




*Nutritional Relationships
in Disease:
Clinical Applications
and Case Studies*

Presented by

Dr. Ron Grabowski

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When Should I Order SpectraCell Testing?

- IBD
- Coronary artery disease
- Depression
- Neurodegenerative diseases
- Pregnancy/Infertility
- Muscle disorders
- Drug/Nutrient Interactions
- Dermatological Conditions
- Diabetes Mellitus
- Polyneuropathies
- Osteoporosis
- Headaches
- Autoimmune
- Athletes

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Proton Pump Inhibitors

■ Medications

- Nexium
- Aciphex
- Prevacid
- Prilosec
- Protonix

■ Nutrients

- Vitamin B12
- Calcium
- Iron
- Copper



Clinical Manifestations of Vitamin B₁₂ Deficiency

- **Hematologic**

 - Megaloblastic anemia

 - Pancytopenia (leukopenia, thrombocytopenia)

- **Neurologic**

 - Paresthesias

 - Peripheral neuropathy

 - Combined systems disease (demyelination of dorsal columns and corticospinal tract)

- **Psychiatric**

 - Irritability, personality change

 - Mild memory impairment, dementia

 - Depression

 - Psychosis

- **Cardiovascular**

 - Possible increased risk of myocardial infarction and stroke.

AAFP – 2003

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Serum Vitamin B12

- Approximately 50 percent of patients with subclinical disease have normal serum B₁₂ levels.

AAFP – 2003



Framingham Heart Study

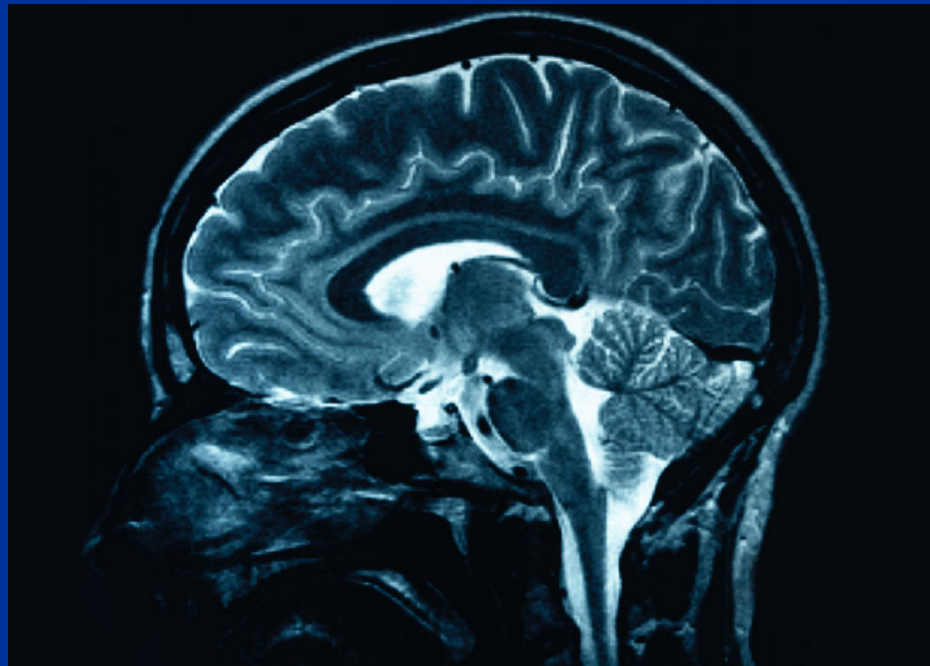
- *Subjects aged 67–93 years*
 - **High prevalence of inadequate B vitamin status.**
 - **The percentages of subjects with inadequate B vitamin status were 30% for folate, 20–25% for vitamin B-12, and 20% for vitamin B-6.**



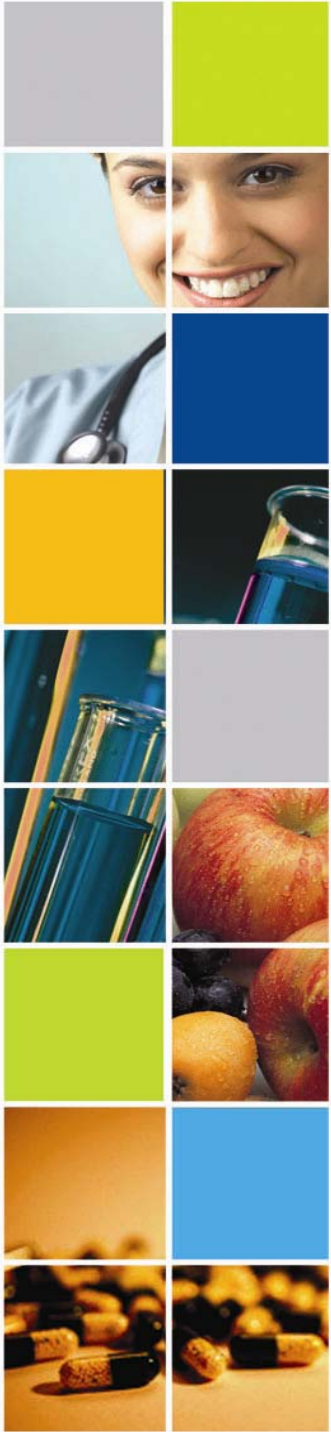
Statins and CoQ10

- CoQ10-lowering effect of statins and its compensation by administration of CoQ10 was described approximately 15 y ago and since then has been confirmed in numerous studies of animals and humans. **AJCN (1/2000)**
- Long-term statin treatment may be associated with chronic peripheral neuropathy.
Eur J Clin Pharmacol. 1999 Jan;54(11):835-8.
- Adverse reactions—myalgia; myopathies; rhabdomyolysis; gastrointestinal symptoms, including hepatic injury; and the initiation or accelerated progression of cataracts and neoplasia—could be a direct or indirect consequence of the CoQ10-deficiency state associated with statin treatment.
AJCN (1/2000)

Nutrition and Neurology



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Nutritional Neuropathies

- **Optimal functioning of the central and peripheral nervous system is dependent on a constant supply of appropriate nutrients.**
- **Neurologic signs occur late in malnutrition.**

Neurol Clin (2007)

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Nutritional Deficiencies and Peripheral Neuropathies

- **Thiamin**
- **Riboflavin**
- **Niacin**
- **Pyridoxine**
- **Pantothenic acid**
- **Vitamin B12**
- **Serine**
- **Copper**
- **Vitamin E**
- **Biotin**
- **Alpha Lipoic acid**
- **Acetyl L-Carnitine**

*Mirror images are not
always what they
appear to be!*



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What is wrong with these patients?

Multiple Sclerosis

- Optic neuritis
- Demyelination
- Peripheral neuropathy
- Myopathy
- Spastic gait
- Sensory ataxia
- Fatigue
- MRI changes

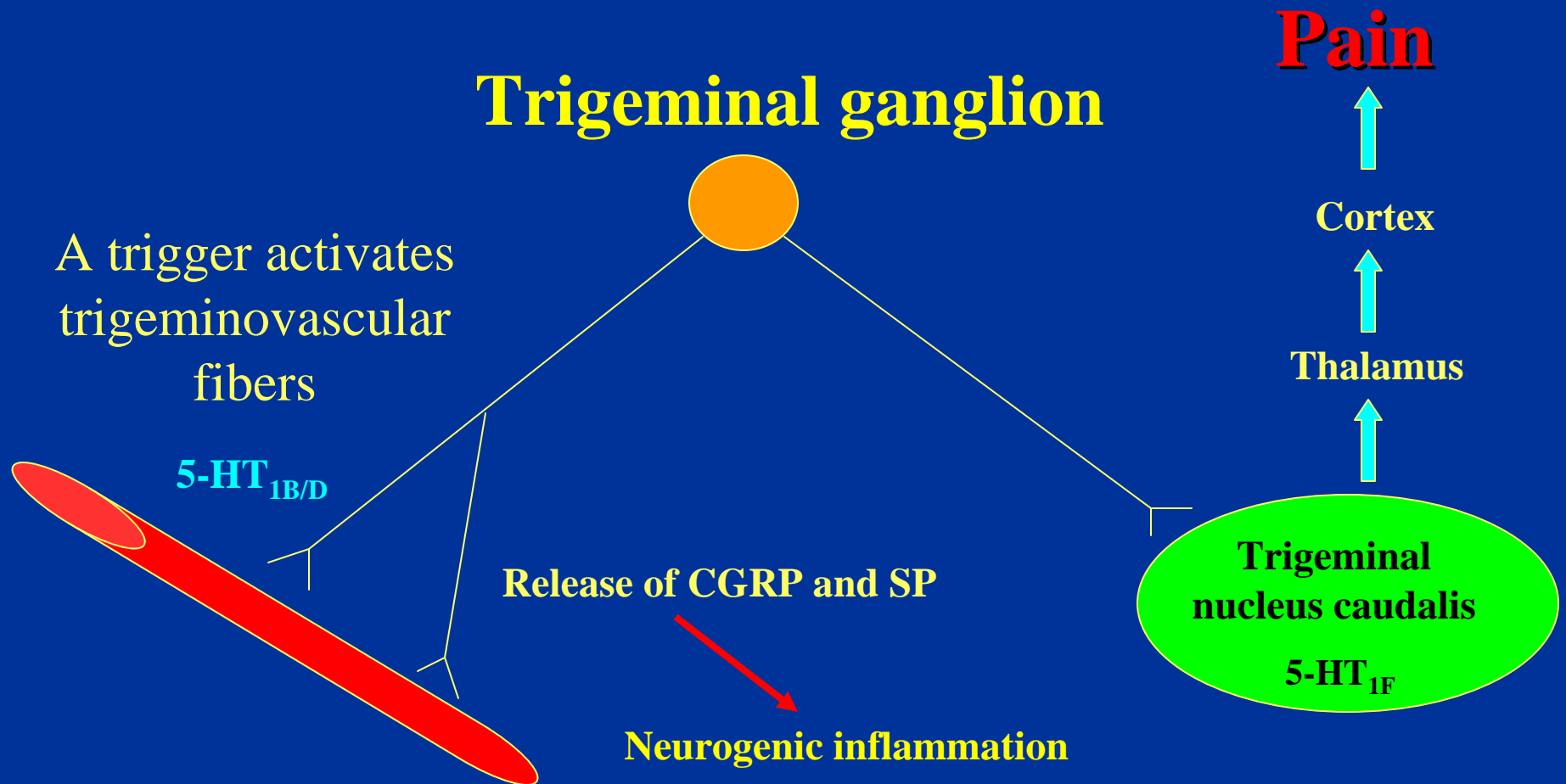
Copper Deficiency

- Optic neuritis
- Demyelination
- Peripheral neuropathy
- Myopathy
- Spastic gait
- Sensory ataxia
- Fatigue
- MRI changes

Mayo Clin Proc. (10/2006)

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Migraine Pathogenesis





Mitochondrial Hypothesis of Migraine Headaches

Sangiorgi et al. – 1994

- Defect of reduced NADH, citrate synthase and cytochrome *c*-oxidase platelet activities.

▪ **Okada et al – 1998**

- Increase in lactic and pyruvic acid levels.

▪ **Sarkela – 2001**

- NO radicals can be produced in this structure.



Magnesium and Migraines

- Current evidence suggests that up to 50% of migraine patients have lowered levels of ionized magnesium during acute attacks.
- Inhibit platelet aggregation.
- Serotonin receptors are altered.
- Nitric oxide synthesis and release are affected by magnesium status.
- Reduce the inflammatory eicosanoids.



Coenzyme Q10

■ **Mitochondrial Relationship**

- Proton-electron translocation in mitochondria.
- Protects mitochondria from oxidation.
- Plays a role in permeability transition of the inner mitochondrial membrane.
- Lowers serum lactate and pyruvate levels.
- > 50% reduction post 3 months
 - Dosage 150 mg/day



Riboflavin

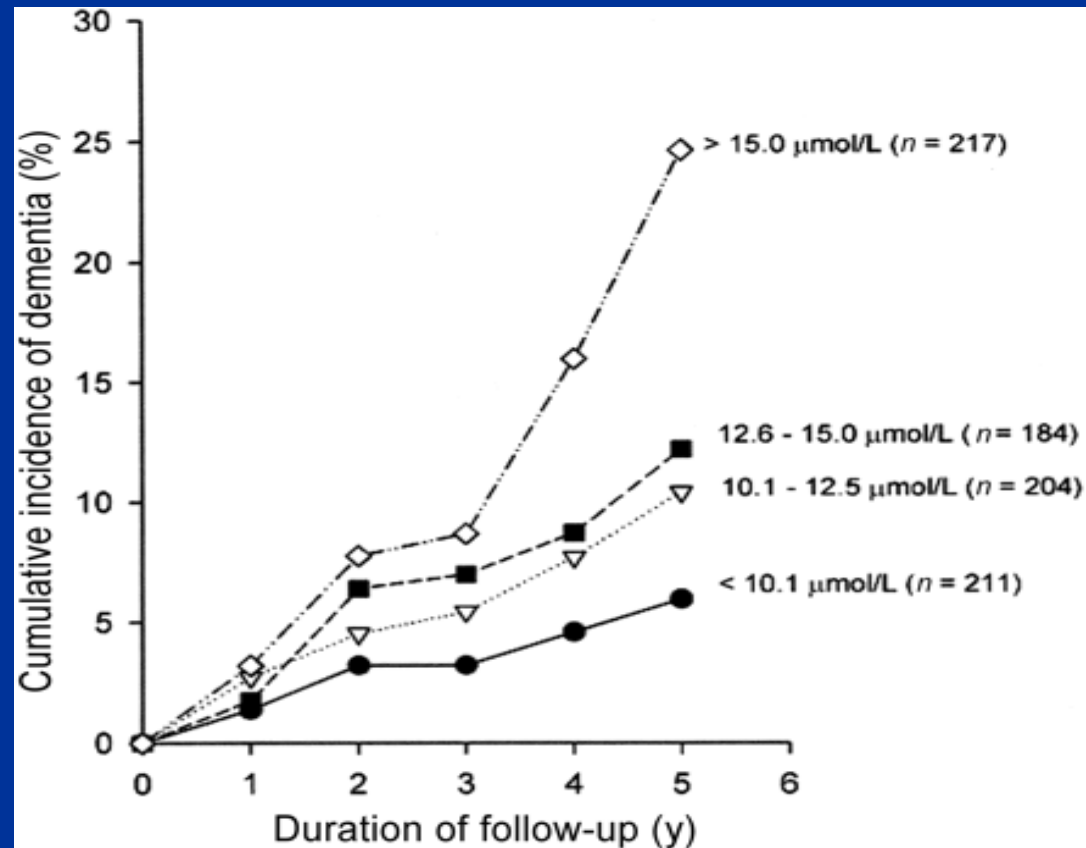
- **FMN and FAD**
 - **Electron transport chain**
 - **Synergistic with NAD and NADP**
- **Amitriptyline**
 - **Increases the renal excretion of riboflavin.**
(Pinto & Rivlin-1987)



Vitamin B12

- **Exerts a scavenging action against nitric oxide (NO).**
 - NO has been shown to inhibit respiratory chain by binding to complex I & III, and cytochrome c oxidase.
- **Homocysteine**
 - Homocysteic acid
 - Excitotoxin

Dementia & Homocysteine

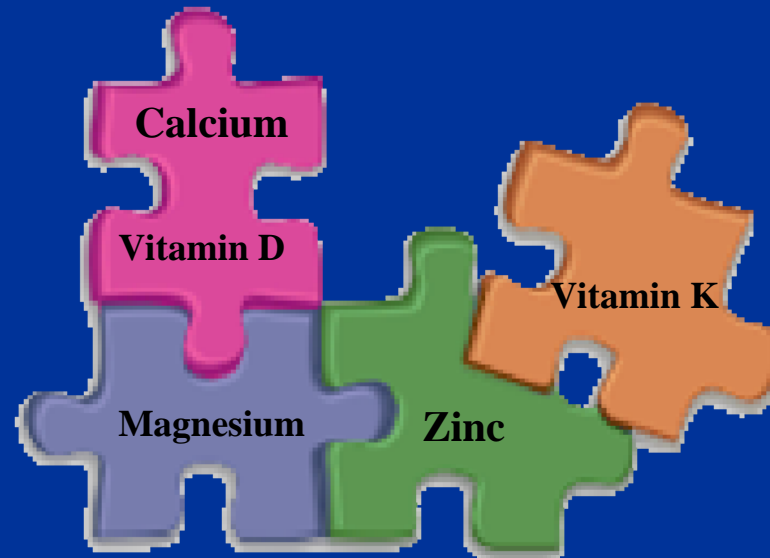


AJCN-9/2005

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Osteoporosis

Have you considered all of the Nutrients?



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Skeleton Integrity

- *Calcium, phosphorus, magnesium and zinc are the primary bone-forming minerals.*
- *At birth an infant contains approximately 20–30 g calcium, 16 g phosphorus, 750 mg magnesium and 50 mg zinc, of which approximately 98%, 80%, 60% and 30%, respectively, are in the skeleton.)*

Eur. J. Clin. Nutr. 48 (Suppl), 161–177.

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Magnesium and Osteoporosis

- On average, >60% of US men and women aged 20 y consume less than the dietary reference intake (DRI) for magnesium. *National Academy Press, 1997.*
- Serum magnesium is generally considered an unreliable indicator of magnesium nutritional status. *J Clin Chem Biochem 1980;18:257-70.*
- Conditions bone mineral crystal stability, largely by substitution of magnesium for calcium in surface positions of hydroxyapatite lattice.



Calcium & Magnesium

- Magnesium and calcium deficiency in humans is related to a number of pathological phenomena such as arrhythmia, osteoporosis, migraine, and fatal myocardial infarction.

J Nutrition (9/2006)

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Zinc and Osteoporosis

- Collagen synthesis and mineralization of bone.
- Synthesis of alkaline phosphatase.
- Augments the anabolic effect of insulin-like growth factor I on osteoblasts.

Clin Orthop (1974)

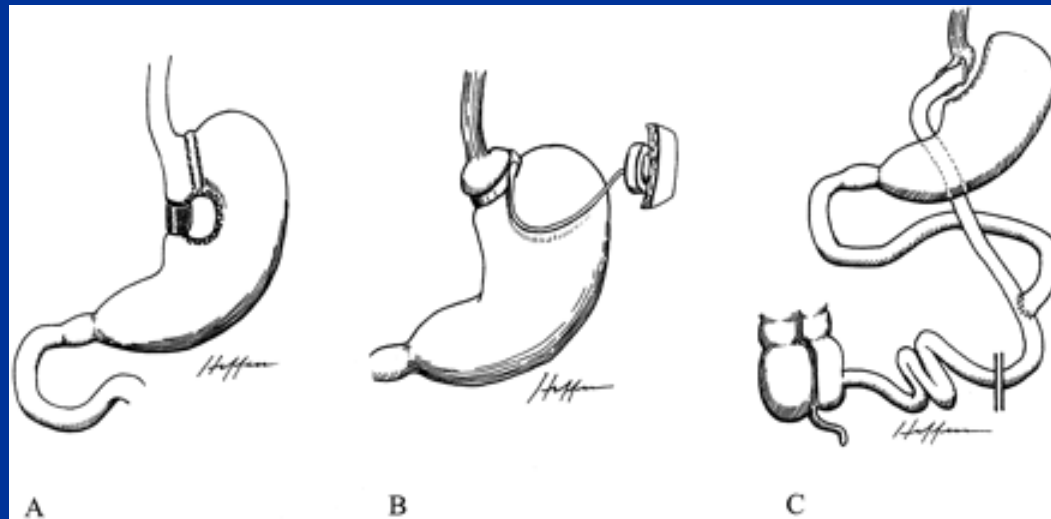
J Nutr (1982)

Biochem Pharmacol (1986 & 1988)

Peptides (1995)

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Bariatric Surgery





Nutritional Deficiencies Following Bariatric Surgery

- Protein
- Iron
- Vitamin B12
- Folate
- Calcium
- Vitamin A
- Vitamin D
- Vitamin E
- Vitamin K

Obes Surg. (2/2005)

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Roux-en-Y Gastric Bypass

493 patients

(318 – 1 yr follow-up & 141 – 2 yr follow-up)

- Nutrient Deficiencies
 - Vitamin A deficiency – 11%
 - Vitamin C – 34.6%
 - Vitamin D – 7%
 - Vitamin B1 – 18.3%
 - Vitamin B2 – 13.6%
 - Vitamin B6 – 17.6%
 - Vitamin B12 – 3.6%

Am Surg – Dec 2006

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Gender and Ethnicity

- Black patients had higher number of deficiencies than white patients.
 - 1 year – Vitamins A, D, B1
 - 2 year – Vitamins B1 and B6
- Women had higher number of deficiencies than men.
 - 1 year – Vitamin C

Am Surg – Dec 2006

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Oncology

■ **Chemotherapy**

- **Mucositis or Stomatitis**
- **Neuropathy**
- **Diarrhea**
- **Weight loss**



Nutritional Considerations

- **Vitamin A**
- **Glutamine**
- **Vitamin E**
- **Acetyl L-Carnitine**
- **Vitamin D**



Vitamin A

- Hyporetinolemia is common, particularly in subjects with severe mucositis, **and** is associated with an increased risk of herpes zoster infection in recipients of hematopoietic stem cell transplant.

Am J Clin Nutr 2002

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Case #1

- 51 y.o female
- **CC:** Myalgia and Osteopenia
- **Past Medical Hx:**
 - Ulcerative colitis
 - Cervical degenerative discopathy
 - Polymyalgia rheumatica
 - Anemia
- **SpectraCell FIA (12/2006)**
 - Asparagine, Carnitine, Vitamin D and Calcium
 - **Marginal values:** Vitamin B12, Oleic acid, Serine
 - **Spectrox: 79.4**



Case Study #2

- **53 year old male**
- **Initial visit: May 17, 2006**
- **Previous diagnosis: Plantar fasciitis**
 - **History :** Burning feet bilaterally x7 years
 - **Surgery:** Calcaneal spurs removed seven years ago.
 - **Examination:** Negative for plantar fasciitis and Tarsal tunnel syndrome
- **Medications:** Nortriptyline – 25mg/bedtime, Tylenol arthritic pain – 1 tablet every 4 hours.
- **Supplementation with 1000mg pantothenic acid and within 4 weeks burning sensation was resolved.**
- **Dosage is presently 500mg/day**



Case Study #3

- **20 year old female**
- **Initial visit: January 2, 2008**
- **Chief Complaint:** Migraine headaches and chronic sinusitis
 - **History :** PMS, three to four sinus infections per year, migraines for the past four to five years, depression and anxiety.
 - **Surgery:** Fractured fifth digit of right hand.
 - **Examination:** Cheilosis, dry skin. Neurological and orthopedic examination was WNL.
- **Medications:** Yaz (OCA) and OTC analgesics and anti-inflammatories
- **SpectraCell: Vitamin B12, Pantothenate and Vitamin D. Spectrox - 57.5%**
 - **Marginal Values:** Riboflavin, folate, choline, serine, CoQ10 and vitamin E



Case Study #4

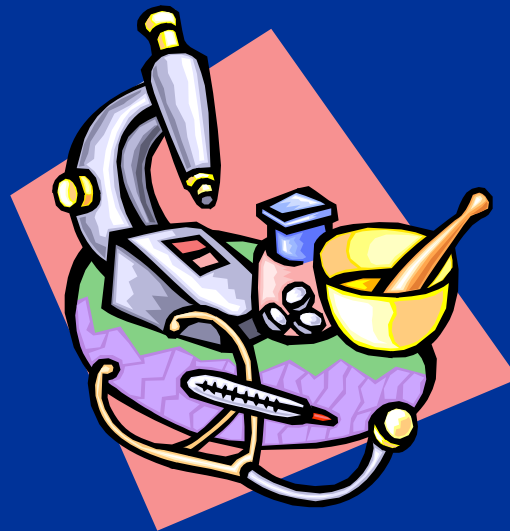
- **39 year old female**
- **Initial visit: April 24, 2007**
- **Chief Complaint: Migraine headaches and PMS**
 - **PM Hx. :** Depression and hypertension
 - **Family Hx.:** **Mother:** Scleroderma and HTN, **Sister:** Depression
 - **Examination:** Positive for chondromalacia patella and bilateral osteoarthritis of the knees.
- **Medications: Wellbutrin, and Prozac. Tylenol - prn**
- **SpectraCell Results: Vitamin B12 and vitamin E deficiencies. SpectroX of 51.9%.**
 - **Marginal values:** Pyridoxine, folate, pantothenate, inositol, glutathione and magnesium.



Case Study #5

- 55 year old female
- **Initial visit:** 11/07/08
- **Chief Complaint:** Hypothyroidism
- **PM Hx.:** Osteopenia and chronic sinusitis
- **Medications:** Synthroid, Allegra and aspirin
- **SpectraCell Results:** Pantothenate, Biotin and Selenium

Are You Using All of the Available Diagnostics?



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Questions and Answers



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