Vitamin D: A Lung Lifesaver?
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Objective
- Identify the role of vitamin D in lung diseases

Body Benefits
- Bone metabolism
- Immunity/host defenses
- Asthma
- COPD
- Tuberculosis
- Respiratory tract infections
- Cancer
- Others?

How Does it Work?

<table>
<thead>
<tr>
<th>Disease State/Condition</th>
<th>Beneficial Mechanism</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bone metabolism</td>
<td>*Development and maintenance of growth plate, chondrocyte growth, mineralized bone</td>
</tr>
<tr>
<td></td>
<td>*Osteoclastogenesis</td>
</tr>
<tr>
<td></td>
<td>*Calcium/phosphate homeostasis</td>
</tr>
<tr>
<td>Immunity</td>
<td>*Modulates monocytes, macrophages, lymphocytes, and epithelial cells</td>
</tr>
<tr>
<td></td>
<td>*Induces cathelicidin</td>
</tr>
<tr>
<td>Asthma/COPD</td>
<td>*Unknown-may prevent infections that can trigger asthma exacerbations</td>
</tr>
<tr>
<td>Infection</td>
<td>*Modulates monocytes, macrophages, lymphocytes, and epithelial cells</td>
</tr>
<tr>
<td></td>
<td>*Induces cathelicidin</td>
</tr>
<tr>
<td>Cancer</td>
<td>*Unknown</td>
</tr>
</tbody>
</table>

How Much is Needed?

<table>
<thead>
<tr>
<th>Life Stage Group</th>
<th>Estimated Average Requirement (IU/day)</th>
<th>Recommended Dietary Allowance (IU/day)</th>
<th>Upper Level Intake (IU/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infants 0-6 months</td>
<td>400</td>
<td>400</td>
<td>1,000</td>
</tr>
<tr>
<td>Infants 6-12 months</td>
<td>400</td>
<td>400</td>
<td>1,500</td>
</tr>
<tr>
<td>1-3 years old</td>
<td>400</td>
<td>600</td>
<td>3,000</td>
</tr>
<tr>
<td>4-8 years old</td>
<td>400</td>
<td>600</td>
<td>4,000</td>
</tr>
<tr>
<td>9-10 years old</td>
<td>400</td>
<td>600</td>
<td>5,000</td>
</tr>
<tr>
<td>&gt;10 years old</td>
<td>400</td>
<td>800</td>
<td>4,000</td>
</tr>
<tr>
<td>14-50 years old pregnant/lactating</td>
<td>400</td>
<td>600</td>
<td>4,000</td>
</tr>
</tbody>
</table>

Herr et al. Respiratory Research 2011, 12:31

Disclosure
- I have no actual or potential conflict of interest in relation to this program.
Deficiency Defined

- Circulating level of 25-hydroxyvitamin D (25(OH)D) < 30 ng/mL
- Considered best blood biomarker reflective of contributions from all sources of vitamin D
- Vulnerable groups include children, pregnant and lactating women

Gupta et al. Am J Respir Crit Care Med 2011;184:1342-1349

Sources of Vitamin D

- Herring
- Salmon
- Halibut
- Oyster
- Shiitake mushrooms
- Tuna
- Eggs


4/9/2013

The U.S. and Vitamin D

Asthma-Pediatrics

- Gupta, et al
  - n=86
    - Children ages 6-16 years
      - 3 groups
        - Severe therapy-resistant asthma (STRA)
        - Moderate asthma (MA)
        - Nonasthmatic
    - Outcomes
      - Serum vitamin D levels
      - Lung function
      - Asthma control
      - Medication dose

Gupta et al. Am J Respir Crit Care Med 2011;184:1542-1549

Asthma-Adults

- Mali, et al
  - n=2,542
    - Adults ages 19-64 years
      - 2 groups
        - Incident asthma cases
        - Nonasthmatic controls
    - Outcomes
      - Serum vitamin D levels
      - Allergic rhinitis

Asthma-Adults (continued)

More Asthma Data

Pediatrics
- Brehm, et al
  - Low vitamin D levels associated with increased inhaled corticosteroid requirement

Adults
- Sutherland, et al
  - High vitamin D levels associated with better lung function and improved glucocorticoid response

- Brehm, et al
  - Insufficiency common in mild-moderate persistent asthma and associated with higher odds of exacerbation

More Asthma Data

Kunisaki, et al
- N=1,142
  - Adult patients with COPD
  - Outcomes
    - Serum vitamin D levels
    - Acute exacerbations of chronic obstructive pulmonary disease (AECOPDs)

COPD

- Kunisaki, et al
  - 1849: Dr. C.J.B Williams used cod liver oil in the treatment of tuberculosis (TB)
    - 206/234 showed “marked and unequivocal” improvement after treatment with cod liver oil
  - 2006: 67 TB patients randomized to receive placebo or vitamin D during the first 6 weeks of TB treatment
    - Significant difference in sputum conversion
      - 100% vs. 76.7% (p=0.002)

Tuberculosis

- Respiratory Tract Infections
  - Benefit
    - Laaski, et al
      - Low vitamin D levels resulted in significantly more absences from duty due to respiratory infections (p=0.004)
    - Li-Ng, et al
      - No self-reported benefit of vitamin D supplementation (2000 IU daily) in decreasing incidence or severity of upper respiratory tract infections
Organization Recommendations

- IOM
  - Updated in 2010
  - Endorses the recommendations of IOM
- AAP
- US Preventative Taskforce
  - Recently recommended against daily vitamin D supplementation in postmenopausal women without vitamin D deficiency or osteoporosis for the prevention of fractures

IOM, 2010
AAP, 2010

Which Product?

- Cholecalciferol
  - Active form
    - Capsule (multiple strengths)
    - Solution (multiple strengths)
    - Tablet (multiple strengths)
- Ergocalciferol
  - Inactive form
    - Capsule (50,000 units)
    - Solution (8000 units/mL)
    - Tablet (400 units)

Drug Interactions

- Absorption
  - Bile acid sequestrants
  - Lipase inhibitors
  - Induce adverse effects
  - Thiazides
- Metabolism
  - Statins
  - Antimicrobials
  - Antiepileptics
  - Corticosteroids
  - Immunosuppressives
  - Chemotherapeutic agents
  - H2-receptor antagonists

Published cases reveal intake > 40,000 IU/day
- Toxicity threshold=200-250 ng/mL
- Signs/symptoms
  - Hypercalcuria
  - Hypercalcemia
  - Cramps
  - Nausea
  - Vomiting
- Long-term risks
  - Increased risk of certain cancers
  - Greater risk of cardiovascular events

Audience Participation

- Would you/do you recommend vitamin D for your patients?

Questions?

http://www.vitamindcouncil.org/about-vitamin-d/what-is-vitamin-d/vitamin-d-toxicity/
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