Nutrition in the Herbal Paradigm

PAUL BERGNER

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Paul Bergner
P.O. Box 83097
Portland, OR 97203

North American Institute of Medical Herbalism
http://naimh.com

http://naimh.com/southwest

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Herbs and Nutrition in History

Ancient Taoist Medicine

8 BRANCHES OF THE TAO HEALING ARTS BEFORE T.C.M.
(Jeff Nagel)

(1) Meditation/Self Cultivation,
(2) Chi Kung/Internal Kung Fu - Tai Chi Chuan…
(3) 5 Phase Nutrition,
(4) Bodywork
(5) Tao Philosophy, Cosmology, Ba Kua/I Ching Medicine,
(6) Feng Shui Astrology-Numerology and the Fine Arts,
(7) Herbology,
(8) Acupuncture.

Challenge

What famous Chinese text states:
"Once you have resorted to herbs and needles, you have already failed."

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The *Nei Jing*
The oldest book of Chinese medical theory

Hippocratic *"Food is your best medicine"*

The man Hippocrates probably never actually said this but this has been the foundation of Egypto-Greco-Roman-Arabic medicine since the first evidence of medicine in Egypt

Baghdad circa 800 AD.
"Any physician who is found to use a strong herb when a mild herb would do, or a mild herb when a dietary change would suffice, or a dietary change when simple lifestyle advice would do will be disqualified from the practice In the medical marketplace. "

Thomsonian/Physiomedical

"Food is your normal medicine, and herbs your occasional medicine, so food is your normal requirement and herbs your occasional requirement"

Wm. Cook. MD

Napiers Clinic, Edinburgh Scotland
Physiomedical herb shop and clinic established in the 1860
Large product labels from the 1940s Listed the herbs in a formula, the expected effects, and ***the diet that should be followed while taking it.***

Mystery Author

Who said:
"It is a first duty of the physician to see that the conditions of life are right. . . . . The first group of conditions are — light, air, exercise, food. If we use the prefix "good," we will express right conditions, as good light, good air, right exercise, good food. If these conditions are wanting, *they must be obtained*. The selection of food, its preparation for use, its mastication, insalivation, gastric digestion, and intestinal digestion, is the ***study of the first, and a study that can not be too thoroughly made.*** The food is the life of the man. It furnishes the material for the continuous renewal of the body, without which the man would die, and it furnishes the force which gives activity to all parts of the body, and a surplus for the world's work.

_____?

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John Scudder MD, Eclectic author of *Specific Medication*

Diet is the Root

The Golden Monkey

- This monkey was unable to reproduce in a zoo setting.
- A researcher went to the monkey's natural habitat to study its diet in the wild.
- When the natural diet was restored, the monkey began reproducing in captivity.
- We are a civilization of primates who have strayed from the natural pattern of their diet, with resulting Diseases of Civilization
- The monkey did not have a *Vitex agnus-castus* deficiency AND *Vitex* would not have restored their fertility.

Diseases rare or non-existent in traditional societies

- **Metabolic and Cardiovascular Diseases**
  - essential hypertension
  - *obesity
  - *diabetes (Type II)
  - cholesterol gallstones
  - *stroke
  - peripheral vascular disease
  - *coronary heart disease
  - varicose veins
  - *deep vein thrombosis
  - *pulmonary embolism
- **Diseases of the colon**
  - constipation
  - Appendicitis
  - diverticular disease
  - hemorrhoids
  - *colon cancer and polyps
  - Crohn's disease
  - ulcerative colitis
- **Other diseases**
  - dental caries
  - kidney stones
  - *gout
  - thyrotoxicosis
  - pernicious anemia
  - *breast cancer
  - *prostate cancer
  - *ovarian cancer
  - rheumatoid arthritis
  - osteoarthritis

Nutrients vs herbs

- Nutrients support normal functions.
- Repletion of a deficiency is ***curative.***
- Repletion has low potential to overstimulate or suppress
- Excess beyond repletion of the normal will usually be of no benefit and may be harmful

- Herbs (generally) stimulate or sedate physiological functions.
- Herbs (generally) are never ***curative*** of a dysfunction that is due to improper diet and nutrition.
- Herbs taken habitually *may* cause the atrophy of a normal function.
- Excess use has high potential to overstimulate, sedate, or suppress.
-

- It is a therapeutic error to take herbs habitually to suppress or mask the effects of suboptimal or deficient nutrition. An error, because it can enable a deeper depletion or progression of a pathology and muddle the picture with side effects.

- On the other hand, herbal treatment for the relief of suffering, or to support normal digestion and rest may be indicated during the 1-6 weeks that is necessary for dietary changes or supplementation to begin to have an effect.

The 21st Century Nutrient Famine

- **1. Magnesium**
  - about 80% of population does not get the RDA. 50% get less than 1/2 the RDA
- **2. B-6** (and its companions)
  - 75% of population does not get the RDA
- **3. Vitamin D**
  - About 60% are grossly deficient, more in winter months
- **4. Essential Fatty Acids**
  - Deficiency by anthropological norms is nearly universal

- **5. Protein**
  - About 50% do not get the RDA at some phase of life; and the RDA is suboptimal according to current science.
- **6. Chromium**
  - Optimal standards not clear; about 60% are grossly deficient
- **7. Antioxidants**
  - Suboptimal for nearly the entire population
- **8. Trace elements**
  - Suboptimal for nearly the entire population

Protein in the herbal paradigm

If protein were an herb it would be:

- **Energy Tonic**
- **Blood tonic**
- **Immune tonic**
- **Adaptogen**
- **Anti-depressant**
- **Connective tissue builder**
- **Protective for bones**
- **Liver detoxifying**

Optimizing protein intake should accompany herbal treatments in these categories

Suboptimal protein presentation

- Fatigue
- Depression
- Loss of muscle mass, or failure of muscles to respond to training exercise
- Immune deficiency, frequent colds, infections.
- Problems with hair, skin, and nails.

If giving adaptogens or tonic herbs for the above pattern, optimal protein should be ensured

Recent trends in protein nutrition

- Protein science has evolved substantially since the year 2000.
- Beginning with **The Protein Summit** recorded in the *American Journal of Clinical Nutrition* in 2007, a consensus statement by protein scholars stated that the RDA of .8 g/Kg of body weight was ***inadequate*** for optimal clinical outcomes.
- This was reinforced eight years later at the **Protein Summit 2.0,** with additional research showing higher levels of protein necessary not only for optimal clinical outcomes but even for normal protein functions.
- Very significant is research showing a **per-meal requirement** of 25-30 grams of protein to get any benefits on muscle mass, and possibly on satiation of the appetite and on metabolism.

Optimal protein intake for metabolic health

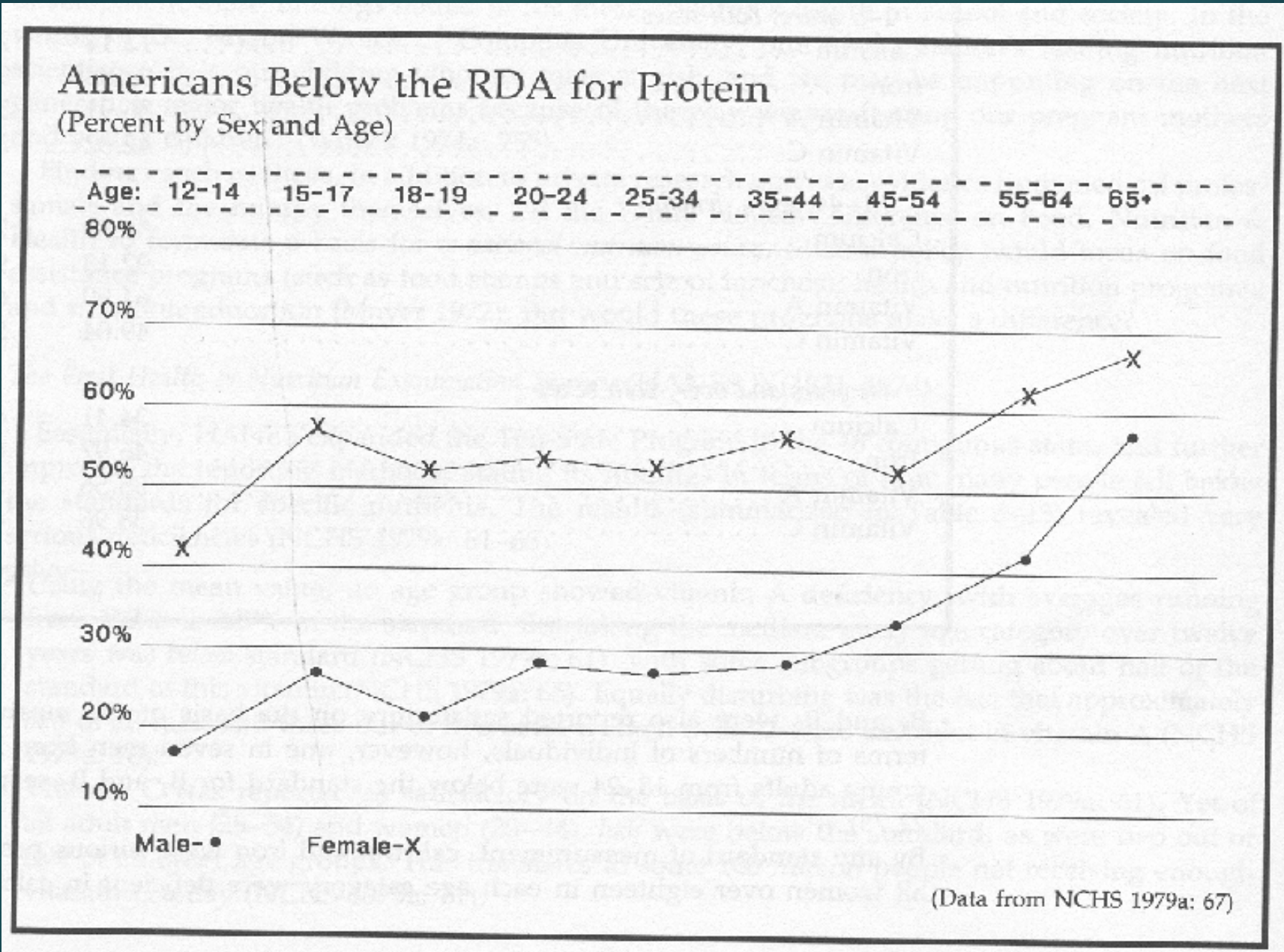
- Active healthy adult (non-athlete) Adult building muscle mass
  - 1.2 to 1.6 grams/Kg* 1.7 to 2.1grams/kg
  - 0.5 to .75 grams/lb 0.7 to 1.0 grams/lb
  - 89-119 g for women 124-158 grams
  - 104-138 g for men 145-185 grams

Leidy HJ, Clifton PM, Astrup A, Wycherley TP, Westerterp-Plantenga MS, Luscombe-Marsh ND, Woods SC, Mattes RD. The role of protein in weight loss and maintenance. Am J Clin Nutr. 2015 Apr 29.

Optimal Protein ***per meal***

- Young adult 15-25 grams
- Age 30-60 20-30 grams
- 60+ > 25 grams
- A threshold effect triggered by the amino acid ***leucine***
- Physical activity near meal time lowers the threshold
- Elders who exercise ***and*** meet the threshold can build muscle mass at the same rate as younger adults.
- Ketogenic diet may lower the threshhold

Layman DK, Anthony TG, Rasmussen BB, Adams SH, Lynch CJ, Brinkworth GD, Davis TA. Defining meal requirements for protein to optimize metabolic roles of amino acids. Am J Clin Nutr. 2015 Apr 29.


Americans Below the RDA for Protein
(Percent by Sex and Age)
Age: 12-14 15-17 18-19 20-24 25-34 35-44 45-54 55-64 65+
80%
70%
60%
50%
40%
30%
20%
10%
Male-•
Female-X
(Data from NCHS 1979a: 67)

More recent protein consumption data

- Statistics as of 2002-2003 show that more than 90% of individuals consume at least the minimum RDA of protein.
- However, another standard of adequacy at the time is the Food Pyramid calculated percentage of 17%-21% of calories, and more than 3/4th of the U.S. population fails to meet those goals. Note that the National Academy of Science says caloric percentage of protein per day may safely be as high as 35%, and current science notes broad benefits to consumption in the 21%-30% range.

Protocol

- **Basic intervention: eat 25-35 grams of protein at breakfast.**
- Consume 25 or more grams of protein per meal.
- Consume 90-140 grams of protein per day for optimal metabolism
- Consume 120-180 grams of protein per day if building or maintaining muscle mass, as in athletics, chronic disease, or the elderly.
- Eat 80% of daily protein at the breakfast and lunch meals

The clinical results of the above pattern are remarkable.

Protein in the frail elderly

- Protein was delivered to frail elders or those at risk for developing frailty.
- Daily intake was set at 0.8, 1.2,or 1.5 grams/kg of body weight.
- Effects on muscle mass and gait were low in the lower protein groups, with no difference between them.
- The 1.5 gram group had approximately 500% of the increase in muscle mass compared to the lower groups, and a doubling in gait speed.

Park Y, Choi JE, Hwang HS. Protein supplementation improves muscle mass and physical performance in undernourished prefrail and frail elderly subjects: a randomized, double-blind, placebo-controlled trial. Am J Clin Nutr. 2018 Nov 1;108(5):1026-1033.

How much is too much?

- The National Academy of Science, in its *Dietary Reference Intakes* manual suggests that up to 30% of daily caloric intake can be from protein in a balanced diet. For a 2400 calorie a day diet, that would be 180 grams a day.
- The text also states that no amount of protein has ever been shown to cause harm in human beings in normal health.
- The authors take note of the purported harms that might be caused by acid/alkaline imbalance, and also adverse effects of the decline of kidney function in chronic Kidney Disease, but state that these are theoretical and have not been demonstrated conclusively.
- Traditional Aborigines in Australia were observed consuming 2-4 lbs of meat a day, without adverse effects. First Nations people of the Fraser River in Canada consume 2 lbs of salmon per capita per day.

Protein as energy tonic and adaptogen

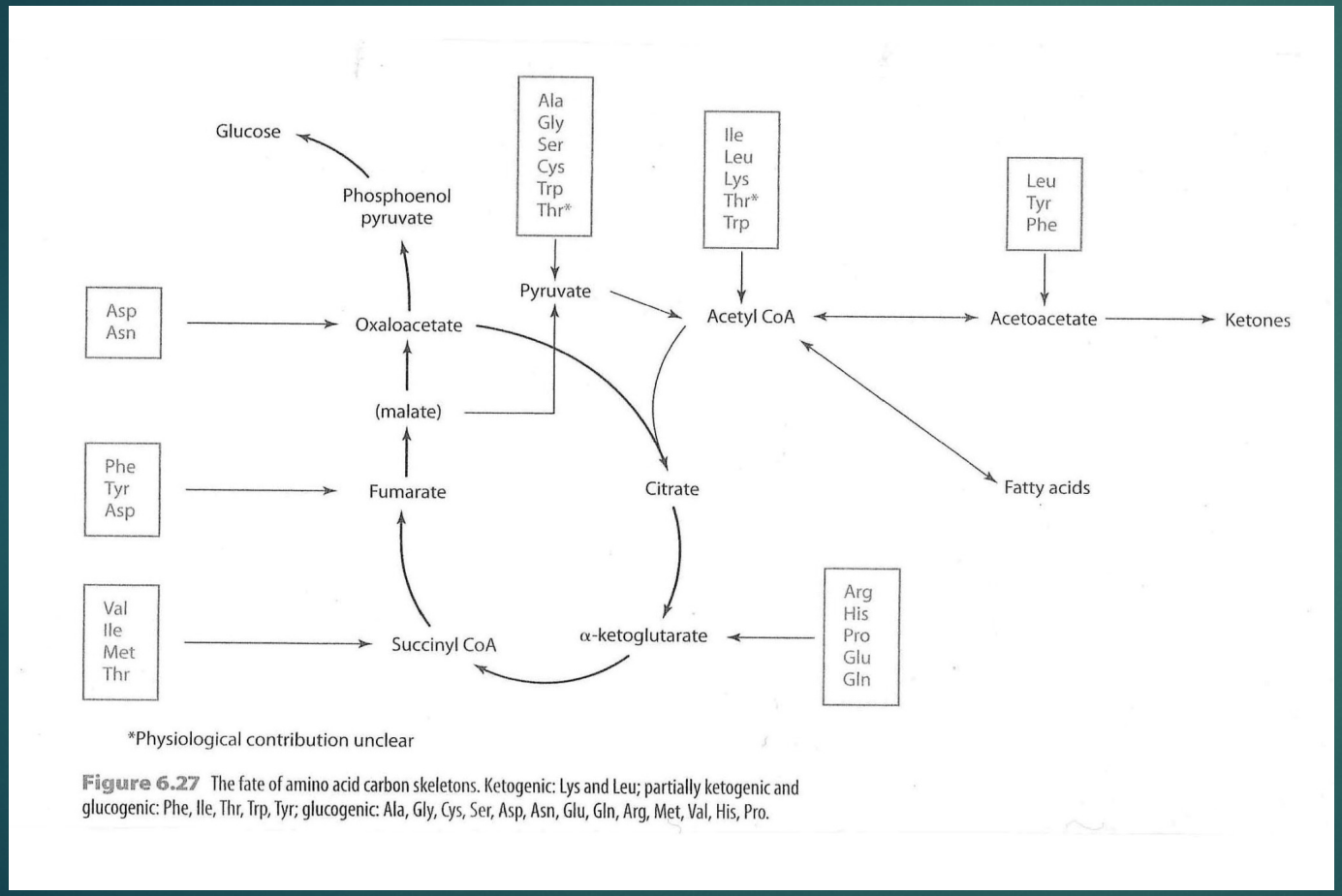


Figure 6.27 The fate of amino acid carbon skeletons. Ketogenic: Lys and Leu; partially ketogenic and glucogenic: Phe, Ile, Thr, Trp, Tyr; glucogenic: Ala, Gly, Cys, Ser, Asp, Asn, Glu, Gln, Arg, Met, Val, His, Pro.

- The Krebs cycle is not simply fed energy from fat and carbohydrates.
- Some amino acids can be burned as fuel.
- Others "feed" the cycle by supporting the Krebs cycle intermediate compounds.
- The Krebs cycle "thrives" in an amino acid rich environment.

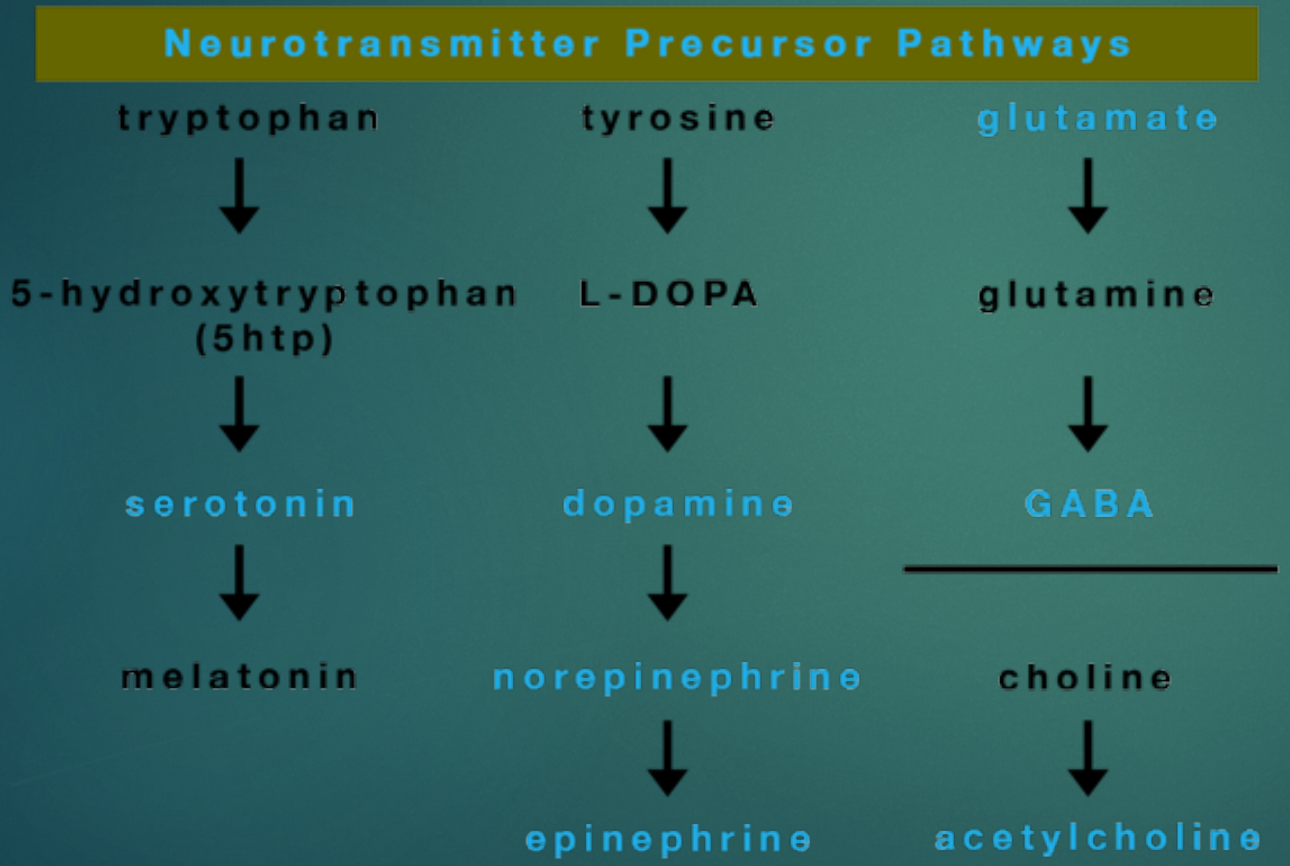
Protein as immune tonic

- In protein malnutrition, circulating amino acids in the plasma are reduced.
- In chronic disease, increased protein nutrition may be necessary to maintain immune function.
- Amino acids regulate: the activation of T lymphocytes, B lymphocytes, natural killer cells, and macorphages
- Amino acids control: cellular redox state, gene expression, and lymphocyte proliferation
- Amino acids regulate: production of antibodies, cytokines, and other cytotoxic substances.

Li P, Yin YL, Li D, Kim SW, Wu G. Amino acids and immune function. Br J Nutr. 2007 Aug;98(2):237-52. Epub 2007 Apr 3. Review.

- If giving herbs to stimulate chronic immune deficiency, or to modulate immune imbalance, optimal protein nutrition should be ensured.

Amino Acids feed Specific Neurotransmitter Pathways



- Tryptophan is the least abundant Amino acid in whole protein.
- A suboptimal total protein intake can result in a tryptophan deficiency
- The result can be a serotonin deficiency and depressed mood

Neurotransmitter realities

L-Tryptophan

Tryptophan hydroxylase

5-HT

5-HT decarboxylase

Serotonin

The pathway on paper

Steak and eggs

Polypeptidases,peptidases

Inhibited by PPI, H2-blockers, stomach inflammation, stress NSAID, chronic indigestion, intestinal inflammation

L-tryptophan

*Absorption i*nhibited by NSAID, antibiotics, chronic inflammation

Tryptophan hydroxylase

Dependent on micronutrients

5-HT

5-HT decarboxylase

Dependent on micronutrients

Serotonin

The pathway in reality

- Optimizing nutrition with whole protein, containing all the essential and non-essential amino acids, feeds the neurotransmitters in a balanced way. Supplementing single amino acids may drive one pathway, at the expense of creating an imbalance.

- Optimizing protein nutrition should be considered in any patient receiving herbal treatments for depression or other mood issues related to neurotransmitter deficiency or imbalance.

Protein and bone health

- We have no evidence to support the theory that protein or meat promote bone loss through acidification of the blood and calcium loss ***independent of sedentary status and calcium intake***. We have substantial evidence to contradict this idea. Higher protein diets, and specifically meat protein, appear to be protective against bone loss (Heaney and Laymen).
- A recent meta-analysis of 36 RCT and prospective cohort studies found no adverse effect of higher protein on the bones, and positive trends on bone mineral density at most sites for higher protein intake (Shams-White et al)

Shams-White MM, Chung M, Du M, Fu Z, Insogna KL, Karlsen MC, LeBoff MS, Shapses SA, Sackey J, Wallace TC, Weaver CM. Dietary protein and bone health: a systematic review and meta-analysis from the National Osteoporosis Foundation. Am J Clin Nutr. 2017 Jun;105(6):1528-1543.

Heaney RP, Layman DK. Amount and type of protein influences bone health. Am J Clin Nutr. 2008 May;87(5):1567S-1570S. Review.

Protein and liver detoxification

- Protein malnutrition decreases segments of both Phase I and Phase II liver detoxification.
- Four of the six Phase II pathways of liver detoxification require amino acids
- Amino acids cysteine, L-glutamic acid, and glycine are the substrates for the formation of **glutathione**, the primary antioxidant in the liver.
- **Glutathione conjugation** is one of the six pathways in Phase II detoxification
- **Amino acid conjugation** is dependent on glycine, glutamine, proline, taurine, and serine
- **Methylation** is dependent on methionine
- **Sulfation** requires the amino acids cysteine and methionine

Magnesium

Magnesium in the herbal paradigm

If magnesium were an herb it would be:

- Energy Tonic
- Adaptogen
- Antidepressant
- Anti-anxiety
- Anti-spasmodic
- Alterative/hepatic
- Cardiotonic
- Anti-inflammatory/anti-allergic
- Antidiabetic
- Female hormone balancing

Magnesium deficiency presentation

- Low energy, muscle fatigue, brain fog, cognitive problems
- Muscle cramps, stiff muscles, twitches (arterial spasm, migraine, hypertension, bronchial spasm)
- Poor stress tolerance, anxiety, depression, insomnia
- Insulin resistance
- Hyperestrogenic symptoms: PMS

Magnesium as energy tonic

- Most common mineral deficiency in U.S.
- Suboptimal in >80% of population, including many with otherwise good diets.
- Declining in the food supply with increase in “empty calorie” foods; also due to farming practices.
- Is excreted in supernormal amounts in conditions of insulin resistance > 60% of population.

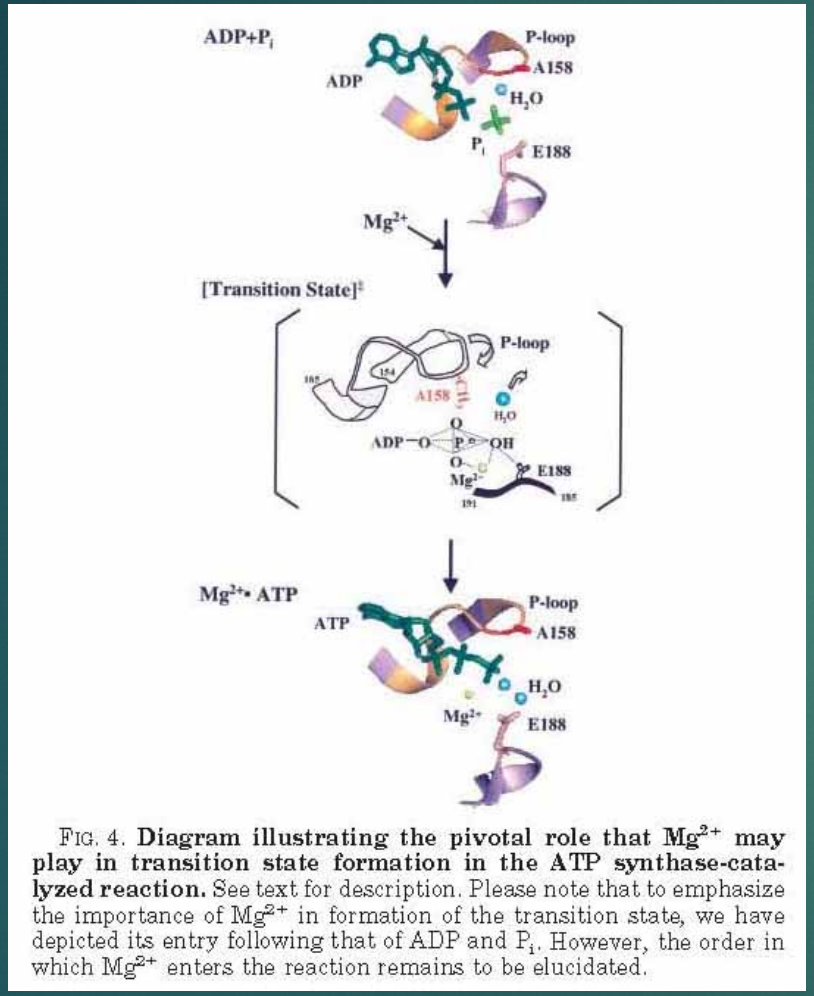
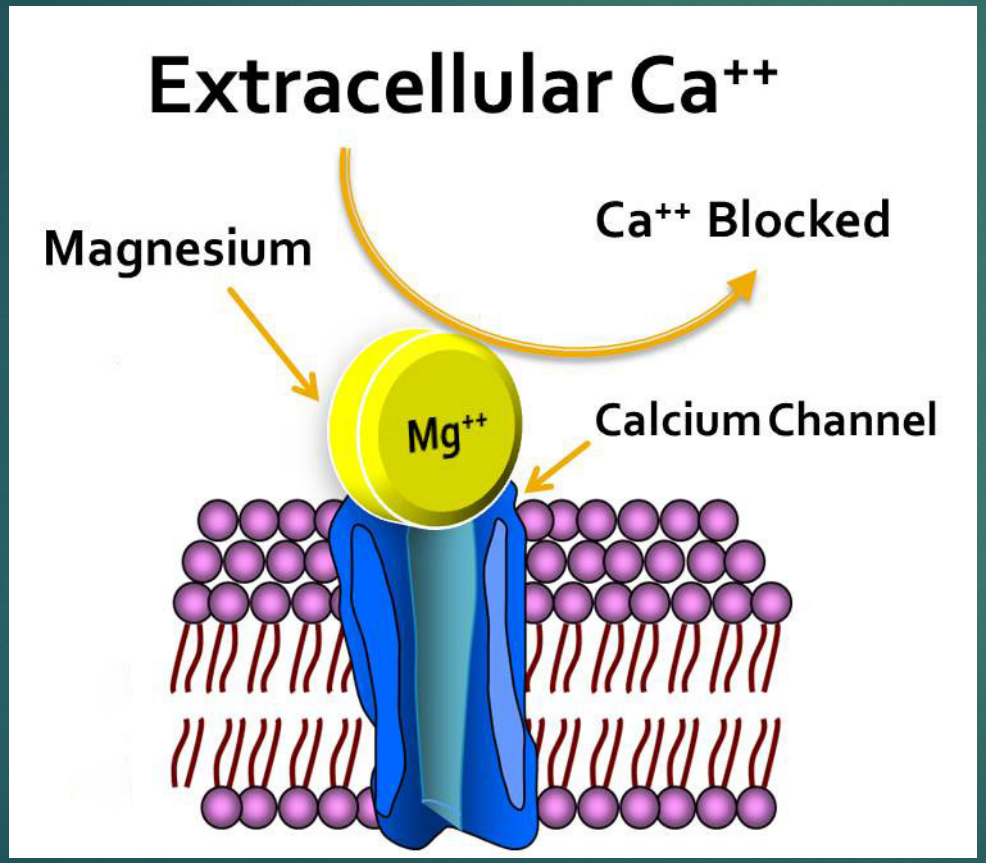


FIG. 4. **Diagram illustrating the pivotal role that Mg^{2+} may play in transition state formation in the ATP synthase-catalyzed reaction.** See text for description. Please note that to emphasize the importance of Mg^{2+} in formation of the transition state, we have depicted its entry following that of ADP and P_i. However, the order in which Mg^{2+} enters the reaction remains to be elucidated.

- Magnesium stabilizes the third high-energy bond in ATP. Reseach in chronic fatigue and
- Fibromyalgia shows that fatigue scores and magnesium status have inverse relationship.
- Likewise brain magnesium stores and cognitive function are inversely correlated

Magnesium as antispasmodic



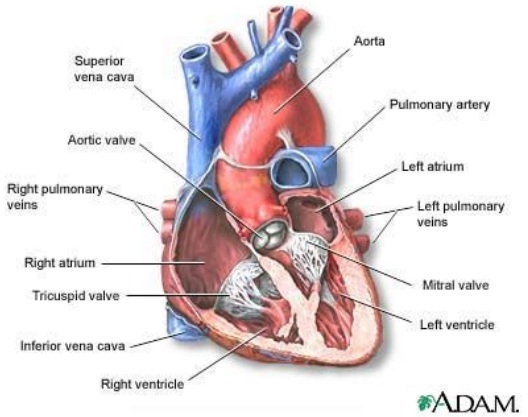
- The influx of calcium through the calcium channels produces contraction in the muscle.
- Calcium competes for channel, and blocks the influx of calcium.
- In magnesium deficiency, the muscles become crampy and stiff.

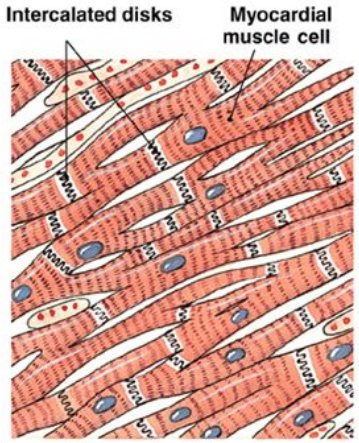
Magnesium as cardiotonic

3. **Cardiac muscle**- found only in heart

   a. Use huge amounts of **ATP** (have more mitochondria than skeletal muscle cells)

   b. Under involuntary control





Myocardial muscle cells are branched, have a single nucleus, and are attached to each other by specialized junctions known as intercalated disks. Fig. 14.7h

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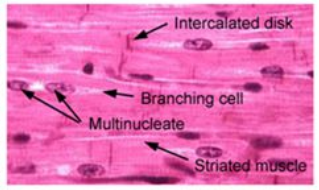
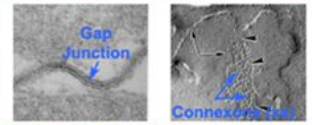




Electron Micrographs of a Gap Junction

- Post mortem biopsies of the heart muscle of heart attack victims showed only 70% of the magnesium concentration compared to matched controls who died of other causes.
- Magnesium deficiency reduces the energy available to the heart muscle, and increases tendency to spasm in the coronary arteries.

Magnesium supplementation

- Dietary intake should be 400-600 mg per day from food and supplements. The American food supply is grossly deficient in magnesium.
- Therapeutic dose 600 up to 1200 mg/day for six weeks
- Better absorbed with small frequent doses.
- ***Not when kidney clearance is impaired.***
- Some people do not respond well to pills, but liquid ionic forms work rapidly.
- Causes loose stool due to local factors in the gut as the intestine secretes fluid to dilute concentrated magnesium from a supplement.
- Take smaller frequent doses to avoid loose stool

Apple cider vinegar magnesium elixir

- 1 ounce of milk of magnesium
- 4 to 4.5 ounces of apple cider vinegar.
- Add vinegar and stir. Wait 5 minutes. If not clear, then add a little more vinegar.
- Some residue will remain from vinegar, but liquid should be clear. Tastes very bad.
- Contains about 42mg of ionic free Mg per tsp.
- Add 1-3 Tbs per liter to drinking water to make "heavy" magnesium water.
- Drink throughout day.

Formula devised by Penelope Toothman, PhD at the North American Institute of Medical Herbalism

How much is too much?

- The laxative effect of magnesium on intestinal fluids is protection against overdose.
- Whatever magnesium is absorbed is readily excreted in the kidney to produce homeostasis in the serum.
- ***Kidney disease can present a risk for magnesium overdose.***

Vitamin D in the Herbal Paradigm

If Vitamin D were an herb it would be :

- Anti-fatigue
- Anti-inflammatory
- Anti-Cancer
- Immune enhancing
- Immunomodulating
- Anti-influenza
- Anti-diabetic
- Anti-hypertensive
- Anti-atherosclerotic
- ***Supplementation with even modest amounts of vitamin D (400-1000IU) may reduce overall mortality by 7%***

Vitamin D deficiency presentation

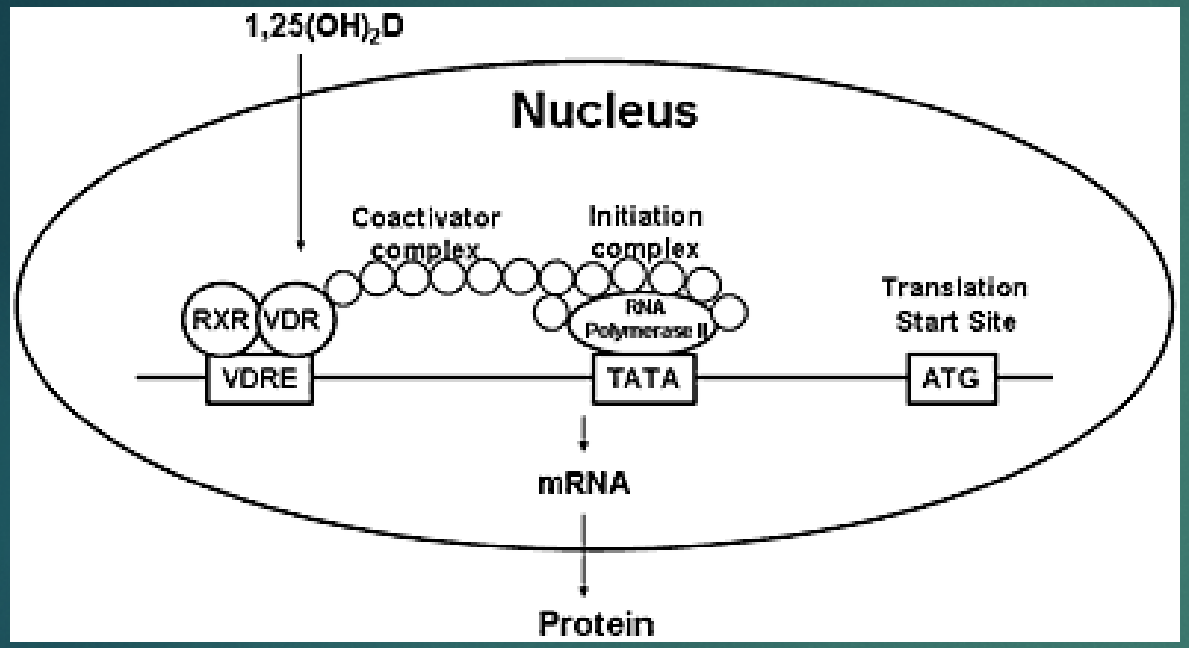
- Fatigue
- Cloudy thinking
- Depression worse in winter
- Muscle weakness, chronic muscle pain
- Frequent respiratory infections
- Any chronic disease with cyclic aggravation between December and March
- Connective tissue weakness and tears

Vitamin D and mitochondrial function

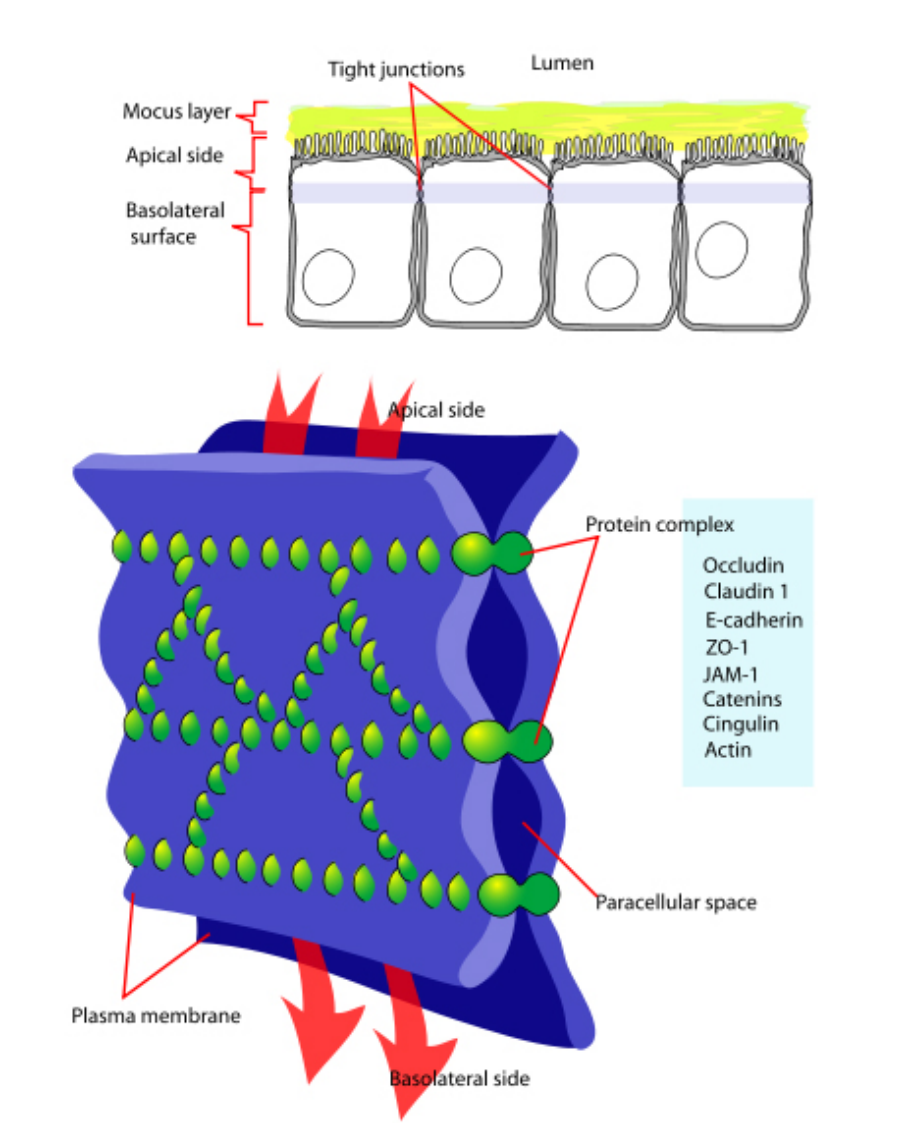
- Mitochondrial function depressed in a group of patients with severe vitamin D deficiency
- D levels raised with supplementation from below 10 ng/mL to above 40 ng/mL.
- ATP production (oxidative phosophorylation) increased by 20%, in linear fashion proportional to increase in D status.
- All patients reported a reduction in fatigue.

Sinha A, et al. Improving the vitamin D status of vitamin D deficient adults is associated with improved mitochondrial oxidative function in skeletal muscle. *J Clin Endocrinol Metab*. 2013 Mar;98(3):E509-13

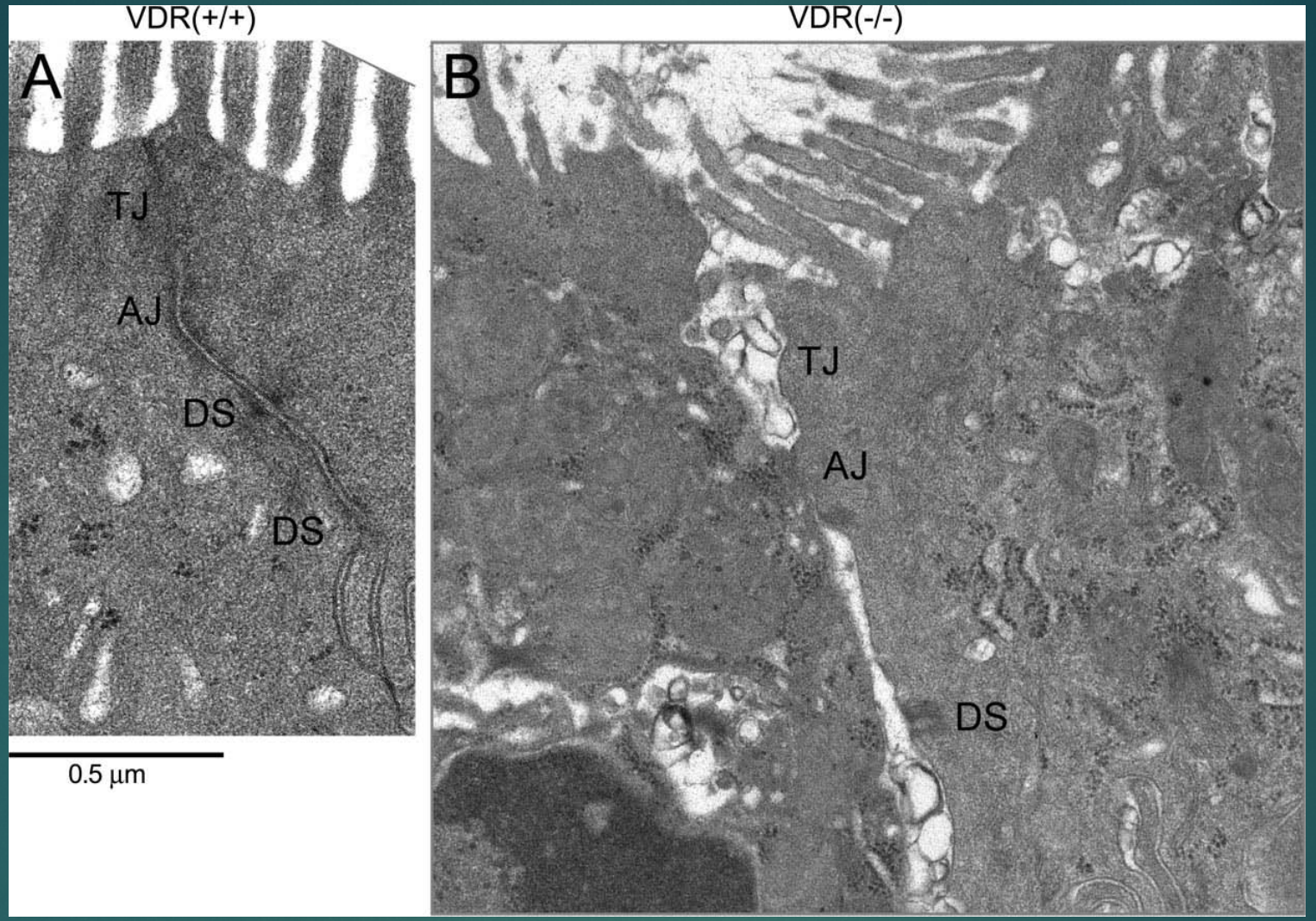
Vitamin D



- Binds to the cell vitamin D receptor (VDR)
- 1,25(OH)2-D3 then binds to the RXR receptor on the cell nucleus.
- This activates the DNA/RNA to produce proteins which are expressed on the cell surface.
- "immunocompetence" proteins on surface of immune cells.
- Junction proteins in connective tissue



- Tight junction
- Vitamin D has critical role on any chronic connective tissue weakness or pain



Tight junctions (TJ) Adherens junctions (AJ) and Desmosomes (DS) in colonocytes of normal and vitamin-D receptor-negative mice after inflammatory challenge

Sander GR, et al. Rapid disruption of intestinal barrier function by gliadin involves altered expression of apical junctional proteins. FEBS Lett. 2005 Aug 29;579(21):4851-5.

Toxicity

- Toxicity has only been recorded in cases of manufacturing accidents, where supplements had thousands of times the levels they were intended to. In one case the dose was 600,000 IU per day for 21 days.
- Although the upper normal at most labs is 80-100 ng/mL, no toxic alteration of function has been observed at levels below 200 ng/mL which should be considered the toxic risk level.
- It is easy to overshoot the 100 ng/mL normal level with supplementation, but very difficult to achieve levels above 150 ng/mL

Phase I safety trial

- Baseline 0
- Next two weeks 4000 day
- Next six weeks 8000 day
- Next six weeks 16000 day
- Next six weeks 32000 day
- Next six weeks 40000 day
- This protocol achieved serum levels of up to 154 ng/ml (385 nmol/L) without hypercalcemia or hypercalcurea
- Participants also took 1200 mg Ca per day

Granulomatous conditions

- In sarcoid, some cancers, and other granulomatous diseases, normal levels of vitamin D may cause toxicity.
- When supplementing must measure and monitor both 25(OH)D3 and 1,25 di-hydroxy D3 (calcitriol) and watch for elevated calcitriol levels.
- Research all autoimmune, neoplasia, and chronic infectious diseases for possible granuloma involvement. Consult with physician if necessary.
- The granuloma, a cluster of white blood cells, converts 25(OH)D3 to the active form intracellularly. There is no negative feedback brake on production, so granulaomatous masses can secrete the active form (calcitriol) continuously to produce toxicity.

Vitamin D protocol

- Take 10,000 IU/day at least 5 days a week for six weeks.
- Then take 4000-7000 IU per day regularly, the higher level during the vitamin D winter.
- In cases of rickets or osteomalacia, it has been common to give a dose of 300,000 IU to a young child. This same dose may be given by injection twice over the winter to adults in Scandinavia.
- On the basis of the above, if rapid correction of a serious deficiency is desired, taking 50,000 IU/day for six days should be safe, and warranted.
- Daily or near daily doses are superior to once-weekly or less often doses at higher levels.

Vitamin B6 in the herbal paradigm

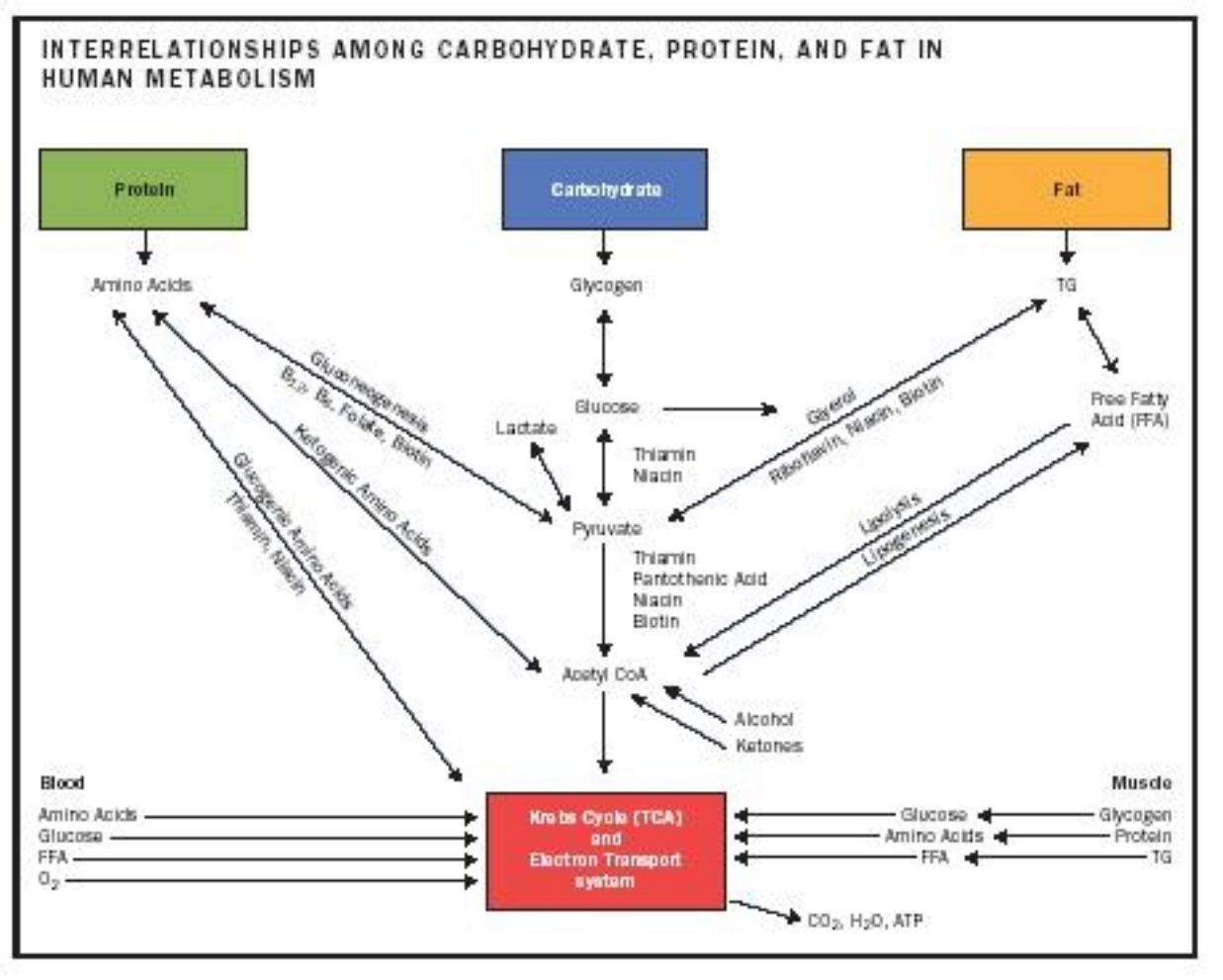
If B6 were an herb it would be:

- Alterative – Critical for Phase I liver detoxification
- Hormonal balancing –Critical for production of dopamine and progesterone; critical for clearance of active form of estrogen
- Blood tonic – Critical for manufacture of hemoglobin
- Antidepressant – Critical for the formation of neurotransmitters
- Immune tonic – Critical for manufacture of antibodies and WBC.

Vitamin B6 deficiency presentation

- First and most prominent are fatigue and mood problems
- Depression, anxiety, irritability, increased sensitivity to pain.
- Can aggravate low grade chronic inflammation.
- Skin rashes and inflammation, inflamed tongue.

B Vitamins and the Krebs cycle



- B vitamins and related nutrients as a group promote the transformation of fuels to make them available to the Krebs Cycle.
- Vitamin B6 is also critical to several of the enzymes in the cycle itself.

- Vitamin B6 is the most common vitamin deficiency in the U.S. population, deficient in 70% of more.
- B6 deficiency rarely occurs in isolation from other B vitamins and related compounds.
- When supplementing, give as part of the whole B complex.
- High quality multivitamins typically contain a B-complex with abundant B6.

Protocol

- Protocol I. With a supplement providing the RDA of the B-Complex, take 2-3 doses per day.
- Protocol II. Take a high quality multivitamin containing a B-complex for ten days. Then continue taking several days a week.

Omega-3 fatty acids in the herbal paradigm
If EFA were an herb it would be:

- Anti-inflammatory – EPA balances Arachidonic acid to create a less inflammatory prostaglandin cascade.
- Anti-diabetic – DHA in the cell membrane promotes insulin sensitivity
- Anti-depressant – DHA promotes cognitive function.
- Cerebral tonic – Effects to to DHA or DHA/EPA combination
- Blood thinning – Healthy levels of omega 3 FA promote normal platelet aggragation.
- Moistening to dry skin – often curative for keratosis pilaris

Controversy about fish oil and CVD

- Recent press account state that Fish Oil is of no use for cardiovascular disease or all cause mortality. The recent metaanalysis contradict earlier meta-studies showing a protective effect for fish oil, especially to prevent second heart attacks, at a level comparable or better than statin therapy.
- The difference may be due to an altered trial design which eliminates one category of cardiac outcomes used in the earlier studies.
- However, there is ***no controversy*** that high RBC omega-3 fatty acids is associated with reduced cardiovascular event, and a reduction in all-cause mortality.
- Erythrocyte omega-3 index is a better predictor OF CVD or overall mortality that serum cholesterol, which in this study was not predictive of either at all.
- The highest quintile of omega-3 (especially DHA) predicted a more than 30% reduction in CVD and all-cause mortality

Harris WS, Tintle NL, Etherton MR, Vasan RS. Erythrocyte long-chain omega-3 fatty acid levels are inversely associated with mortality and with incident cardiovascular disease: The Framingham Heart Study. J Clin Lipidol. 2018 May - Jun;12(3):718-727.e6.

EPA/DHA deficiency presentation

- Dry skin
- Keratosis pilaris
- Dull mind, cloudy thinking
- Chronic inflammation
- Menstrual pain
- Symptoms of insulin resistance

- Keratosis pilaris
- Raised keratinous bumps around hair follicles
- May resolve completely with fish oil supplementation

Fish oil supplementation

- Supplement initially with 3 grams of combined EPA and DHA per day for ten days.
- Follow this with 1 gram combined EPA/DHA most days.
- Take make-up doses up to 3 grams/day
- Maximize sardines, ocean fish, wild game, and grass-fed (exclusively) meats.

Nutrients and Immunity

- When your mind runs to "immune stimulation" with herbs such as *Echinacea* or *Astragalus,* or to "immunomodulation" with herbs such as *Ganoderma* or *Shiitake* mushrooms, think also of:
- Optimize protein nutrition
- Optimize vitamin D status
- Optimize EFA nutrition
- Then the acronym is ZACES (Zinc, vitamin A, vitamin C, vitamin E, and selenium). The ZACES program, plus garlic, was developed by a woman in Zimbabwe to treat malnourished HIV patients.
- These should be considered in all cases presenting as immune deficiency, or immune imbalance.

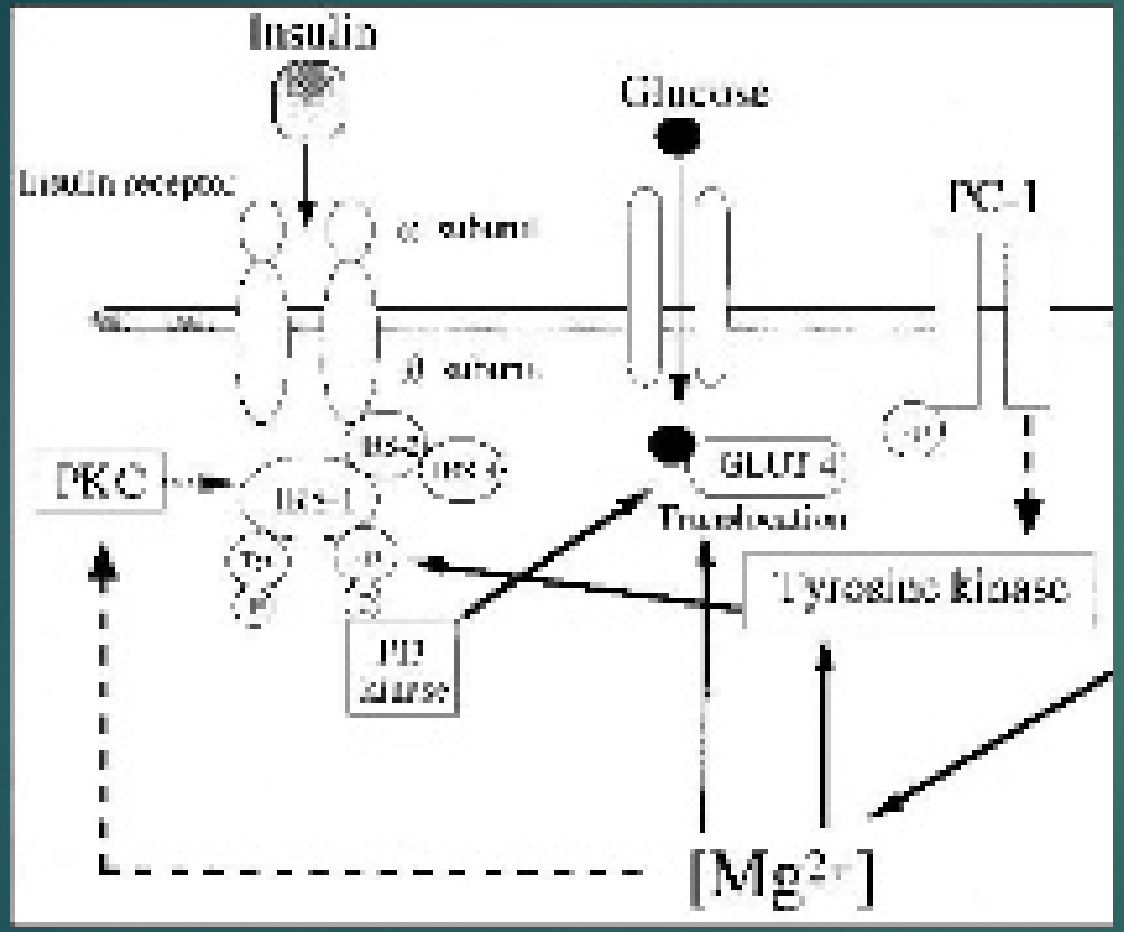
Nutrition and inflammation

- If treating a patient with anti-inflammatory herbs such as *Curcuma, Boswellia, Zingiber*, the salicylate-containing herbs, or others, consider deficiencies of
- Omega-3 fatty acids
- Vitamin D
- Magnesium
- Vitamin B-6 and complex

Nutrients and insulin resistance

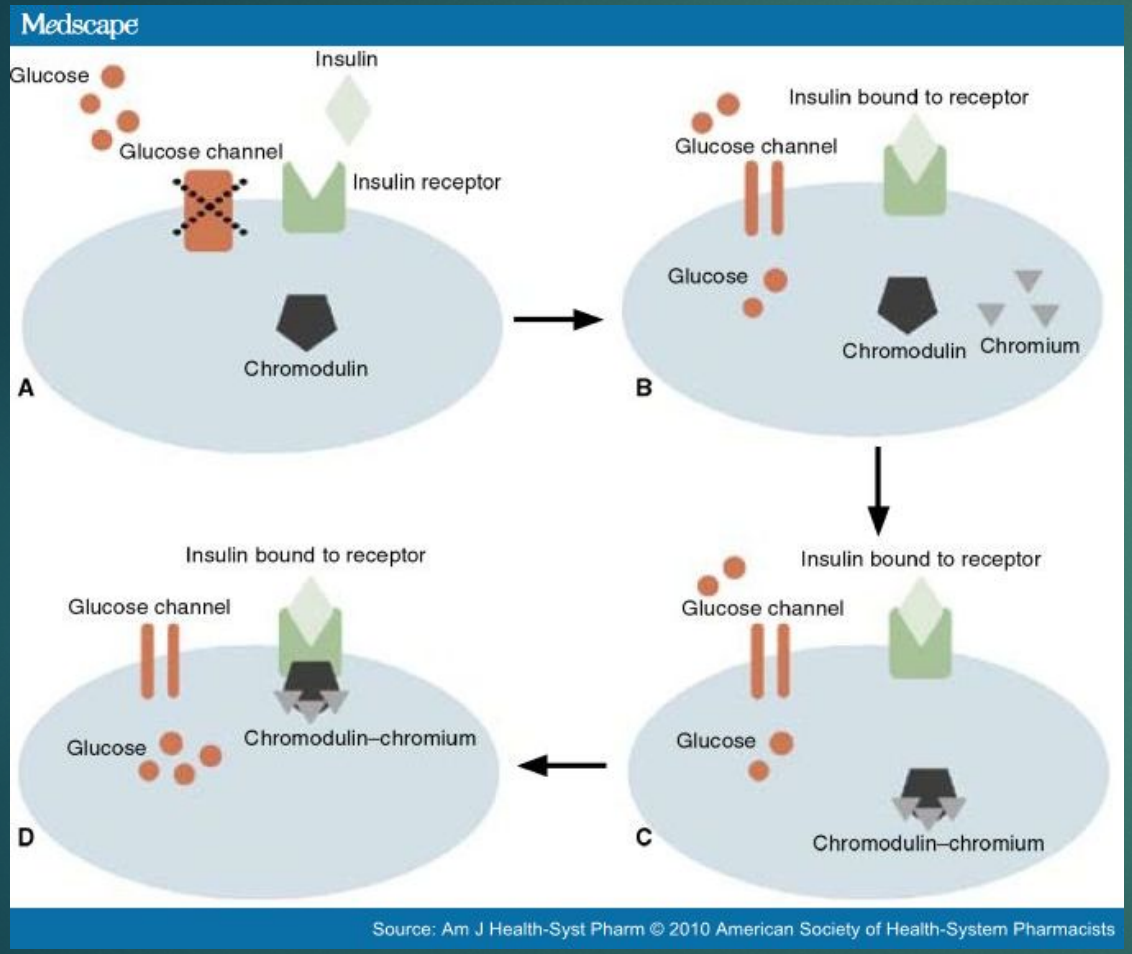
- Herbs such as *Cinnamomum, Trigonella, Caffea, Opuntia, Ocimum*, and others may promote insulin sensitivity.
- The four mineral nutrients Chromium, Magnesium, Zinc, and Manganese are all essential for normal insulin sensitivity and cell responsiveness to the insulin signal.
- Starving test animals for any one of these nutrients can produce diabetes.
- All four follow the same pattern that they are excreted in larger than normal amounts in patients with hyperinsulinemia.

Magnesium and glucose metabolism



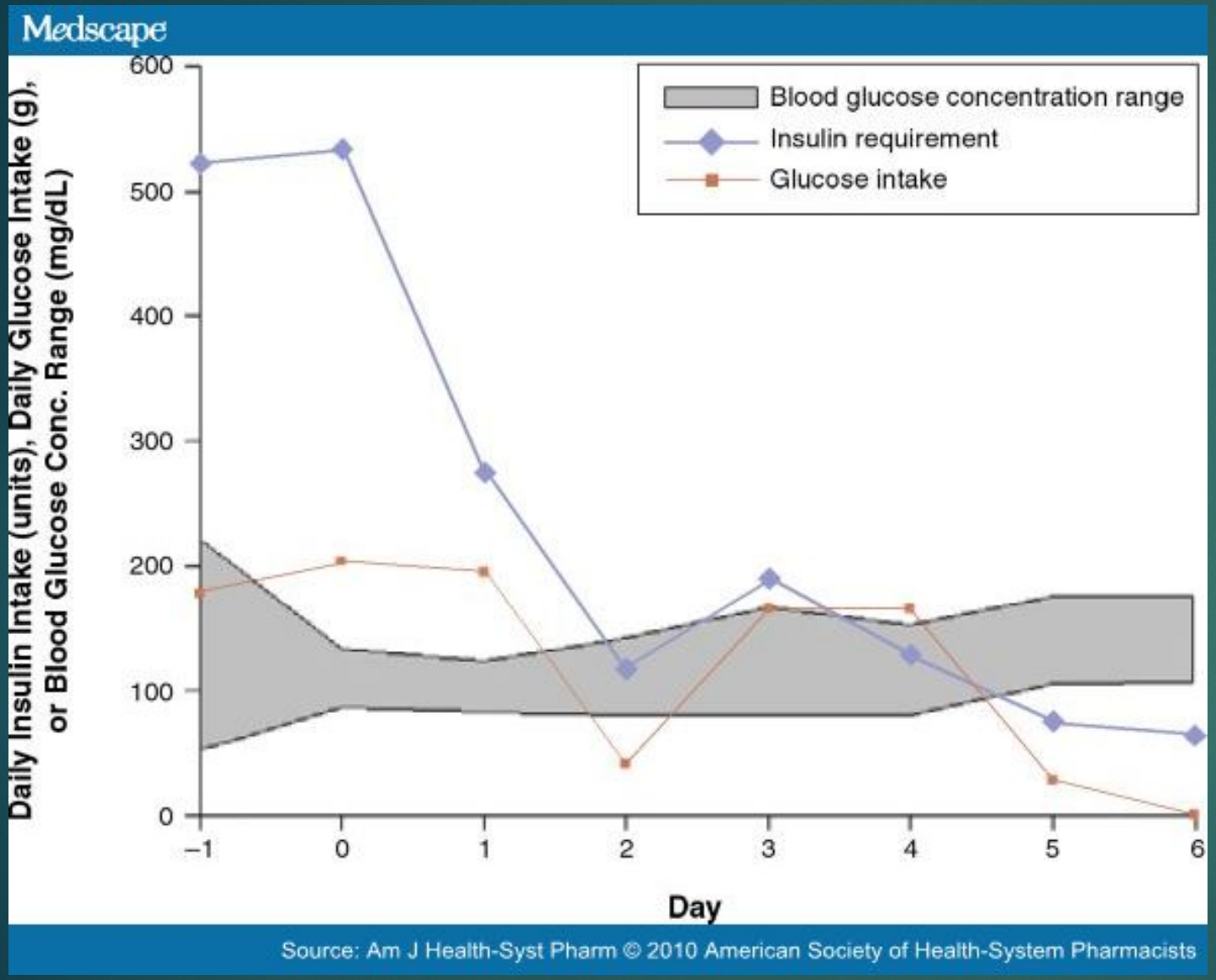
Magnesium is a critical rate-limiting cofactor in the response of the cell to insulin binding. It is essential at two steps in the production of glucose transporter proteins in response to insulin binding.

Chromium



- A Normal insulin regulation without the presence of chromium, insulin has not yet bound to the receptor.
- B Insulin binds to its receptor, glucose clearance is low. Chromium enters the cell independently of insulin activity.
- C Chromium binds to the protein chromodulin to form a complex.
- D Chromodulin–chromium complex binds to the insulin receptor, keeping it in the active position attached to insulin, thus increasing glucose entry into the cell.

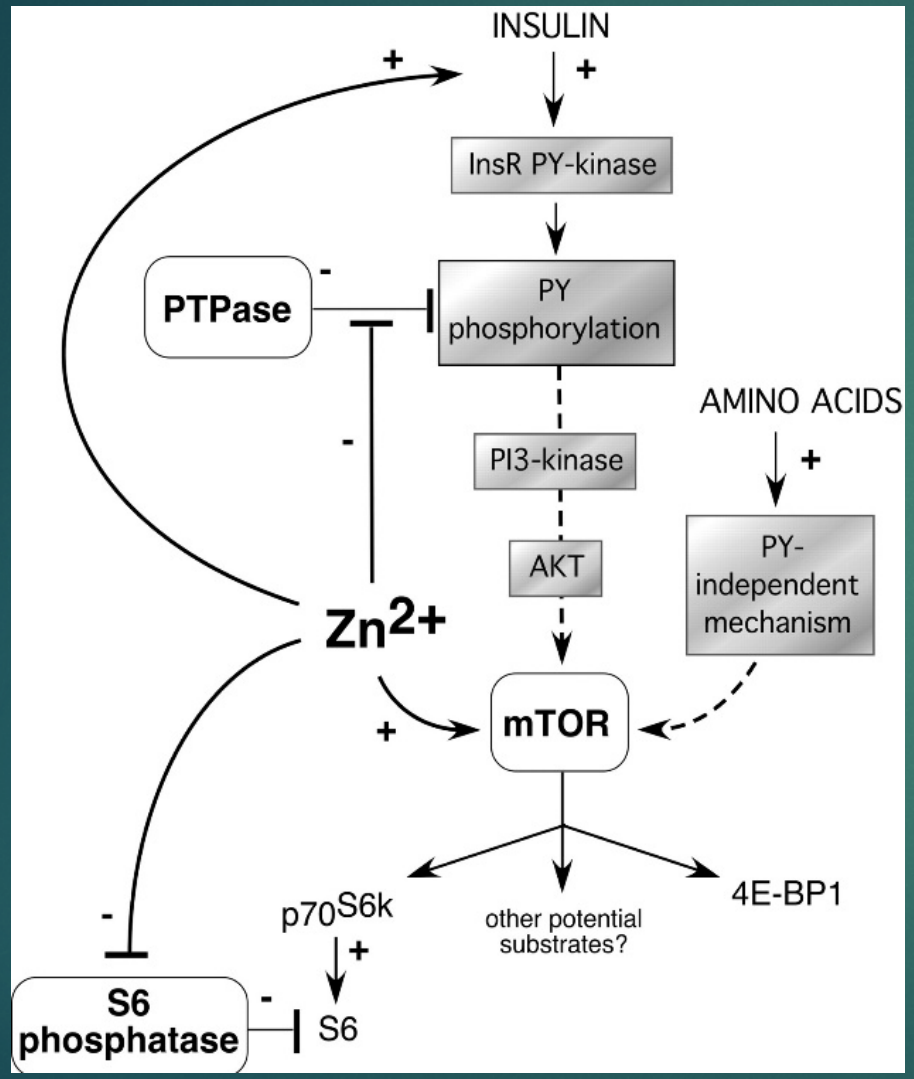
Phung OJ, Quercia RA, Keating K, Baker WL, Bell JL, White CM, Coleman CI. Improved glucose control associated with i.v. chromium administration in two patients receiving enteral nutrition. Am J Health Syst Pharm. 2010 Apr 1;67(7):535-41.



- In response to I.V chromium, this diabetic patient reduced insulin requirements by 75%
- Clinical interventions trials have mixed results, perhaps due to a low dose of chromium in most.

Phung OJ, Quercia RA, Keating K, Baker WL, Bell JL, White CM, Coleman CI. Improved glucose control associated with i.v. chromium administration in two patients receiving enteral nutrition. Am J Health Syst Pharm. 2010 Apr 1;67(7):535-41.

Zinc and the glucose transporters



The cell responds to insulin binding by producing glucose transporter proteins which in turn allow the entrance of glucose and other nutrients into the cell. Zinc has a key role, and its deficiency can produce insulin resistance and diabetes in test animals.

Lynch CJ, Patson BJ, Goodman SA, Trapolsi D, Kimball SR. Zinc stimulates the activity of the insulin- and nutrient-regulated protein kinase mTOR. Am J Physiol Endocrinol Metab. 2001 Jul;281(1):E25-34.

Manganese

- Manganese is considered an insulin mimetic.
- Manganese is essential for the manufacture of insulin receptors, and the number of receptors is reduced in deficient animals.
- Manganese is also essential to the manufacture of glucose transporter proteins, and its deficiency may lead to 40-50% decline in glucose clearance in animals.

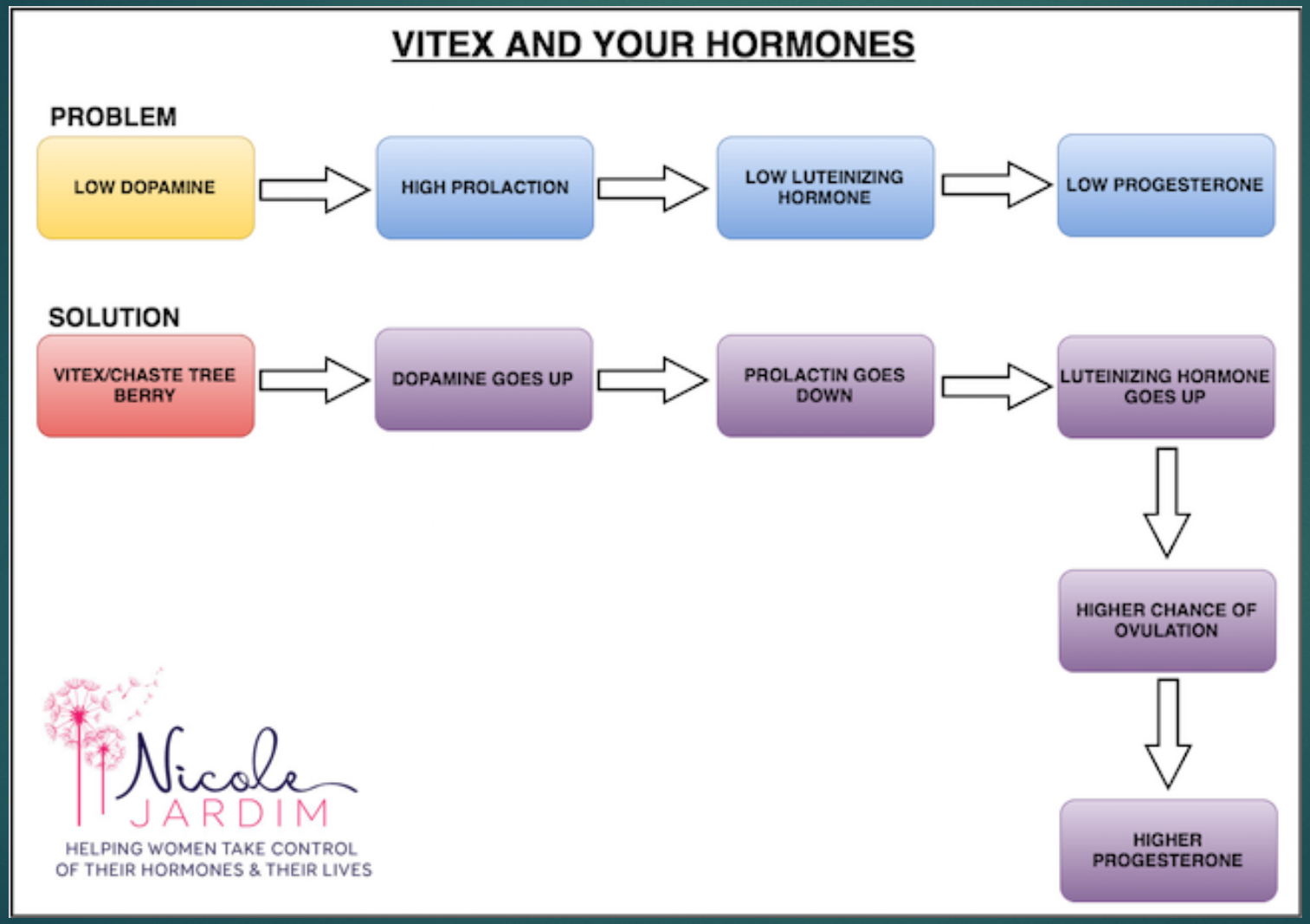
Baly DL, Schneiderman JS, Garcia-Welsh AL. Effect of manganese deficiency on insulin binding, glucose transport and metabolism in rat adipocytes. J Nutr. 1990 Sep;120(9):1075-9.

- All four of these essential nutrients are depleted in the patient with persistent hyperinsulinemia (elevated throughout the 24 hour day)
- **Normal nutrition** cannot replace them.
- **Aggressive supplementation** may be required to break the vicious cycle.
- Insulin resistance is at least in part a deficiency disease.
- ***Herbal medicines cannot be expected to correct insulin resistance in the presence of these deficiencies***

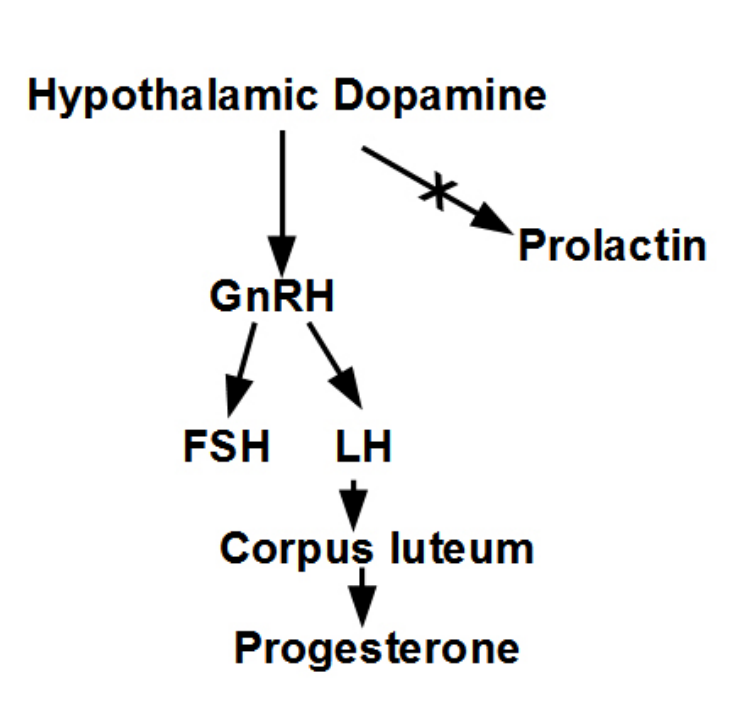
If treating insulin resistance with herbs

- Chromium. 200 mcg BID to QID
- Magnesium. 200 mg BID to QID
- Zinc. 20 mg BID to TID
- Manganese 5 mg BID to TID
- Vitamin B complex
- Vitamin D
- Omega-3 fatty acids (DHA specifically)

Vitex and the dopamine pathway



Dopamine, prolactin, and progesterone

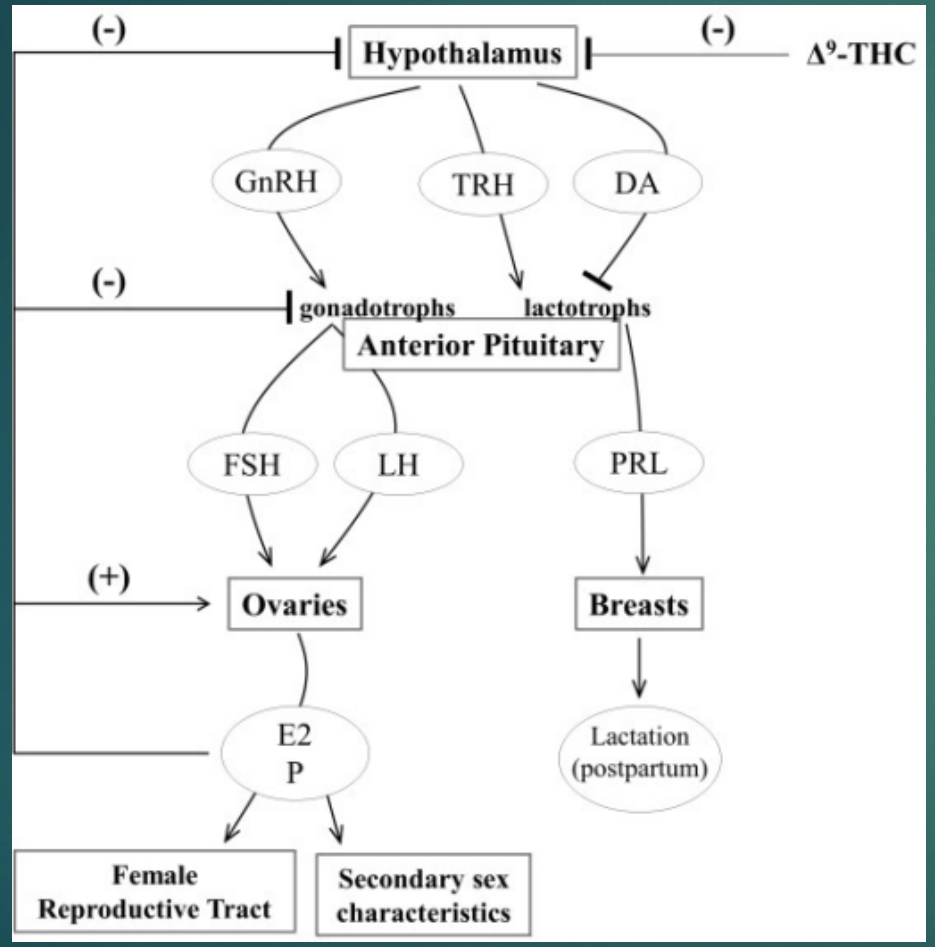


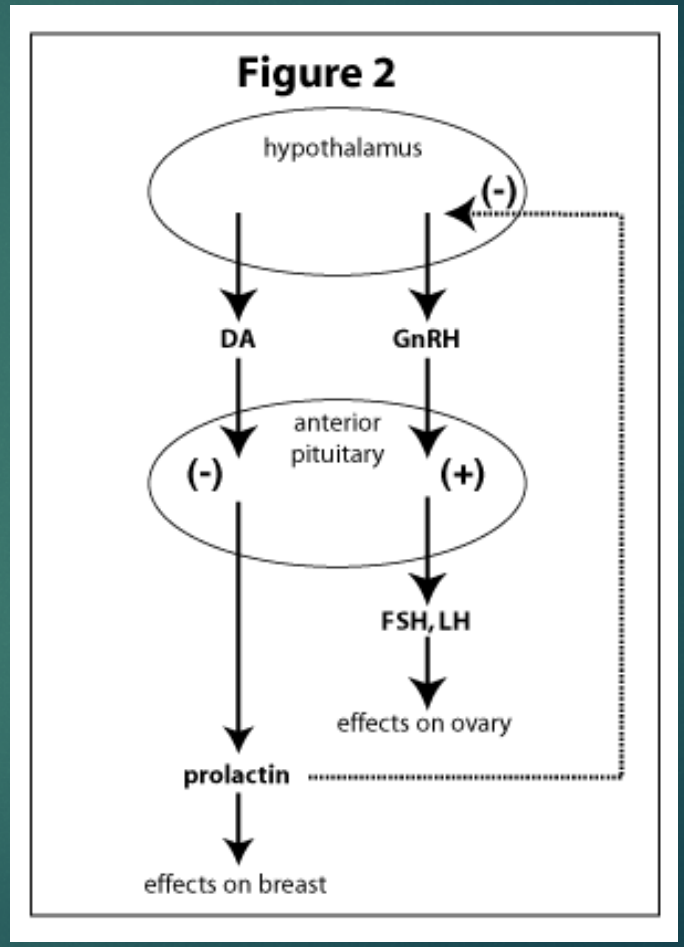
Dopamine deficiency promotes clinical or subclinical hyperprolactinemia and in turn suppresses GnRH and LH, reducing the production of progesterone from the corpus luteum, producing relative hyperestrogenism

This is the "*Vitex*" pathway: Vitex is a dopamine stimulant. It can thus mask the nutrient deficiencies that promote dopamine deficiency

Cofactors
Mg, B6, Zn, C, Fe, EFA, and abundant protein.

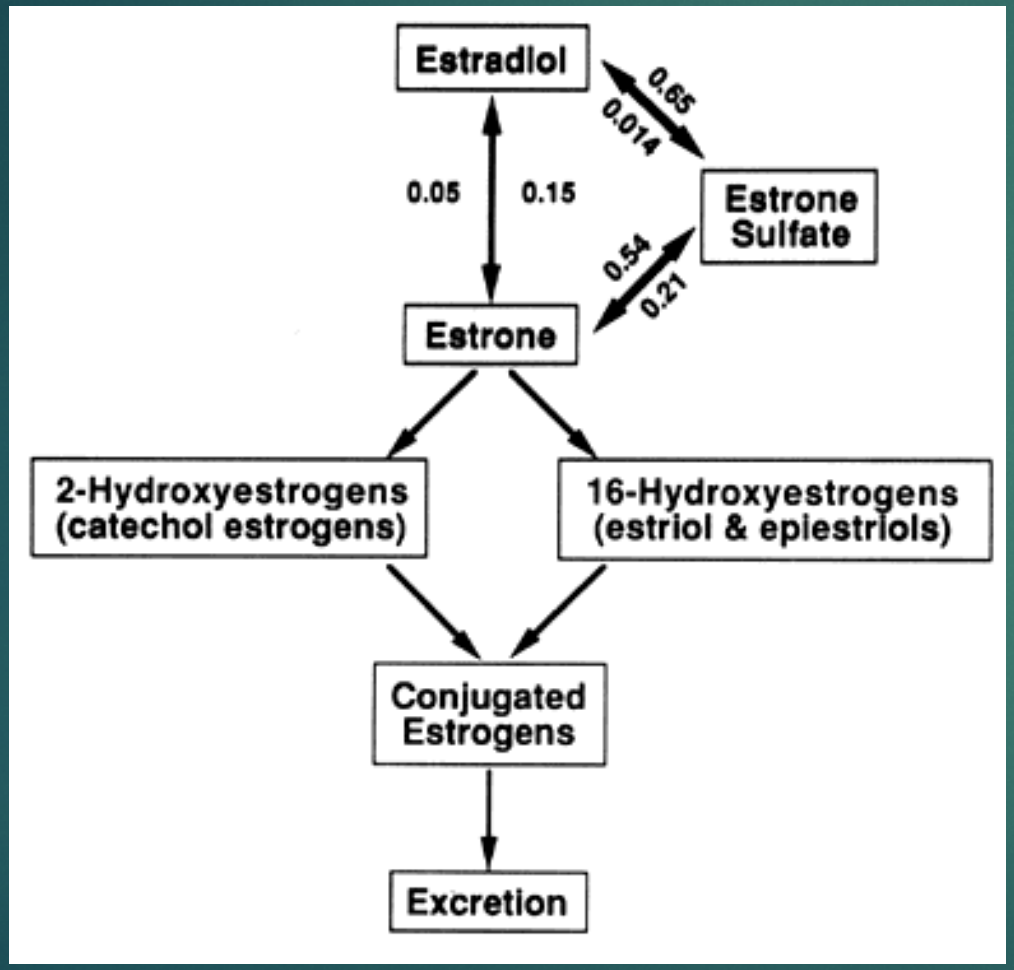
Dopamine, prolactin, progesterone





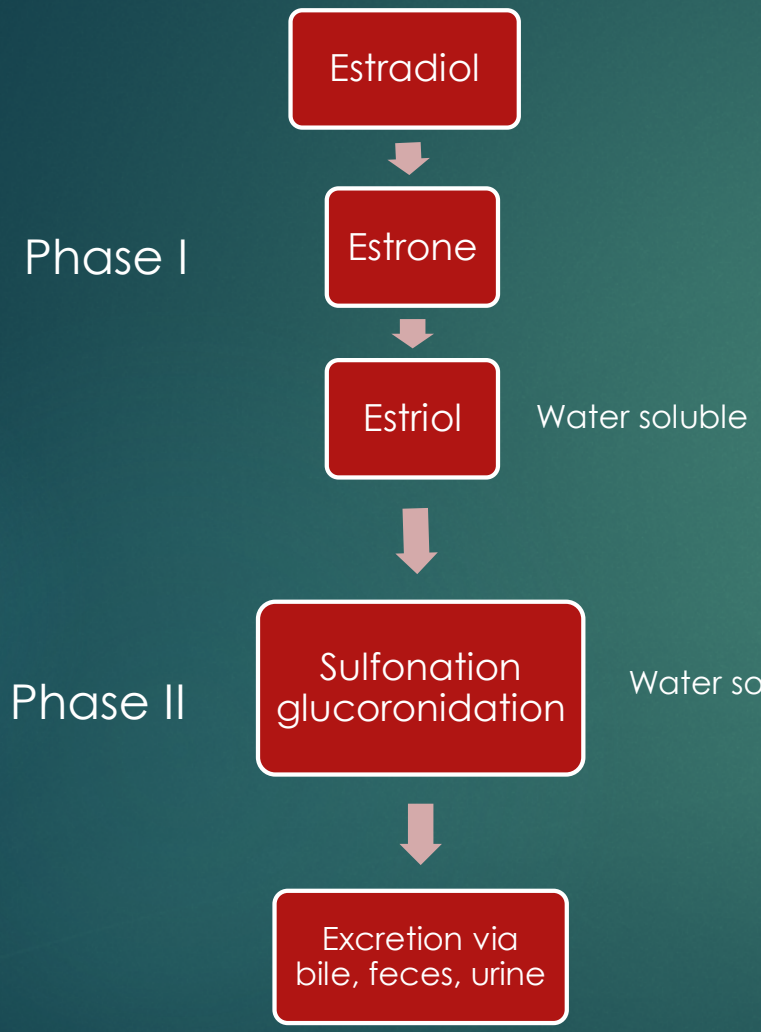
- So the question is: “Why is the dopamine deficient in the first place?
- Dopaminergic nutrients = Magnesium, B6, Zinc, Vitamin C, Iron, EFA, protein and chocolate.
- Optimization of protein nutrition ensures abundant amino acid substrates,
- Repletion and optimization with these nutrients in patients who are “*Vitex* responders” can remove the necessity of *Vitex*.
- The same protocol is useful an addictions related to the downregulation of the dopamine system
- (Taking *Vitex* for dopamine deficiency makes about as much sense as taking caffeine for fatigue)

Liver clearance of estradiol



- Estradiol, the most active form of estrogen, is transformed into Estrone by the Phase I liver detoxification system.
- These enzymes are mediated by magnesium, B6, and zinc.
- This can be further transformed, and then conjugated in in the liver via glucoronidation, sulfation, methylation, or glutathione conjugation.
- This process is dependent on multiple amino acids.

Nutrient density and Liver biotransformation of estrogen



Cofactors
magnesium, zinc,
copper, Vitamins, B2,3,6, and 12
Folic acid, flavonoids

Cofactors
EFA, molybdenum

Cofactor
fiber

"Hormonal balancing"

- Most female hormonal imbalances have excess estrogen relative to progesterone.
- Many herbs are proposed as "hormonal balancers" in women, based on supposed estrogenic or progesteronic effects.
- Herbs such as *Angelica sinensis* and *Dioscorea villosa,* purported to have such effect, in fact have no hormonal effects at all in the system. (See Hirata et al)
- On the other hand, the ***nutritional triad*** of Magnesium (the most common mineral deficiency), B6 (the most common vitamin deficiency), and Zinc (deficient in possibly 40% of the female population) support normal production of progesterone and normal clearance of estradiol.

Hirata JD, Swiersz LM, Zell B, Small R, Ettinger B. Does dong quai have estrogenic effects in postmenopausal women? A double-blind, placebo-controlled trial. Fertil Steril. 1997 Dec;68(6):981-6

Adaptogen therapy

- If considering adaptogens for their anti-fatigue, anti-stress, immune enhancing effects, first consider:
- Optimizing protein nutrition. I many cases the simple intervention of a high protein breakfast, magnesium, vitamin D, and EFA will remove the necessity for the adaptogen.
- Optimize B-vitamin nutrition
- Replete magnesium
- Replete stores of zinc
- Optimize vitamin D status to at least 40 ng/mL serum 25(OH)D3
- Optimize omega-3 status with fish oils/oily fish/grass-fed meats
- Masking these deficiencies with a stimulating adaptogen will enable the progression to a more serious chronic disease.

Paul Bergner
P.O. Box 83097
Portland, OR 97203

North American Institute of Medical Herbalism
http://naimh.com

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