“What’s your vitamin D level?”
This may soon be a number that’s as familiar as your cholesterol value or blood pressure. Vitamin D is being touted by some as the “miracle vitamin”. Besides its known value in building strong bones and teeth, emerging research links vitamin D deficiency to viral infections, cancers, cardiovascular disease, autoimmune disorders and other illnesses. Other research indicates that many Americans are deficient in vitamin D. Because of these findings, the number of tests performed has risen exponentially over the last five years. This rapid increase in test volume created problems. New assays were developed that lacked standardization between methods making it difficult for doctors to compare results from one lab to another. There were no uniform range levels as to low, normal or high; low in one lab was borderline normal in another. In addition, there was a lack of consensus among clinicians as to the amount of supplemental vitamin D to prescribe to patients. These and other questions will be discussed below.

Objectives:
1. State the function of vitamin D and how the body acquires it.
2. List the foods that contain or are fortified with vitamin D.
3. Discuss vitamin D supplements- dosage, contraindications, FDA approval.
4. List the problems that occur with too little or too much vitamin D.
5. Explain why lab values for vitamin D may be misleading.
6. Discuss the controversy surrounding vitamin D and its effect on certain diseases.
7. Explain the findings from the Institute of Medicine report.

What is vitamin D?
Vitamin D is a fat soluble vitamin that is naturally present in some foods, added to others and available as a dietary supplement. It is also produced when skin is exposed to sunlight. There are different forms of the vitamin but two are important to humans: Vitamin D2 (ergocalciferol) and vitamin D3 (cholecalciferol). Vitamin D2 is derived from plants. Vitamin D3 is synthesized by humans in the skin when it is exposed to ultraviolet B rays (UVB) from sunlight. Foods may be fortified with vitamin D2 or D3.

What happens to vitamin D in the body?
Vitamin D obtained from sun, food and supplements is biologically inert and must undergo two hydroxylations in the body for activation. The first occurs in the liver and converts vitamin D to 25-hydroxyvitamin D [25(OH)D], also known as calcidiol. The second occurs primarily in the kidney and forms 1,25-dihydroxyvitamin D [1,25(OH)2D], also known as calcitriol. The major function of vitamin D is to maintain normal blood levels of calcium and phosphorus. It helps the gut absorb calcium which helps to form and maintain strong bones. It is needed for bone growth and remodeling by osteoblasts and osteoclasts. Remodeling occurs because bone is always being built up by osteoblasts and broken down by osteoclasts. Without sufficient amounts of vitamin D, osteoblasts can’t do their job and bones become brittle, thin or misshapen. Vitamin D is also needed by the muscles, nerves and the immune system to fight off invading bacteria and viruses.
Where do you find it?

DIET

Very few foods naturally contain vitamin D. Fortified foods provide most of the vitamin D in American diets. Foods which contain vitamin D:

- Fatty fish such as salmon, tuna and mackerel are among the best sources
- Beef liver, cheese and egg yolks provide small amounts
- Mushrooms provide some vitamin D
- Almost all of the U.S. milk supply is fortified with 400 IU (International Units) of vitamin D per quart. But foods made from milk, like cheese and ice cream, are usually not.
- Vitamin D is added to many breakfast cereals and to some brands of orange juice, yogurt, margarine and soy beverages. Check the labels.

Vitamin D deficient diets are associated with milk allergy, lactose intolerance, ovo-vegetarianism and veganism.

The U.S. Department of Agriculture’s Nutrient Database Web site provides a comprehensive list of foods containing vitamin D:


SUN

Most people get at least some of their vitamin D exposure from sunlight. Researchers suggest that 5-30 minutes of sun exposure between 10AM and 3PM at least twice a week to the face, arms, legs or back without sunscreen usually leads to sufficient vitamin D synthesis. Glass blocks virtually all UVB so sitting indoors and being exposed to sunlight through a window will not produce vitamin D. Neither will using tanning beds which mainly emit UVA radiation. Cloudy days, shade and having dark-colored skin cut down on the amount of vitamin D the skin receives. Sunscreen with a sun protection factor of 8 or more appears to block vitamin D-producing UV rays but people rarely cover all skin or apply sufficient amount or reapply it regularly so skin likely synthesizes some vitamin D.
However, despite the importance of sunshine and vitamin D synthesis, the American Academy of Dermatology advises that photoprotective measures be taken, including the use of sunscreen, whenever one is exposed to the sun. UV radiation is a carcinogen responsible for most of the estimated 1.5 million skin cancers and 8,000 deaths due to metastatic melanoma that occur annually in the US.

People who avoid the sun or who cover their bodies with sunscreen or clothing should include good sources of vitamin D in their diets or take a supplement.

SUPPLEMENTS
Vitamin D is included in most multi vitamins, usually in strengths of 50 IU to 1,000 IUs as soft gels, capsules, tablets and liquids. The Adequate Intake (AI) levels have been established by the Institute of Medicine of the National Academy of Sciences and are found at the end of this paper. Vitamin D should be taken with a hearty meal (not a low fat one) since this vitamin is fat soluble.

A few words about safety of vitamins from the Mayo Clinic website:

Safety

The U.S. Food and Drug Administration does not strictly regulate herbs and supplements. There is no guarantee of strength, purity or safety of products, and effects may vary. You should always read product labels. If you have a medical condition, or are taking other drugs, herbs, or supplements, you should speak with a qualified healthcare provider before starting a new therapy. Consult a healthcare provider immediately if you experience side effects.

Vitamin D supplements have the potential to interact with several types of medications:  
- Prednisone and other corticosteroid medicines prescribed to reduce inflammation can reduce calcium absorption and impair vitamin D metabolism. These effects can further contribute to the loss of bone and the development of osteoporosis if used long term.
- Both the weight-loss drug orlistat (brand names Xenical® and Alli®) and the cholesterol-lowering drug cholestyramine (brand names Questran®, LoCholest®, and Prevalite®) can reduce the absorption of vitamin D and other fat-soluble vitamins (A, E and K).
- Both phenobarbital and phenytoin (brand name Dilatin®), used to prevent and control epileptic seizures, increase the breakdown of vitamin D and reduce calcium absorption.

Can you receive too much Vitamin D?
Intakes of vitamin D from food high enough to cause toxicity are very unlikely. Neither is excessive sun exposure because the sustained heat on the skin is thought to photo degrade previtamin D3 and vitamin D3 as it is formed. Toxicity is much more likely to occur from high intakes of dietary supplements. Signs of toxicity include nausea, vomiting, poor appetite, constipation, weakness, and weight loss. Excess vitamin D can also cause kidney damage.
Who is at risk for vitamin D deficiency?

In general, young people have higher levels of vitamin D than older people, males higher levels than females and by race, non-Hispanic blacks tend to have the lowest levels. Certain other groups at risk are:

- Breast fed infants, since human milk is a poor source of the nutrient. Breastfed infants should be given a supplement of 400 IU of vitamin D each day.
- Older adults, since their skin doesn’t make vitamin D when exposed to sunlight as efficiently as when they were younger.
- People with dark skin because the melanin pigment in the epidermal layer reduce the skin’s ability to produce vitamin D from sunlight.
- People with limited sun exposure such as the homebound, women who wear long robes and head coverings for religious reasons, and people with occupations that limit sun exposure.
- People with disorders such as Crohn’s disease or celiac disease whose bodies don’t process fat properly. Vitamin D needs fat to be absorbed.
- Obese people, because body fat binds to some vitamin D and prevents it from getting to the blood.

What diseases are due to vitamin D deficiency?

- RICKETS -

In children, vitamin D deficiency causes rickets in which the bone tissue does not mineralize properly. This results in soft bones and skeletal deformities. Rickets was first described in the mid-17th century. In the late 19th and 20th centuries, physicians in Germany noted that consuming 1-3 teaspoons of cod liver oil a day could reverse rickets. In the 1930s, the United States implemented a milk fortification program to combat rickets, then a major public health problem. Today, almost all of the U.S. milk supply is voluntarily fortified with 100 IU/cp. Infant formula must be fortified with 40-100 IU/100kcal vitamin D. The fortification of milk with vitamin D has made rickets a rare disease in the US but it can be found among exclusively breast fed infants and African American infants and children.

Bowing of legs in 4 yr old girl – emedicine

Treatment for rickets:

Oral doses of 5,000-15,000 IU/day of vitamin D for 4 weeks are generally safe and effective. Radiologic lesions and clinical symptoms improve rapidly with treatment, although alkaline phosphatase levels may remain elevated for several months after radiologic resolution.
OSTEOMALACIA

In adults, vitamin D deficiency leads to osteomalacia, literally meaning “soft bones”. It is an abnormality in the building process of bones, making them soft and able to break more easily. It occurs when the newly formed bone of the growth plate does not mineralize and the growth plate becomes thick, wide and irregular. It results in bone pain and muscle weakness. Treatment involves replenishing low levels of vitamin D and calcium and may involve orthopedic surgery. This is different from osteoporosis which is degeneration of previously constructed bone. This condition results in brittle bones which also break easily.

In this bone biopsy the larger osteoclasts outnumber the osteoblasts. It should be the reverse. Here, more bone is being broken down than rebuilt. The brown area is fibrous tissue. In a healthy bone, calcium deposits such as seen at the top of the slide would be covering the fibrous tissue. (Thanks to Dr. Germàn Leparc, FBS Chief Medical Officer, for the explanation of the bone biopsy slide.)

Why is there confusion over testing?

1. LABS USE DIFFERENT TESTING EQUIPMENT

To evaluate a person’s vitamin D level, a metabolite known as 25-hydroxyvitamin D or 25(OH)D is measured. There has long been controversy over the quality and accuracy of vitamin D testing. There were many assays developed and no standards to measure the
differing values between the assays. There was no standard reference range to delineate low, normal or high values. Clinicians who received results from different labs complained that monitoring their patients’ 25(OH)D was “like watching a bouncing ball.” Physicians were advised to use one lab to keep the method and range uniform.

There are basically two methods for testing 25(OH)D:

1) Immunoassays (3 types) - CIA (chemiluminescence immunoassay)
   - RIA (radioimmunoassay)
   - ELISA (enzyme linked immunosorbent assay)

2) Chromatographic assays (2 types) – HPLC (high performance liquid chromatography)
   - LC-MS/MS (liquid chromatography tandem mass spectrometry)

Standardization of the different testing methods was needed to compare results and achieve more uniform, accurate test results.

In CAP surveys, the majority of clinical labs use the DiaSorin Liaison, chemiluminescence immunoassay. It is less expensive than the mass spec and requires less expertise. It combines D2 and D3 to provide a total 25OH vitamin D.

The chart below demonstrates the prevalence of the Liaison in the DEQAS Proficiency Test survey of 2009. Note also the number of labs participating more than doubled in the period of one and a half years (283 labs to 586 labs).

![DEQAS Proficiency Testing Program for 25(OH)D](image)

American Association for Clinical Chemistry

HPLC separates and measures 25(OH)D3 and 25(OH)D2 but reports the sum of the values. LC-MS/MS can provide a total vitamin D value as well as separate result for 25(OH)D3 and 25(OH)D2. The LC-MS/MS method tends to produce higher results than the widely used DiaSorin immunoassay method. Carroll E. Streetman Jr, president of DiaSorin, says that historically mass spec results have reported out approximately 10 to 20 percent higher vitamin D values than the DiaSorin Liaison.
CAP Today reports that labs offering LC-MS/MS are working on different ways to handle the difference in result reporting between the two methods. For example, LabCorp harmonized its LC-MS/MS used for vitamin D testing to the DiaSorin Liaison, which it still uses for the majority of its testing. They did this because the majority of clinical studies of vitamin D were done using DiaSorin assays – either the RIA or the Liaison.

2. THERE IS NO STANDARDIZATION IN TESTING EQUIPMENT

In 2009, after four years of research, scientists at the National Institute of Standards and Technology (NIST) in collaboration with the National Institutes of Health’s Office of Dietary Supplements, developed a reference sample for vitamin D testing. There was now a standard to validate the various testing methods in use. It was called NIST Standard Reference Material (SRM) 972, “Vitamin D in Human Serum”. It consisted of four pools (Level 1 – Level 4) of fresh-frozen serum, each pool having a different level of $25$(OH)$D_2$, $25$(OH)$D_3$, or both. One pool also contained 3-epi-$25$(OH)$D_3$, a recently discovered metabolite which may be present in samples from infants. These standards were developed to serve as a reproducible point of comparison between different test methods. They could also be used to validate new analytical methods and to assign values to in-house quality-control materials.

Credit: NIST

3. RESULTS ARE GIVEN IN DIFFERENT UNITS

If someone learns their vitamin D level is “20”, what does that mean?

Vitamin D levels may be reported using conventional units which are nanogram per milliliter (ng/mL) or in international system units which are nanomole per liter (nmol/L). One must know the units of measure used to interpret the lab value. Someone who is 20 ng/mL is borderline sufficient whereas 20 nmol/L is very deficient.

4. LAB RANGES VARY
What are “normal ranges”? It depends on who you ask. For example:

**NIH:** Levels < 30 nmol/L (12 ng/mL) = too low for bone or overall health
Levels ≥ 50 nmol/L (≥ 20 ng/mL) = sufficient for most people
Levels above 125 nmol/L (50 ng/mL) = probably too high.
(NIH is National Institutes of Health.)

**CDC:** Levels <30 nmol/L (12 ng/mL) = at risk of vitamin D deficiency
Levels 30-49 nmol/L (12-19 ng/mL) = at risk of vitamin D inadequacy
Levels 50 – 125 nmol/L (20 – 50 ng/mL) = sufficient in vitamin D
≥ 125 nmol/L (50 ng/mL) = possibly harmful vitamin D
(CDC is Centers for Disease Control and Prevention.)

**ARUP:** Levels less than 20 ng/mL = deficiency
Levels 20-29 ng/mL = insufficiency
Levels 30-80 ng/mL = optimum
Levels >150 mg/mL = possible toxicity
(ARUP is national reference laboratory.)

For example, a level of 20 ng/mL would be sufficient for the NIH and CDC but insufficient by ARUP standards. Likewise, a level of 60 ng/mL would be optimum for the ARUP, possibly harmful by CDC standards and probably too high by NIH.

**So how much vitamin D do you need?**
What is the sufficient daily requirement? Older references said 400-600 IUs per day. But new studies indicated that higher values could fight or prevent cancer and colds, reduce the risk of developing multiple sclerosis, decrease the severity of asthma symptoms, treat type 1 and type 2 diabetes, hypertension, glucose intolerance and other medical conditions. Because of the conflicting information the public has received, the U.S. government (along with Canada) asked the Institute of Medicine (IOM) to research the current data on health outcomes associated with vitamin D and calcium. The IOM commissioned experts to review the evidence as well as update the nutrient reference value, known as Dietary Reference Intakes (DRIs). These values are used by government agencies in setting standards for school meals or specifying the nutrition label on foods.

The committee assessed more than one thousand studies and reports and listened to testimony from scientists and stakeholders before making its conclusions. It reviewed a range of health outcomes, including but not limited to cancer, cardiovascular disease and hypertension, diabetes and metabolic syndrome, falls, immune response, neuropsychological functioning, physical performance, preeclampsia, and reproductive outcomes.

**What did the IOM find?**
The IOM report was released 11/30/2010. The report states most Americans are getting enough vitamin D based on the current recommendations. Even though the average total intake of vitamin D is below the median requirement, the average levels of vitamin D are above the 20 ng/mL that the committee recommends for good bone health. This inconsistent data suggests that sun exposure currently contributes meaningful amounts of vitamin D to North Americans and indicates that a majority of the population is meeting its needs for vitamin D. But some
people, particularly those who are older and living in institutions or who have dark skin pigmentation, may be at increased risk of getting too little vitamin D.

As North Americans take more supplements and eat more food fortified with vitamin D and calcium, it becomes more likely that people will consume high amounts of these nutrients. The following chart contains the new recommended daily intake of Calcium and Vitamin D.

Dietary Reference Intakes (DRI):

<table>
<thead>
<tr>
<th>Life Stage Group</th>
<th>Estimated Average Requirement (mg/day)</th>
<th>Recommended Dietary Allowance (mg/day)</th>
<th>Upper Level Intake (mg/day)</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 to 6 months</td>
<td>*</td>
<td>1,000</td>
<td>**</td>
<td>*</td>
<td>1,000</td>
<td>**</td>
</tr>
<tr>
<td>Infants 6 to 12 months</td>
<td>*</td>
<td>1,500</td>
<td>**</td>
<td>*</td>
<td>1,500</td>
<td>**</td>
</tr>
<tr>
<td>1-3 years old</td>
<td>500</td>
<td>700</td>
<td>2,500</td>
<td>400</td>
<td>600</td>
<td>2,500</td>
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<tr>
<td>4-8 years old</td>
<td>800</td>
<td>1,000</td>
<td>2,500</td>
<td>400</td>
<td>600</td>
<td>3,000</td>
</tr>
<tr>
<td>9-13 years old</td>
<td>1,100</td>
<td>1,500</td>
<td>3,000</td>
<td>400</td>
<td>600</td>
<td>4,000</td>
</tr>
<tr>
<td>14-18 years old</td>
<td>1,300</td>
<td>1,500</td>
<td>3,000</td>
<td>400</td>
<td>600</td>
<td>4,000</td>
</tr>
<tr>
<td>19-30 years old</td>
<td>800</td>
<td>1,000</td>
<td>2,500</td>
<td>400</td>
<td>600</td>
<td>4,000</td>
</tr>
<tr>
<td>31-50 years old</td>
<td>800</td>
<td>1,000</td>
<td>2,500</td>
<td>400</td>
<td>600</td>
<td>4,000</td>
</tr>
<tr>
<td>51-70 year old males</td>
<td>800</td>
<td>1,000</td>
<td>2,000</td>
<td>400</td>
<td>600</td>
<td>4,000</td>
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<tr>
<td>51-70 year old females</td>
<td>1,000</td>
<td>1,200</td>
<td>2,000</td>
<td>400</td>
<td>600</td>
<td>4,000</td>
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<tr>
<td>&gt;70 years old</td>
<td>1,000</td>
<td>1,200</td>
<td>2,000</td>
<td>400</td>
<td>800</td>
<td>4,000</td>
</tr>
<tr>
<td>14-18 years old, pregnant/lactating</td>
<td>1,300</td>
<td>1,300</td>
<td>3,000</td>
<td>400</td>
<td>600</td>
<td>4,000</td>
</tr>
<tr>
<td>19-50 years old, pregnant/lactating</td>
<td>800</td>
<td>1,000</td>
<td>2,500</td>
<td>400</td>
<td>600</td>
<td>4,000</td>
</tr>
</tbody>
</table>

In regards to the belief that high doses of vitamin D may help other health conditions, the committee found these studies provided mixed and inconclusive results and could not be considered reliable. They found higher levels of vitamin D did not give health benefits, in fact, caused more health problems. They stated that more research should continue on the nutrients’ possible role in other health outcomes, such as cancer and cardiovascular disease. They did find a strong body of evidence to substantiate the importance of vitamin D and calcium in promoting bone growth and maintenance.

Regarding calcium, what one eats and drinks from childhood on is critical. Dairy foods, especially milk, yogurt and cheese, are the primary sources of calcium in the American diet. Consumption of milk has been falling steadily for decades, especially in adolescence, when most bone development occurs. A British study found that frequent milk consumption before the age of 25 was an important determinant of bone strength.
among middle-aged and elderly women. Postmenopausal women who typically consume only one or two servings a day of dairy have a hard time meeting the 1200 mg needed per day as recommended by the IOM. Dr. Ethel Siris, director of osteoporosis clinic at Columbia University Medical Center in New York, said these women could benefit from a supplement of calcium carbonate (600 mg/day) or calcium citrate (500 mg/day). Be sure to read the product label which states the usual “serving” is two tablets. Calcium carbonate should be taken with meals to assure absorption, but calcium citrate can be taken at any time and may cause fewer digestive problems. Most calcium supplements now also contain vitamin D supplying about 250 to 300 IU in two tablets.

The IOM suggested that risk levels for vitamin D are levels below 30 nmol/L (12 ng/mL). They stated that some people are potentially at risk with levels between 30 and 50 nmol/L (12 and 20 ng/mL). Practically everyone is sufficient at serum levels of at least 50 nmol/L (20 ng/mL). Serum levels above 75 nmol/L (30 mg/mL) are not consistently associated with increased benefit. Levels above 125 nmol/L (50 ng/mL) are a cause for concern.

Potential toxicities of vitamin D and calcium were also assessed and the Upper Limits (UL) for daily supplementation was revised. The new ULs are based on increased fortification of foods with nutrients and the use of larger doses of dietary supplements. In general, the risk of adverse effects for vitamin D begins when intake surpasses 4,000 IUs per day. Very high levels of vitamin D (above 10,000 IUs per day) are known to cause kidney and tissue damage. The risk of harm for calcium begins when intake surpasses 2,000 milligrams per day. Side effects of calcium most immediately include hypercalcemia and hypercalciuria (resulting in kidney stones).

The Committee concluded that the prevalence of vitamin D inadequacy in North America is overestimated. They attributed this largely to the popularity of blood tests and to laboratories’ inconsistent methods of determining when the levels are too low. Urgent research and clinical priorities were identified, including reassessment of laboratory ranges for 25-hydroxy vitamin D to avoid the problem of both undertreatment and overtreatment.

Is this the final word?
Not hardly. The IOM stated more research should be done to see the effect of vitamin D and disease. Since the report was released, the following studies have occurred:

In 2011 researchers at the University of California, San Diego School of Medicine and Creighton University School of Medicine in Omaha reported that markedly higher intake of vitamin D is needed to prevent or markedly reduce the incidence of breast cancer and several other major diseases. They studied several thousand volunteers who were taking vitamin D supplements in the dosage range from 1,000 to 10,000 IU/day. They found that daily intakes of vitamin D by adults in the range of 4000-8000 IU are needed to maintain blood levels of vitamin D metabolites in the range needed to reduce about half the risk of several diseases – breast cancer, colon cancer, multiple sclerosis, and type-1 diabetes. They believe that 40 to 60 ng/ml is the appropriate level of 25-vitamin D in the blood for preventing the major vitamin D-deficiency related diseases. They add
that according to a recent National Health and Nutrition Examination Survey, only 10% of the US population has levels in this range, mainly those people who work outdoors.

At the 2011 Annual Meeting of the Pediatric Academic Societies findings were presented that demonstrated that vitamin D deficiency may play an important role in anemia in children. Researchers analyzed data from the blood samples of more than 9,400 children aged 2 to 18 years. They found that the lower the vitamin D level, the lower was the hemoglobin and the higher the risk for anemia. The study revealed that only 1% of white children had anemia compared to 9% of black children. Black children averaged much lower vitamin D levels (18 ng/ml) than white children (27 ng/ml). The findings show a clear link between low vitamin D levels and anemia but they do not prove that vitamin D deficiency causes anemia. Further study is needed.

Researchers in the Netherlands published a report in May 2011 where they assessed vitamin D levels of 156 babies at birth by measuring concentrations in their cord blood. After one year, 18 babies had developed a lower respiratory tract infection caused by a respiratory syncytial virus (RSV). These babies, researchers found, were more likely to have had lower levels of vitamin D. Months earlier another study showed that newborns with low amounts of vitamin D were more likely to wheeze and develop respiratory infections than those with higher levels. The researchers concluded that especially during pregnancy, doses up to 4000 IU per day may be needed to maintain optimal maternal and neonatal health.

In May 2011 Dr. Kristin Skinner from the University of Rochester Medical Center in New York presented the results of a study to examine the role of vitamin D in breast cancer progression. They studied 194 newly diagnosed patients from stage 0 to III breast cancer who had total 25(OH) vitamin D levels checked 3 months prior to or after their surgery. They found those with vitamin D deficiency were associated with breast cancer subtypes with the highest mortality. Suboptimal levels of vitamin D were also associated with an increased risk for recurrence. Optimal vitamin D levels were defined to be at least 32 ng/mL and suboptimal levels were below 32 ng/mL. Dr. Skinner noted that breast cancer patients had a significantly lower mean 25(OH) vitamin D level than age-matched healthy control subjects and that the odds of acquiring breast cancer were 2.5-fold greater with deficient vitamin D levels. It is not known if patients develop more aggressive cancers because they were vitamin D deficient or whether vitamin D deficiency does something in the development of the cancer that changes the tumor from a less aggressive into a more aggressive cancer. More research is needed.

In 2011, doctors in the Waikato Hospital in Hamilton, New Zealand performed a study on the effects of vitamin D levels and patients hospitalized with pneumonia. They hypothesized that because of the known antimicrobial effects of vitamin D, low levels of this vitamin could be related to disease severity and outcome in hospitalized patients with community-acquired pneumonia. They did find that patients with severe 25(OH)D deficiency suffered an increased 30-day mortality compared to patients with sufficient vitamin D levels. Severe deficiency was defined as a level below 30 nmol/L and was found in 15% of patients in the study cohort. The researchers speculate that since sunlight is the main source of vitamin D for most people, deprivation of sunlight during the winter months might plausibly contribute to the increased prevalence of pneumonia during this time.
The *Los Angeles Times* reports in December 2010 that Harvard University researchers are enrolling 20,000 subjects for a study to compare rates of cancer, heart disease, diabetes, cognitive decline, depression and respiratory diseases in people randomly chosen to receive a daily dose of 2,000 IUs of vitamin D versus other subjects who get a placebo. Ongoing trials in Israel and India will assess how a year's worth of monthly supplementation with 10,000 IUs of vitamin D affects the development of insulin resistance, metabolic syndrome and diabetes in obese women, and with what side effects. A University of Colorado study will compare rates of respiratory infections among elderly nursing home patients taking as much as 4,000 IUs of vitamin D a day compared to those taking a smaller dose of 400 to 1,000 IUs daily.

There continues to be much interest in vitamin D and its effect on health and disease. Will it become the “wonder vitamin”?

People who live in sunshine states may mistakenly believe they don’t need to worry about their levels. One study looked at 93 adults in Hawaii who reported several hours of sun exposure each week for at least 3 months. It was found that half of them had low vitamin D levels.

Do you know your number?
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