Importance of Vitamin D in Healthy Ageing

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Healthy life expectancy - the challenge!

Life expectancy is moving towards 80 years

Dysfunctional Life (9.6 yrs.)

Healthy Life (70.4 yrs.)

2010 - 2050 Number of disabled older persons in and out of institutions will approximately triple!
Healthy aging is high on the EU agenda: ambition is to add two healthy years till 2020

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... and this requires focus on healthy nutrition from conception throughout the life cycle!
Healthy aging is a life-long process

1000 days principle: “early programming of infants”

Maternal nutrition may have a long-term influence on the risk of chronic diseases in later life.

Triage theory by Bruce Ames

- Even modest micronutrient inadequacies have long-term effects on health!

Micronutrient intake

- 3rd priority: Long term healthy aging
- 2nd priority: Fitness
- 1st priority: Urgent - Severe deficiency symptoms

Hawrylowicz and Kimuli Ryanna 2011
Vitamin D comes from different sources
We evolved to make Vitamin D via sunlight (UVB) on the skin

25(OH)D serum level is the relevant indicator of Vitamin D status (IOM 1997)

- **< 25 nmol/L**: deficient
- **25 - 50 nmol/L**: insufficient
- **50 - 75 nmol/L**: inadequate
- **> 75 nmol/L**: desirable

- **< 10 ng/ml**: deficient
- **10 - 20 ng/ml**: insufficient
- **20 - 30 ng/ml**: inadequate
- **> 30 ng/ml**: desirable
The scientific interest in vitamin D increased tremendously in previous years.

During the last decades, the number of scientific publications focusing on the health benefits of vitamin D has increased exponentially.

An increasing number of registered clinical trials are expected to provide further proof for the multiple health benefits of vitamin D.

Source: clinicalTrials.gov
Role of Vitamin D for humans

Classical role of vitamin D: bone health

- Improves **bone mineral density** through calcium absorption
- Essential for bone health throughout life
- Necessary to prevent rickets

Emerging health benefits of vitamin D

- **Muscle** - Reduces risk of falling by improving muscle strength
- **Immunity** - Strengthens the immune system
  - Reduces risk of multiple sclerosis and diabetes type I
- **Cardiovascular** - Lowers blood pressure
- **Cancer** - Inhibits cell proliferation
Factors affecting vitamin D requirements in elderly

The need for vitamin D in elderly

- Decline of the skin’s ability to produce vitamin D with age
- Lack of adequate exposure to sunlight, especially home-bound or institutionalised residents
- Limited effective sun exposure due to
  - Protective clothing
  - Consistent use of high SPF sun screens
  - Air pollution, cloudy sky
- Malabsorption due to disease states (e.g. inflammatory bowel disease, celiac disease)
- Insufficient dietary vitamin D intake due to loss of appetite or decreased milk consumption
The classical benefit of Vitamin D: Bone health

Phases in skeletal life: from cradle to grave

**Start young!**

- Pregnant women with insufficient vitamin D levels do not pass on enough vitamin D to the foetus
- Maximize Peak bone mass to be used as ‘bone capital’ during adult life.
- Bone health needs to be managed from cradle to grave

**Osteoporosis**

- Osteoporosis is a disease in which the density and quality of bone are reduced
- Loss of bone occurs "silently" and progressively. Often there are no symptoms until the first fracture occurs.
- Affects around 1 in 3 women and 1 in 5 men around the world...
- Approximately 1.6 million hip fractures occur worldwide each year. By 2050 this number could reach between 4.5 and 6.3 million.
- 70% of fractures in women aged 45 and over are due to underlying osteoporosis

Source: International Osteoporosis Foundation [www.iofbonehealth.org](http://www.iofbonehealth.org)

* Rickets is also known as “soft bones” or “the English disease”
Vitamin D delivers more than the bone benefit

1. Improves Bone Mineral Density through Calcium absorption

2. Reduces the risk of falling through improving muscle strength

- Falling is a major risk factor for bone fracture
- Vitamin D prevents falls via its positive effect on muscle function and strength which reduces loss of balance
- Muscle function improvement occurs already within a few months of increasing the Vitamin D intake (>800 IU/day)

Fewer falls = fewer fractures...
if one obtains 800-2000 IU of daily Vitamin D
More than 95% of hip fractures are caused by falling.

1 in 5 hip fracture patients dies within one year of the injuries.

In 2012, the direct medical costs of falls, adjusted for inflation, were $30 billion in USA.

Prevalence of osteoporotic fracture is on the rise
Vitamin D Treatment Reduces the Risk of Falling among Older Adults
- Meta-analysis of randomized controlled trials

**Risk Reduction: 19%**
Dose Level: 700-1000 IU / d

**Risk Reduction: 14%**
Dose Level: 200-1000 IU / d

Source: Bischoff-Ferrari et al, BMJ 2009,339:B3692;
Benefits of Vitamin D for Fall Risk Reduction May Start at A Dose of 700 IU/d and A Serum Level of >60 nmol/l 25(OH)D

- Anti-fracture efficacy for non-vertebral and hip fractures increased significantly with higher vit. D dose and higher achieved 25(OH)D plasma levels
- 20% risk reduction in fractures with higher dose

DSM awarded with a disease risk reduction health claim

Vitamin D may reduce the risk of falls and bone fractures

Scientific Opinion on the substantiation of a health claim related to vitamin D and risk of falling pursuant to Article 14 of Regulation (EC) No 1924/2006

On the basis of the data presented, the Panel concludes that a cause and effect relationship has been established between the intake of vitamin D and a reduction in the risk of falling.

The Panel considers that the following wording reflects the scientific evidence: “Vitamin D may reduce the risk of falling. Falling is a risk factor for bone fractures”.

The Panel considers that, in order to obtain the claimed effect, 800 I.U. (20 µg) of vitamin D from all sources should be consumed daily. The target population is men and women 60 years of age and older.

- Article 14 Disease Risk Reduction health claim
- The claimed effect requires consumption of 800 IU (20 µg) of vitamin D daily
- The target population is men and women 60 years of age and older

IOF advocates higher Vitamin D intakes for elderly

IoF position statement: vitamin D recommendations for older adults

B. Dawson-Hughes · A. Mithal · J.-P. Bonjour · S. Boonen · P. Burckhardt · G. E.-H. Fuleihan · R. G. Josse · P. Lips · J. Morales-Torres · N. Yoshimura

Recommendations

- The estimated **average vitamin D requirement for older adults** to reach a serum 25OHD level of 75 nmol/L (30 ng/ml) is 20 to 25 µg/day (**800 to 1,000 IU/day**).
- Considerably higher doses would be needed to ensure that almost all older adults reached 75 nmol/l (30 ng/ml).

Intake may need to be adjusted upward to as much as 50 µg/day (2,000 IU/day) in individuals who are obese, and in those with osteoporosis, limited sun exposure (institutionalized, homebound), and malabsorption, and in non-European populations known to be at high risk for vitamin D deficiency such as those in the Middle East and South Asia, or immigrants from such regions living in Europe.
# Impact of Vitamin D₃ on Various Infections

Randomized trial of vitamin D supplementation to complications after hip fracture

RCT in 173 elderly patients with acute hip fracture with 800 vs 2000 IU Vitamin D₃ per day for 1 year

<table>
<thead>
<tr>
<th>Cholecalciferol Therapy</th>
<th>2000 IU/d (n=86)</th>
<th>800 IU/d (n=87)</th>
<th>Adjusted Relative Rate Difference (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of Hospital Readmissions, Reason</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall-related injury</td>
<td>7</td>
<td>18</td>
<td>-60 (-83 to -3)</td>
</tr>
<tr>
<td>Any nonvertebral fracture</td>
<td>7</td>
<td>15</td>
<td></td>
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<tr>
<td>Hip fracture</td>
<td>3</td>
<td>6</td>
<td></td>
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<tr>
<td>Soft-tissue injury</td>
<td>0</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Infection</td>
<td>1</td>
<td>10</td>
<td>-90 (-99 to -13)</td>
</tr>
<tr>
<td>Hip prosthesis infection</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Pneumonia</td>
<td>0</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Bronchitis</td>
<td>0</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Colitis</td>
<td>0</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Sepsis</td>
<td>0</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Infected indwelling catheter</td>
<td>0</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

Conclusions

- Supplementation of 800 vs 2000 IU Vitamin D₃ elevated 25(OH)D levels above 30 ng/mL in 70 vs 93% of elderly hip fracture patients
- Fall related injury leading to hospital readmissions were reduced by 60% in the group receiving 2000 IU Vitamin D₃.
- Infection leading to hospital readmissions were reduced by 90% in the group receiving 2000 IU Vitamin D₃.

Bischoff-Ferrari et al, Arch Intern Med. 2010
Upper respiratory tract infections in NHANES III
Strong inverse association with circulating 25(OH)D levels

Conclusions

- Strong inverse association between URTI and 25(OH)D levels
- After adjusting for season, BMI, smoking, asthma and COPD subjects with 25(OH)D below 75nmol/L show significantly higher risk for URTI
- The association is even stronger in subjects with asthma and COPD (OR 5.67 and 2.26, respectively)

Source: Ginde, Arch Intern Med 2009
Low vitamin D is associated with cardiovascular disease (CVD)

- Several epidemiological studies reported the inverse association between vitamin D levels (measured as 25OHD₃) and various outcomes of CVD or risk factors for CVD.

- In 16,603 men and women of the NAHNES population the association between CVD prevalence and 25-hydroxyvitamin D (25(OH)D) levels was studied by Kendrick et al.

- A linear and independent relationship of 25(OH)D deficiency with CVD prevalence.

Higher intakes of vitamin D could improve heart health.

Kendrick et al., 2009
Vitamin D lowered blood pressure in elderly women

**Study design & results**

- 148 elderly women (mean age: 74 yr) with a 25-hydroxycholecalciferol (25OHD3) level below 20 ng/mL received either 1200 mg calcium plus 800 IU vitamin D3 or 1200 mg calcium/day for 8 weeks.

- Vitamin D and calcium supplementation decreased systolic blood pressure (SBP) by 9.3% and heart rate by 5.4% compared to calcium alone.

**Conclusion**

Vitamin D has beneficial effects on risk factors for cardiovascular diseases

Pfeifer et al., 2001
Health benefits of Vitamin D3 going beyond bone health

- Immunity / Infections (1001 publications)
  - Colon cancer (459 publications)
  - Autoimmune
    - Multiple sclerosis (260 publications)
    - Diabetes type I
  - Diabetes type II
  - Muscle (1583 publications)
  - Immunity / Tuberculosis (493 publications)

- Bone (14605 publications)
  - Bischoff-Ferrari 2009 fracture

- Blood pressure & CVD (794 & 1927 publications)
  - Forman 2007
  - Anderson 2010


Bischoff-Ferrari 2009
Forman 2007
Anderson 2010
Munger 2006
Zitzis 2008
Jenab 2010
Knekt 2008
Anderson 2010
Weise 2009
Jenab 2010
Knekt 2008
Health Insurance Companies are waking up

Bupa urges everyone to take vitamin D to reduce cancer risk

16 December 2009

As the winter solstice approaches, the shortest day of the year signals the start of winter when sunlight hours fall to an average of just two a day. Bupa, the UK’s leading healthcare company, is urging people to take vitamin D to reduce their risk of cancer as day-time no longer means sun-time.

Vitamin D helps protect against certain cancers such as breast, bowel, prostate and colon. For people to obtain enough vitamin D naturally, they need either to expose their skin to lots of summer sun or eat large quantities of oily fish. Bupa’s assistant medical director, Dr Virginia Warren said: “Natural ways to get enough vitamin D aren’t realistic because our skin cannot make vitamin D from winter sunlight in the UK as it is too weak. In the summer, people are rightly concerned about risks of skin cancer. And nobody wants to eat four lins of mackerel every day to get their vitamin D from oily fish.”

Now, after analysing years of independent research, Bupa says the only alternative is to take vitamin D supplements to reduce the chance of developing cancer by 26 percent. People need to take at least 1,500-2,000 international units (IU) a day, which equates to 3-4 fish strength capsules (12.5 micrograms/capsule).

Dr Warren continues: “People have to act now to take preventive measures against cancer for their future long-term health. The old-fashioned view was to take a low daily dose of vitamin D for healthy bones. Cancer is today’s biggest killer and we need to protect our bodies from it as much as we can. Taking vitamin D supplements are an effective, inexpensive and easy way of doing that.”

- Bupa is one of the largest global private health insurers with over 60’000 employees and own hospitals
- Very clear supplementation recommendation: 1’500-2’000 IU in winter time
- Very progressive positioning against cancer
Vitamin D Deficiency & Treatment Cost

The added time spent in the surgical intensive care unit doubles the cost of hospital stay due to high cost per day.

Matthewes & al. epub 2012 AJ Surgery
DO-HEALTH: Europe starts largest healthy aging study
EU partners with Nestle, DSM and Roche Diagnostics

EU research project will provide ‘definitive’ evidence on healthy aging: Bischoff-Ferrari

By Nathan Gray, 06-Feb-2012
Related topics: Research

A new international study hopes to provide definitive evidence that vitamin D, omega-3, and exercise can reduce the burden of chronic diseases in the elderly.

The European Commission backed DO-HEALTH study (VitaminD3-Omega3-Home Exercise-Healthy Ageing and Longevity Trial) will be Europe’s largest healthy ageing study, and is expected to provide solid evidence for the efficacy and safety of three simple preventive interventions: vitamin D, omega-3 fatty acids and a simple home exercise programme, says the projects principle investigator Professor Heike Bischoff-Ferrari.

Vitamin D expert Bischoff-Ferrari, who is director of the Centre on Aging and Mobility at Zurich University, told Nutraceuticals Today that the new 12.8 million Euro research project “is an attempt to create evidence for three simple strategies to improve health at older age.”

She explained that there is a wealth of information in the scientific literature that suggests vitamin D, omega-3 fatty acids, and exercise can all help to improve health endpoints. However, the evidence for

- DO-HEALTH will study impact of Vitamin D3, Omega3 and exercise on aging
- 12.8 mio Euro
- > 2000 participants in 5 countries and 8 centers, during 3 years
- Focus on prevention!
The key ageing consumer messages

“Don’t fall behind”

“add more healthy life to your years”
Our collaboration value proposition
Helping you get to market faster with appealing nutritional solutions that work