 "For hundreds of thousands of years, man has lived with the sun: Our ancestors were outdoors far more often than indoors. We developed a dependence on sunshine for health and life, so the idea that sunlight is dangerous does not make sense. How could we have evolved and survived as a species, if we were that vulnerable to something humans have been constantly exposed to for their entire existence?"

~ Dr. Frank Lipman, internationally recognized expert in the fields of Integrative and Functional Medicine and practicing physician.

Sunlight

The human body was designed to receive vitamin D by producing it in response to sunlight exposure – specifically, the UVB band of the Sun's ultraviolet spectrum. Since this is the way Nature intended, it should be considered the method of choice.

Studies show large quantities of vitamin D3, also known as cholecalciferol, are synthesized in the skin in response to full-body summer sun exposure - about 10,000 international units (IU).[1]

Because this happens within minutes, overexposure is not necessary. In fact, one will have made all the vitamin D they are going to make for the day in about one-half the time it takes for their skin to turn pink.

Factors affecting vitamin D production from sunlight

There are many factors that influence how much vitamin D is produced in response to UVB exposure [2], the most well-known factor being the angle of the Sun's rays.

Angle of the Sun's rays

 If your shadow is longer than you are tall, you are not

making much vitamin D.

Time of day, season, and latitude all determine the amount of UVB that reaches your skin. When the Sun's rays enter the Earth's atmosphere at too much of an angle, the atmosphere diffuses (blocks) the UVB portion of the rays. This occurs during the early and latter parts of the day, during the winter season (what is called “Vitamin D Winter”), and increases as one moves further away from the equator. A good rule of thumb is: If your shadow is longer than you are tall (an indicator of the oblique angle of the Sun), you are not making much vitamin D.

Time of day

For vitamin D production, sun exposure should be midday between the hours of approximately 10am-2pm. These hours will vary slightly according to latitude. The closer to solar noon, the more vitamin D produced. [3]

Season: Vitamin D Winter and latitude

What latitude you reside at will affect the length of your Vitamin D Winter. Vitamin D Winter is when no vitamin D production is possible due to the atmosphere blocking all UVB. This lasts for several months, with the duration of time increasing as you move further from the equator. [4]

Estimated Vitamin D Winter months according to latitude:

- Latitudes from zero degrees to around 35 degrees north or south allow year-round vitamin D production, though the amount produced will decrease as latitude increases. [3] [5]
- Latitudes above 40 degrees north will experience Vitamin D Winter from around November through early March.
- Latitudes below 40 degrees south, around June through August.
- Latitudes above 50 degrees north, October through early April. [3]
- Latitudes below 50 degrees south, mid-April through July. [4]

Skin Type

An individual’s skin phototype also influences the the amount of vitamin D produced relative to length of sun exposure time. Skin phototype is determined by melanin content (how light or dark one's skin is).

Skin Phototypes:

Skin Type	Skin Color	Characteristics
I	White; very fair; red or blond hair; blue eyes;	Always burns, never tans

Skin Type	Skin Color	Characteristics
	freckles	
II	White; fair; red or blond hair; blue, hazel, or green eyes	Usually burns, tans with difficulty
III	Cream white; fair with any eye or hair color; very common	Sometimes mild burn, gradually tans
IV	Brown; typical Mediterranean caucasian skin	Rarely burns, tans with ease
V	Dark Brown; mid-eastern skin types	Very rarely burns, tans very easily
VI	Black	Never burns, tans very easily


For vitamin D production, dark-skinned individuals will need up to six times longer in the sun than those with light skin.

Vitamin D synthesis occurs faster in individuals with skin types I through III than in those with skin types V and VI. Skin type I will need around 15 minutes of sun exposure whereas those with dark skin will need longer exposure times - up to 6 times longer.

This is because darker skin has increased melanin content. Melanin is Nature's built-in protection against skin damage from excess ultraviolet exposure and so it allows less UV to enter the skin. This is why those whose ancestry is native to regions near the equator have darker skin than those native to regions located at higher latitudes. It is also why those with darker skin living at higher latitudes have higher prevalence of vitamin D deficiency. [6]

Skin type, latitude, and season

Combining the factors of skin type, latitude, and season one can see how difficult it can be to determine the necessary length of sun exposure time for a particular individual to produce optimal amounts of vitamin D. [7]

For example:

At noon in Miami, an individual with skin type III would require approximately 6 minutes to synthesize 1000 IU of vitamin D in summer and 15 minutes in winter. Skin type V would need around 15 and 29 minutes, respectively.

At noon in Boston during summer, skin type III would require approximately 1 hour and skin type V, 2 hours to synthesize 1000 IU of D. During the winter months in Boston vitamin D production is not possible.

Other factors

An SPF as low as 8 can block almost 100% of vitamin D production. SPF 30, as pictured here, will block 100%.

There are other factors which affect the amount of vitamin D produced in response to UVB. They are:

- Amount of skin exposed – at least 40% of the entire skin surface should be exposed for optimal vitamin D production. The torso produces the most, legs and arms some, hands and face very little or none at all. [8]
- Age – vitamin D synthesis can take up to 4 times as long for those over the age of 60 and under the age of 20, apparently due to having less 7-dehydrocholesterol in the skin.
- Sunscreen – an SPF as low as 8 can block as much as 95% of vitamin D production.
- Altitude – more UVB is filtered out of the atmosphere at the beach as opposed to a mountain top.
- Cloud cover – water droplets in the air scatter some UVB back into space.
- Air pollution -- particles in the air (such as ozone, haze, and sulfur dioxide) can either absorb UVB or reflect it back into space.
- Being behind glass – glass blocks all UVB.

Indoor tanning


Studies show a positive association between tanning bed use and higher blood levels of vitamin D.

Indoor tanning beds provide a viable alternative to natural sunlight, provided they are used sensibly. Studies show a positive association between tanning bed use and higher serum levels of vitamin D. [9] One case study successfully used a tanning bed as the method of treatment for vitamin D deficiency due to Crohn's disease. [10]

As with natural sunlight, vitamin D production from a tanning bed happens within minutes. Actual tanning of the skin and overexposure are not necessary.

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