DIETARY SUPPLEMENTS FOR HEALTH & WELLNESS FROM A TO ZINC

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M.A.
Dietary Supplement Background

- Are Dietary Supplements Regulated by the FDA?
- Regulated as foods, not as drugs
- 1994 – DSHEA set standards for labeling and manufacturing of supplements
- FDA determines what kind of claims you can make – but usually doesn’t look at substantiation
- FDA heavily involved in GMPs
- FTC, NAD, Class Action Lawyers regulate substantiation behind claims
What is a Dietary Supplement?

- Tablet, capsule, softgel, powder, liquid, and in some cases a bar
- Supplements are not: cream, injectable, sublingual, inhalants
- Can’t treat diseases
Calcium for Bones

• Most well known nutrient for bone health
• Recommended amounts vary by age
• FDA Health Claim: Adequate Calcium and Vitamin D as part of a healthful diet, along with physical activity, may reduce the risk of osteoporosis in later life.
• Works best in conjunction with weight-bearing exercise
<table>
<thead>
<tr>
<th>Life Stage Group</th>
<th>Calcium</th>
<th>Vitamin D</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Estimated Average Requirement (mg/day)</td>
<td>Recommended Dietary Allowance (mg/day)</td>
</tr>
<tr>
<td>Infants 0 to 6 months</td>
<td>*</td>
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<tr>
<td>Infants 6 to 12 months</td>
<td>*</td>
<td>**</td>
</tr>
<tr>
<td>1-3 years old</td>
<td>500</td>
<td>700</td>
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<tr>
<td>4-8 years</td>
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<tr>
<td>9-13 years old</td>
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<td>1,300</td>
</tr>
<tr>
<td>14-18 years old</td>
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<td>1,300</td>
</tr>
<tr>
<td>19-30 years old</td>
<td>800</td>
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<td>31-50 years old</td>
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<tr>
<td>51-70 year old males</td>
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<tr>
<td>51-70 year old females</td>
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<td>1,200</td>
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<tr>
<td>&gt;70 years old</td>
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<td>1,200</td>
</tr>
<tr>
<td>14-18 years old, pregnant/lactating</td>
<td>1,100</td>
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</table>
Calcium Clinicals

- USPTF: recently recommended against supplements of 1000mg calcium & 400 IU of Vitamin D or less, to prevent fractures
- State insufficient evidence for higher intakes
- USPTF previously recommended Vitamin D to reduce risk of falling – inconsistent recommendations.
- However, large study by Prentice found 1000/400 combo reduced hip fracture in those not taking additional supplements
Which Form is the Best?

• **Supplements available as:** Calcium Carbonate, Calcium Citrate, Calcium Amino Acid Chelate, Calcium Hydroxyapatite, Coral Calcium, Calcium Gluconate…..

• Bristow/14 – no major differences between citrate, carbonate or hydroxyapatite after 8 hours or 3 months for raising blood calcium or reducing bone turnover markers (all effective)

• Don’t rely on most of calcium intake from supplements – use in combo with food (green leafy veggies, sardines, certain nuts like almonds, in addition to dairy)
Vitamin D & Bone

- Works by increasing calcium blood levels
- Helps to increase absorption and retention
- Too much Vitamin D with insufficient calcium intake may pull calcium from bones
- Study published same year as USPTF report found 1000 IU but not 400 IU reduced bone loss in hip
- D3 vs. D2 – at high dose but not low dose show a difference in bioavailability
Coenzyme Q-10 for Heart Health

• Also known as: Co Q10, Ubiquinol, Ubiquinone
• Naturally produced in almost every cell
• Found in meat and fish – few mg
• Levels can decline with age
• Dual role in energy production and antioxidant function
Supplement Studies

- Theoretical basis for supplementation
- 300mg improved endothelium relaxation in patients with CAD (Tiano/07)
- Mixed results on blood pressure with 120 – 200mg Co Q-10 in various populations
- Overall safe, more efficacy trials needed
Co Q10 & Statins

• Most promising area for Co Q10 benefits
• Statins are most widely prescribed cholesterol medication
• Includes Lipitor, Zetia, Mevacor, Zocor, Pravachol, Crestor…..
• Can be associated with muscle pain & weakness
• Co Q-10 depletion may be a cause of side effects
Co Q10 – Statin Interaction

Diagram:
- Acetyl - CoA
- HMG - CoA
- Mevalonic Acid
- Dolichol
- Farnesyl Pyrophosphate
- Squalene
- Cholesterol

HMG-CoA Reductase Inhibitors
Clinical Trial Results

• Meta-analysis found reduction in plasma Co Q10 in 8 out of 9 trials (Langsjoen/03)
• Several, but not all studies have found reductions in muscle Co Q10 levels (Paiva/05, Vladitu/04)
• Studies between 100 – 200mg have found mixed results for reduction in muscle pain
• Study currently being performed at Hartford Hospital in CT giving 600mg
• Even in those without pain or without reduction in pain – makes sense to take for optimal Co Q10 levels
Omega-3s for Heart Health

- EPA & DHA can be found in fatty fish such as tuna, salmon, mackerel
- Can also be found in “vegetarian” algae sources as well – more expensive
- Lovaza: high dose prescription.
- ALA found in plant sources such as chia & flax, which can convert to EPA & DHA
Clinical Benefits

• American Heart Association recommends eating 2 servings of fish per week
• Supplements may have reduced mercury, PCBs and other toxins
• Can help reduce triglycerides
• Cholesterol benefits not as clear
Lutein for Eye Health

- Carotenoid found in the macula of the eye
- Average U.S. intake approximately 2mg/day
- Food Sources: Egg Yolk, Corn, Spinach, Zucchini, Squash
- Green leafy veggies typically have 8 – 15 mg per serving
- Macula responsible for central vision
Clinical Trials

- Original AREDS study: Benefit with high dose antioxidant supplementation
- AREDS2: Added on Lutein and other potentially beneficial compounds
- DBPC, 5 year study
- 10mg Lutein, 2mg Zeaxanthin
- No effect on overall group
- However – in group with lowest dietary lutein intake, they had a significant decrease in need for cataract surgery
- Bottom line: If not eating a lot of green leafy veggies, Lutein supplements can be beneficial
Lutein & Computers

• More relevant to most of the population
• Ma/09 – measured lutein supplements in 20 year olds. Average 10 hrs per day on computer
• 6mg and 12mg improved contrast sensitivity, but not glare sensitivity
• Contrast sensitivity: ability to detect differences between light and dark objects
Zeaxanthin for Vision

- Carotenoid found in veggies along with Lutein
- Studies starting to emerge on clinical benefits
- Richer/11 – measured lutein and zeaxanthin in combo or individually
- All groups improved – but combo group not better than other groups
- Bottom line: Take at separate times, may compete for absorption
Glucosamine for Joints

• By far the most popular joint ingredient
• Available primarily as Glucosamine Sulfate or Glucosamine HCl
• More research on Sulfate form
• Head to head studies show they are equal for joint pain and stiffness
Joint Structure
GAIT I & II

- Large Govt. studies designed to settle the question on whether glucosamine supplements work
- GAIT 1: Over 1000 subjects, supplemented for 6 months with 1500/1200 Glucosamine/Chondroitin
- Mixed Results: Didn’t help reduce pain in overall group, but in a sub-group that had more moderate to severe pain at start – showed significant improvement
- Bottom Line: Depends on who you ask!
GAIT II

- Extension of GAIT I study – over 500 subjects who completed 1st 6 months stayed on for additional 18 months
- Measured joint space narrowing from start to 2 years later
- Didn’t find any difference between active groups and placebo for slowing joint space loss
- Several issues with design: Technique they used to measure joint space outdated by the time study was completed
Recommendations for Joint Health

- Glucosamine and Chondroitin safe overall
- Studies on Chondroitin-only mostly show benefit
- Use in conjunction with healthy overall lifestyle: Exercise, Low fat diet rich in omega-3s and plant-based antioxidants, yoga
Phytosterols

- Collection of over 200 related plant compounds
- Naturally occur in nuts, seeds, whole grains and legumes
- A balanced diet may provide a few hundred mgs per day
- Unlike statins, phytosterols work on cholesterol absorption
FDA Health Claim

- Foods containing at least 0.5 g per serving of phytosterols eaten with meals or snacks for a daily total intake of 2 g as part of a diet low in saturated fat and cholesterol, may reduce the risk of heart disease.
- Minimum .5g per serving, and must mention 2g per day
- Some research shows reduction in cholesterol absorption at 400mg – amount achievable through diet
Phytosterol Containing Foods

• Amount to achieve 2g phytosterols:
  • 2 servings of Minute Maid: 48g sugar
  • 4 servings of Benecol Spread: 32g fat and 4g saturated fat
  • CHECK YOUR LABELS – No sugar or fat Restrictions – only sat fat and cholesterol
Probiotics for Digestive Health

- World Health Organization: live microorganisms which when administered in adequate amounts confer a health benefit on the host
- From Greek word 'biotikos', translates to 'for life'
- Over 400 species of bacteria inhabit our GI tract.
- Pop Quiz – more bacterial cells or human cells in body?
- About 100 trillion bacteria in body
Probiotic Nomenclature

- Probiotics are broken into Genus, Species and Strain - example:
  - genus - lactobacillus
  - species - acidophilus
  - strain - LA-5
Probiotics in Foods
What Do Our Naturally-Occurring Gut Bacteria Do?

• Form symbiotic relationship with our body
• Help crowd out bad bacteria that we ingest in food or that are on skin
• Play a role in digestion of food
Philips Colon Health

- Currently under investigation by FTC and Dept. of Justice
- Studies unpublished
- Gov’t saying studies didn’t show statistically significant effects and were not done in healthy individuals
Specific Strains – *L. plantarum* 299v

- Shown to help with gas and bloating
- 10-20 billion CFUs
- Found in Nature Made, Jarrow, among others
L reuteri DSM 17938

- Sold under the tradename BioGaia
- Available online
- Studies in children for reduced diarrhea
- Adult studies show some benefit in lactose intolerant individuals
- 100 million – 500 million CFUs per day
Bifidobacterium infantis 35624

- Sold under product name Align
- Some evidence for reduced bloating
- Studies between 100 million – 1 billion CFUs
Immune Health

- Vitamin C is most popular supplement for helping to reduce duration of colds and for cold prevention
- Found in citrus fruits, green leafy vegetables
- Vitamin C in foods may work in conjunction with other antioxidants such as bioflavonoids
**Cochrane Review**

- Considered highest standard for various healthcare reviews
- Analyzed clinical trials of Vitamin C for both prevention and treatment of the common cold
- Dosages of at least 200 mg
- Found routine supplementation did not prevent incidence of developing a cold
- However, it did help reduce the duration and severity of colds
- If start taking once have a cold – may be too late!
Ester-C

- Patented, non-acidic version of Vitamin C.
- In individuals sensitive to acidic foods – found Ester-C group to have less heartburn and other symptoms compared to traditional Vitamin C.
- Van Straten/02: Significantly less colds and shorter duration of severe symptoms compared to placebo (remember: analysis of all vit c studies found no reduction in cold incidence).
- Early study found no difference between Vitamin C & Ester-C in blood, but later studies found increased white blood cell levels with Ester-C.
Echinacea

- Most popular herb for immune support
- Several different varieties: Angustifolia, Purpurea, Pallidia
- Clinical trials are all over the map
Brain Health & Memory

• Can any supplement really boost your memory? *(I can’t remember!)*

• Memory is very complex:
  - Episodic memory (remembering past events “linked to a time and place”)
  - Working memory (the ability to remember “transitory” information that a person uses later)
  - Sensory memory (remembering visual stimuli or sounds)
  - Semantic memory (“general knowledge about the world,” including facts, concepts, and vocabulary)
  - Procedural memory (needed to learn new skills).

• If Supplement can enhance memory, which aspect does it work on?
DHA

• Found in all cell membranes, including brain cells
• Plays important role in cell to cell communication, and movement of nutrients in and out of cells
• Found primarily in fatty fish (Tuna, Salmon)
• Flax & Chia provide indirect source as ALA
The MIDAS Trial

- Large study of healthy, older adults with memory decline
- 485 subjects, 24 weeks, 900mg DHA per day
- From Algal Oil
- Improved test of visuospatial learning and episodic memory, as well as immediate and delayed recall
- Did not improve working memory or executive function
- Although authors conclude it “improved learning and memory” the FTC felt results not strong enough to support a claim
- Not all FTC commissioners agreed and no fine issued
Ginkgo Biloba

- Derived from Ginkgo Tree – seeds give rancid smell
- Dosages range from 60 – 320mg. Standardized for 24/6 Glycosides/Terpenes
- May interact with meds and cause bleeding
- Mechanism believed to be increased cerebral bloodflow
Phosphatidylserine

- Original products were made from Cow Brain
- New products made from soy lecithin or egg: Contain different PS structure
- Autopsies reveal brain levels may decline with age
- Open label studies show benefit – need more DBPC studies
- 300-400mg per day
Alpha GPC

- Also known as Glycerophosphorylcholine or Choline Alphoscerate
- Has most consistent evidence, but not very recent
- 1200mg helps in healthy and diseased subjects
- Costly $$$$
Overall Recommendations for Memory

• Stay socially engaged
• Continue to challenge your brain – new activities, reading
• Don’t be depressed!
• Exercise
• Can try supplements in conjunction with healthy lifestyle
Multivitamin –
To take or not to take
## Nutrient Intakes in U.S.

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>% Below EAR, nonusers</th>
<th>% Below EAR, DS users</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vitamin A</td>
<td>58</td>
<td>2</td>
</tr>
<tr>
<td>Vitamin C</td>
<td>48</td>
<td>3</td>
</tr>
<tr>
<td>Vitamin D</td>
<td>96</td>
<td>25</td>
</tr>
<tr>
<td>Vitamin E</td>
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<td>5</td>
</tr>
<tr>
<td>Folate</td>
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<tr>
<td>Calcium</td>
<td>51</td>
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<tr>
<td>Iron</td>
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<td>0.6</td>
</tr>
<tr>
<td>Zinc</td>
<td>13</td>
<td>0.3</td>
</tr>
</tbody>
</table>
Recent Evidence for Multivitamins

• Barringer/13: In Type 2 Diabetics, significantly reduced incidence of infections and sick days over 1 year
• Grodstein/13: in male physicians >65, multis had no long-term benefit for cognitive function (may have been too well-nourished)
• Christen/14 – In male physicians >50, reduced cataract incidence but not AMD
• Camfield/13 and Pipengas/13 found mixed results in reducing stress and improving mood
Multivitamin Summary

• How do you show that healthy people are healthier?

• Long-term studies often have issues with compliance and are tough to control lifestyle

• Everyone is different!