase magnesium levels 3x

JAMA. 1987;257:1076-78
Intensive Care Med 1993;159:467-471.

Myer's Cocktail IV

- Dr. John Myers
- • Baltimore, MD
- • 1970's developed a nutritional IV protocol—
- Meyer's IV protocol
- • B-vitamins, vitamin C, calcium pantothenate,
- Vitamin B6, thiamine, magnesium chloride, and/or
- calcium gluconate

Myers Cocktail IV

- All-around nutritional IV
- Combination of vitamins and minerals
- Kreb's cycle
- Detoxification pathways
- Methylation pathways
- Oxidative phosphorylation

Content Of Dr. Myer's IV

- Magnesium chloride
- Calcium cluconate
- Thiamine
- Vitamin B6
- Vitamin B12
- Calcium pantothenate
- Vitamin B Complex
- Vitamin C
- Dilute HCL

How to Modify Myer's IV

- Stop and think about what you are trying to accomplish
- Vasodilation: Magnesium
- Immune support: Vitamin C or glutathione

IV Vitamin C

- AIDS
- Bronchitis
- Chickenpox
- Coronary artery disease
- Dysentery
- Herpes
- Influenza
- Malaria
- Measles
- Mumps
- Polio
- Pseudomonas
- Rabies
- Rocky mountain spotted fever
- Staphylococcal infections
- Typhoid fever
- URI
- Viral Encephalitis
- Viral hepatitis
- Viral Pneumonia

IV Vitamin C

- Acute infections
- Adrenal dysfunction
- Amalgam removal
- Pre-immunization
- Pre/post toxicity exposure
- Root canal removal