

Vegan Vitamin D3: Making the Right Choice for Health & Sustainability

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The prevalence of vitamin D deficiency and insufficiency (i.e., inadequate levels) is significant. The journal *Nutrients*¹ indicated that 29% of the US population is vitamin D deficient and an additional 41% are vitamin D insufficient. Considering vitamin D's critical for building bone and for so many other aspects of human health, this is hugely problematic. It also helps explain why, arguably, more human research on vitamin D has been conducted in recent years than any other nutrient. According to a PubMed search in 2023, there were 3,309 human clinical studies published in scientific journals in the past 10 years on vitamin D—and a grand total of 6,687 human clinical studies since 1965 (when only 3 clinical studies on vitamin D were conducted).

VITAMIN D BENEFITS

Many of those studies demonstrated vitamin D's well-known role in facilitating calcium absorption and promoting bone health.² Beyond that, vitamin D has also been shown to have value as a dietary supplement for the support of blood sugar, insulin, heart health, cholesterol, intestinal health, liver health, thyroid health, menstrual health, fertility (women and men), ovarian health, urinary health, immune health, muscle comfort, age-related muscle health, joint health, moodiness, anxiety (stress related), upper respiratory health, lung health, acne (non-cystic), skin comfort, and testosterone.

VITAMIN D USAGE

Consistent with the impressive number of human studies conducted on vitamin D, this vitamin's market size is likewise impressive. In 2022 the global vitamin D market was \$1.3 billion. In 2023 it is estimated to reach \$1.4 billion—and the market is projected to reach \$1.9 billion in 2027. That's a CAGR of 7.1%.³

It should be noted that most of the vitamin D being sold is vitamin D3. This is important since there are two primary forms of vitamin D available for use in dietary supplements: cholecalciferol (vitamin D3) and ergocalciferol (vitamin D2). Cholecalciferol is the form made in the human body, and it is more active than ergocalciferol. In fact, vitamin D2 potency is less than one third that of vitamin D3⁴—so D3 is generally considered the preferred form of vitamin D.

The problem is that, heretofore, commercial cholecalciferol was exclusively derived from lanolin (from sheep) or fish liver oil, and so was not considered vegan, nor was it necessarily a sustainable or non-GMO source. Furthermore, lanolin from sheep's wool undergoes esterification, dehydrogenation, and saponification to become 7-dehydrocholesterol. It then undergoes photoreaction, crystallization, and concentration to become cholecalciferol. This is a synthetic process. To be clear, vitamin D3 (cholecalciferol) derived from lanolin is synthetic. Now, however, there are vegan and natural sources of D3, including reindeer lichen derived VegaDelight® from Nutraland USA which is a sustainable, non-GMO source.

REINDEER LICHEN (CLADONIA RANGIFERINA)

Researchers have identified reindeer lichen as being able to provide a predictable vitamin D source for humans⁵. This makes sense considering that pro-vitamins D (7-DHC and ergosterol) is converted into vitamin D3 and D2 via pre-vitamin D at low temperatures (<16°C) in the reindeer lichen⁶. So, let's take this opportunity for a closer look at reindeer lichen.



Figure 1: Reindeer lichen

Lichen introduction

Lichens are used in traditional medicine, food, dyes, in the production of alcohol and perfume, and various other ethnic uses by cultures across the Himalayas and southwestern parts of China.⁷ Evidence-based knowledge from historical and modern literature and investigation of ethnic uses from 1990 indicated that 142 lichen species have been used as medicine in the Himalayas and southwestern parts of China, with 42 species having been utilized as food. Furthermore, some lichens are currently used in ethnic and modern life.⁸ *Cladonia rangiferina*, commonly known as reindeer lichen (due to the fact that it is a food source for reindeer), is a primary lichen used historically and in modern times.

Reindeer lichen use as food

From the perspective of use as a food, small amounts of reindeer lichen have been nibbled or crumbled into soup. Norwegians sometimes eat Reindeer lichen and believe the taste to be crisp and agreeable though bitter. Likewise, the Labrador Inuit will eat reindeer moss in times of starvation because it contains "enough nourishment to sustain life". It is eaten by the Inuit, Igloodik, Copper, Caribou, Netslik, Baffin Island, Nuamiut, and Polar Chipewyan peoples. During World War II, a method of using reindeer lichen for making glucose was developed because beet sugar was scarce, and potatoes and grains were scarce. The glucose yield was 75% of the dry weight of the lichen. For a time, a whisky was made in Denmark and a brandy was made in Sweden from reindeer lichen.⁹

Reindeer lichen use as medicine

Reindeer lichen has historically been used to treat colds, arthritis, fever, jaundice, constipation, convulsions, cough, and tuberculosis.¹⁰ Research has shown that reindeer lichen contains a variety of other constituents, including atranorin and fumarprotocetraric acid—demonstrated to have significant free radical scavenging activity, including neutralization of the superoxide free radical. Likewise, reindeer lichen also had antimicrobial activity, and strong anticancer activity in human melanoma and human colon carcinoma cell lines.¹¹

Inuit of Baffin Island boil reindeer lichen to make a broth which is then used for sickness and eye infections. The Ojibwa of Northeastern North America historically made decoction of Reindeer lichen in which to bathe newborns to give them strength. For a laxative, reindeer lichen was boiled in water. For respiratory infections, it was boiled in milk.¹²

Reindeer lichen as a source of nutrients

In addition, Reindeer lichen naturally contains a number of different nutrients. This includes zinc, potassium, phosphorus, sulfur, boron, copper and magnesium.¹³ Other naturally-containing nutrients include protein, fiber, fat, niacin, calcium and carbohydrates.¹⁴ More significantly—for the purpose of this white paper—Reindeer lichen is also a source of vitamin D^{15 16}. In fact, reindeer lichen serves as important winter feeds for reindeer and caribou, and it is thought to provide a vital source of vitamin D for the animals, especially during winter.¹⁷

Sustainability of reindeer lichen

As previously noted, reindeer lichen serves as a source of food for reindeer and caribou. Nevertheless, in no way does the practice of wildcrafting reindeer lichen as a source of vitamin D endanger its supply. Research¹⁸ indicates that the overgrowing of the fertile branches of reindeer lichen ensures continued vegetative growth, which is not impeded by sexual reproduction.

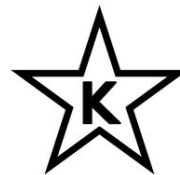
Furthermore, China started to use the IUCN Red List Criteria of Threatened Species to assess endangered species in the early 1980s.¹⁹ Reindeer lichen is listed in the IUCN Red List as “Least Concern (LC)”^{20 21}. This means that Reindeer lichen has been “evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this category.”²²



Figure 2: Pristine alpine region of China where reindeer lichen is wildcrafted for VegaDelight vegan D3.

VEGADELIGHT D3

VegaDelight® is a GRAS-affirmed, natural, vegan vitamin D3. It is vegan.org Vegan Certified, AVA Vegan Certified, Non-GMO Project Verified, Star-K Kosher Certified, and AHF Halal Certified.



Other vegan D3 material

In addition to VegaDelight®, there are a limited number of other vegan D3 materials offered by suppliers claiming to provide vegan sources of D3 from lichen or algae. However, the suppliers don't indicate the lichen or algae species being used. Hiding the source is problematic considering that:

- There are more than 20,999 lichen species^{23 24} some of which are rare or endangered, and some that contain toxic compounds as well.
- There are about 320,500 algae^{25 26}, including some harmful to human health. Also, by hiding the alga source, there is no way to independently confirm if it is from clean or polluted waters.

In our opinion, hiding the species source is like saying a probiotic comes from *Lactobacillus*, without identifying which of 50+ species (*L. acidophilus*, *L. rhamnosus*, *L. gasseri*, etc.). But why hide the source in the first instance? One possible reason is that, without identifying species, the supplier can switch to alternative species sources—which may be undesirable for the reasons previously mentioned.

CONCLUSION

Vitamin D deficiency and insufficiency is prevalent. This is problematic considering vitamin D's critical for building bone and for so many other aspects of human health. Vitamin D₃ is the most active form of vitamin D but, heretofore, commercial D₃ was exclusively derived from lanolin (from sheep) or fish liver oil, and so was not considered vegan, nor was it necessarily a sustainable or non-GMO source. Now, however, Nutraland USA offers VegaDelight[®], a vegan source of D₃ derived from reindeer lichen. As of this writing, and to the best of our knowledge, VegaDelight[®] is the only vegan source of D₃ which publicly identifies the species from which it is derived with documented sustainability.

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