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VITAMIN D

WHITEPAPER



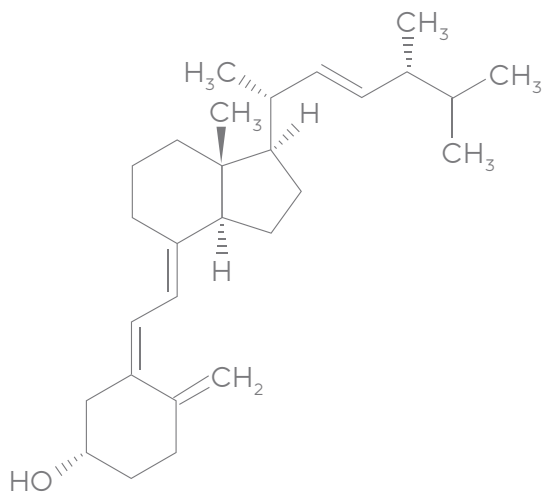
## WHAT IS VITAMIN D?

Vitamin D is part of a group known as the fat soluble vitamins along with vitamins A, E and K. The body absorbs them in a similar manner to the fats in our diet and are stored in our liver, fatty tissue and muscles. This means that the body is able to store a reserve, which it can call upon when needed. Unfortunately this means that you can build up or deplete your levels over time.

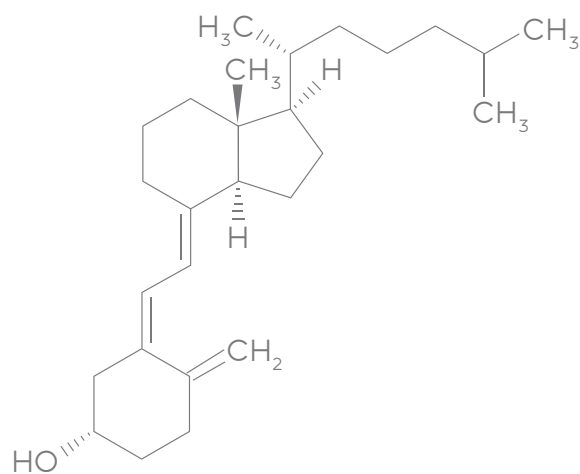
Vitamin D's role in maintaining a healthy immune system<sup>(1008)</sup> is well documented. As is its role in keep your bones, teeth and muscles healthy. <sup>(1002/1006)</sup>.

Research also indicates optimum Vitamin D levels can help reduce inflammation<sup>(1008/9)</sup>, improve heart health<sup>(1011/1012)</sup>, support mental health<sup>(1010/1012)</sup>, improve gut microbial diversity<sup>(1015)</sup>, help prevent diabetes<sup>(1009)</sup> and aid weight loss<sup>(1014)</sup>.

Vitamin D exists in two main forms; Vitamin D<sub>2</sub> and D<sub>3</sub><sup>(1001)</sup>.



VITAMIN D<sub>2</sub>



VITAMIN D<sub>3</sub>



## WHERE TO GET VITAMIN D?

There are three sources of Vitamin D:

### 1. Sunshine

Vitamin D<sub>3</sub> can be produced naturally with exposure to sunlight hence its nickname ‘The Sunshine Vitamin’. From **late March to late September**, you may be able to get your required vitamin D from sunlight. From **October to early March**, the sunlight is not strong enough in the UK for our skin to be able to produce vitamin D. Modern pressures and other factors i.e. working inside and UK climate mean that it is difficult to get sufficient vitamin D through sunlight alone, in fact it’s impossible for several months of the year. There are also other risks associated with regular exposure to sunlight without sunscreen i.e. skin damage.

### 2. Diet

Unfortunately, few foods naturally contain Vitamin D, and most of which contain only very low amounts, Furthermore, certain foods sources contain only the inferior D<sub>2</sub> form, which then has to be converted by the body into the active D<sub>3</sub> form. Vitamin D is found in the following food sources:

SOURCE	EXAMPLES	AMOUNT	AMOUNT IU
Oily fish	trout, salmon, tuna, sardines, mackerel	Moderate	~200-600 IU
Fortified sources	Milk (cows, almond, oat), cereals, tofu	Low	~100 IU
Egg Yolks		Low	~40 IU

### 3. Supplements

It is a challenge to get adequate levels of vitamin D from diet and sunshine alone, in fact the UK government recommends that EVERYONE should take Vitamin D supplements during Autumn and winter months and many should supplement all year round depending on your risk. It is no surprise that Vitamin D deficiencies and low levels are very common.

A nutritional supplement is an ideal way to achieve and maintain healthy levels. Vitamin D<sub>3</sub> is the form best used by the body, so we always recommend that type. Vegan Vitamin D<sub>3</sub> supplements are available and are usually produced from a lichen source. It’s also best to take vitamin K<sub>2</sub> with Vitamin D<sub>3</sub> as they have synergistic properties and the K<sub>2</sub> ensure that calcium levels remain safe.



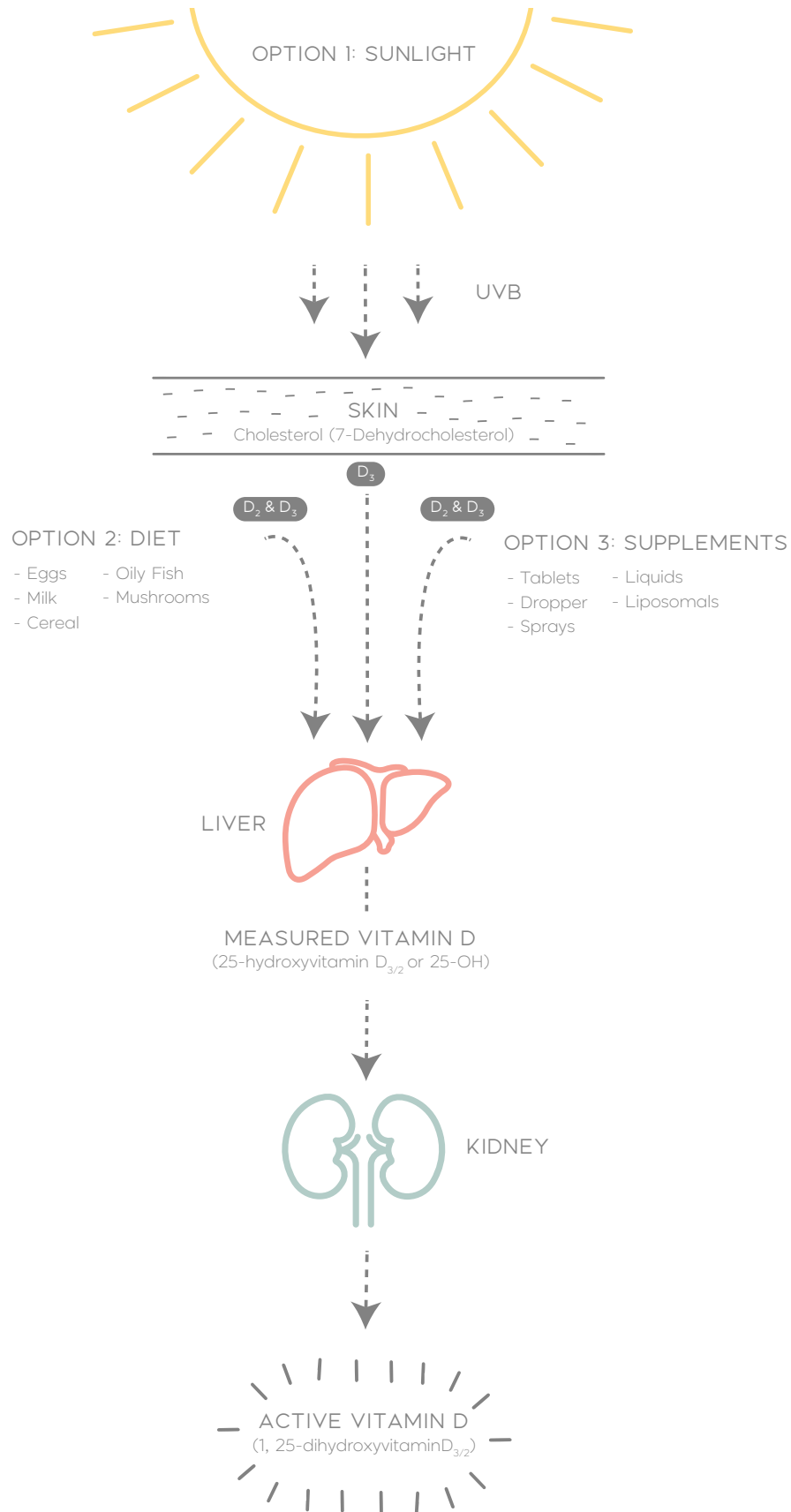


Figure 1. Diagram showing metabolism of Vitamin D.

## RECOMMENDED MAINTENANCE DOSAGES:

AGE (years)	OUR RECOMMENDATIONS	NUTRIENT REFERENCE VALUE (NRV)	UPPER LIMIT (UL)
<1	400iu (10µg) 100% NRV	340-400iu (8.5-10µg)	1000iu (25µg)
1-10			2,000iu (50µg)
11-17			400iu (10µg)
18-50			
>50			
Pregnant / Breast-feeding			
	1,000iu (25µg) 250% NRV		

Short term higher level doses may be required to address low levels. Age, BMI, sex, smoking, alcohol intake, dietary requirements, medical conditions and medications can affect nutrient levels and how much is required to maintain optimum levels. Please contact your nutritionist for further advice.

## DEFICIENCY

A Vitamin D deficiency can lead to soft, thin and brittle bones. Which can lead to diseases such as rickets for children, osteomalacia and osteoporosis in adults. Long term deficiency can also lead to autoimmune problems, infections, cardiovascular conditions, neurological diseases, certain cancers and pregnancy complications. Vitamin D deficiency has also been linked to the development of Multiple Sclerosis (MS)<sup>(1012)</sup>.

Symptoms of Vitamin D deficiency include:<sup>(1018)</sup>

- o Bone & joint pain
- o Muscle pain/cramps
- o Fatigue
- o Mood changes/depression
- o Recurring sickness
- o Hair loss

## TOXICITY

High levels of Vitamin D for extended periods can also be harmful and can cause too much calcium to build up in the body, known as hypercalcemia/calcium toxicity.<sup>(1002)</sup> This can weaken bones and damage the heart and kidneys. It would be difficult to get to toxic levels through sunlight and diet, so the main risk of Vitamin D toxicity is through prolonged use of high supplementation dosage over 4000IU.

Symptoms of Vitamin D toxicity/hypercalcemia include:<sup>(1019/1020)</sup>

- o Nausea
- o Vomiting
- o Poor Appetite
- o Stomach Pain
- o Constipation or diarrhoea
- o Kidney Stones

Taking Vitamin K<sub>2</sub> in conjunction with Vitamin D allows the calcium absorbed into the body to be deposited into the bones. This helps prevent hypercalcemia/calcium toxicity<sup>(1017)</sup>.



## WHO IS AT RISK OF VITAMIN D LOW LEVELS?

You may be at higher risk of Vitamin D deficiency or low level if the following apply to you:-

- o Vegan or Vegetarian - Most natural sources of Vitamin D are found in animal products and therefore if these are not in your diet, your dietary vitamin D source is the inferior vitamin D<sub>2</sub>. It is more likely that you will need to get your Vitamin D from sunlight or supplementation.
- o Body mass Index - People with a BMI over 30 are more likely to suffer from a Vitamin D deficiency. This is due to vitamin D being distributed into the fat tissue where it is retained. Therefore there is less active vitamin D in the bloodstream and more is required to maintain ideal levels.<sup>(1021/1022)</sup>
- o Age - Age has an effect on multiple factors involving vitamin D. Less vitamin D<sub>3</sub> is produced by sunlight in aged individuals, this means that a major source of vitamin D is limited. Besides the vitamin D metabolic processes is slower and calcium absorption is also decreased. Any age related vitamin D metabolism issues are substantially worse if sunlight and/or dietary vitamin D is insufficient.<sup>(1024)</sup>
- o Skin tone - The darker a person's skin the longer periods of sun to produce the vitamin D required to maintain healthy levels.<sup>(1030)</sup>
- o Exercise - As well as many other health benefits, including a significant portion of exercise activity being outside. There is an association with exercise and higher vitamin D levels.<sup>(1025)</sup> However on the other end of the spectrum people who exercise to significant levels (e.g. athletes) have lower levels of vitamin D.<sup>(1026)</sup>
- o Alcohol consumption - Alcohol consumption is directly linked with low Vitamin D levels. As the consumption of alcohol interferes with the absorption of multiple nutrients including Vitamin D. However, drinking in moderation as part of a healthy diet and lifestyle isn't considered to have a significant effect on long term vitamin D levels. Excessive alcohol consumption can lead to liver diseases that will also contribute to low vitamin D levels.<sup>(1027)</sup>
- o Smoking - Cigarette smoke decreases the production of 25-hydroxyvitamin D into 1,25-dihydroxyvitamin D in the lungs. This means that a higher amount of 25-hydroxyvitamin D is required in the blood is required to overcome this affect. Smoking may also contribute to lower levels of 25-hydroxyvitamin D in the blood.<sup>(1028)</sup> There is also evidence that having adequate amounts of vitamin D helps protect against the effects of cigarette smoke.<sup>(1029)</sup>
- o Medical conditions - The following diseases are known to have an effect on vitamin D levels:-<sup>(1031/2/3)</sup>
  - > Irritable bowel syndrome (IBS)
  - > Crohn's Disease
  - > Ulcerative Colitis
  - > Cystic Fibrosis
  - > Celiac Disease
  - > Kidney Diseases
  - > Liver Diseases
  - > Bone disorders
  - > Heart disease
  - > Stroke
  - > Arrhythmia
  - > High blood pressure
  - > Rheumatoid arthritis
  - > Multiple sclerosis
  - > Psoriasis
  - > Lupus
  - > Hashimotos
  - > Graves
  - > Diabetes
  - > Eczema
  - > Asthma
  - > Hay fever

o Medication - The following types of medication are known to have an effect on vitamin D levels.<sup>(1034)</sup>

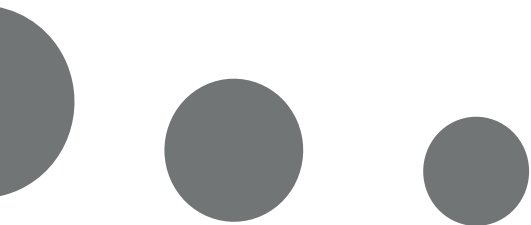
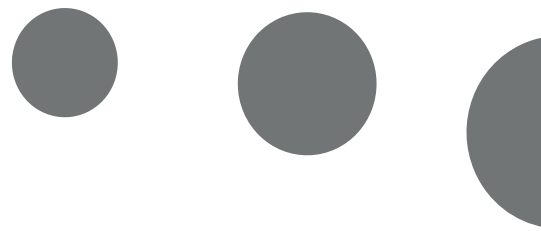
- > Laxatives
- > Steroids (prednisone, hydrocortisone, dexamethasone)
- > Cholesterol-lowering drugs (cholestyramine, colestipol)
- > Seizure-control drugs (phenobarbital, phenytoin, primidone, carbamazepine, oxcarbazepine)
- > Tuberculosis drugs (rifampin, isoniazid)
- > Weight loss drugs (orlistat)
- > Antimalarial drugs (hydroxychloroquine)

## SUMMARY

It is no surprise that many people in the UK have lower than optimal levels of Vitamin D. Certain studies have shown that 75% of people in the UK have lower levels of Vitamin D than advised for optimal health benefits. Unfortunately, very few foods naturally contain Vitamin D and the sunlight is not intense enough for many months of the year.

A blood test is a quick and easy way to see where you current levels are so that you can make the necessary diet, lifestyle and supplement adjustments to optimise your health.





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