

SYNTHETIC VS. VEGAN D3: IMPACT ON HEALTH & SUSTAINABILITY

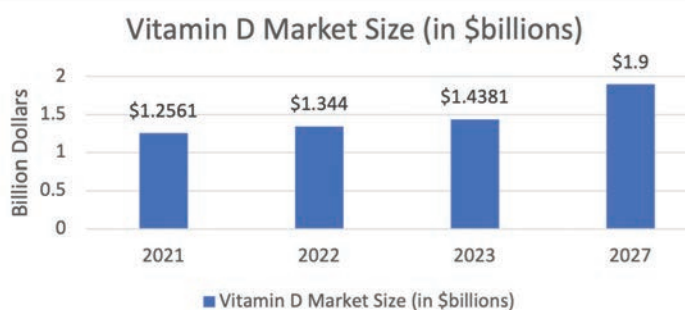
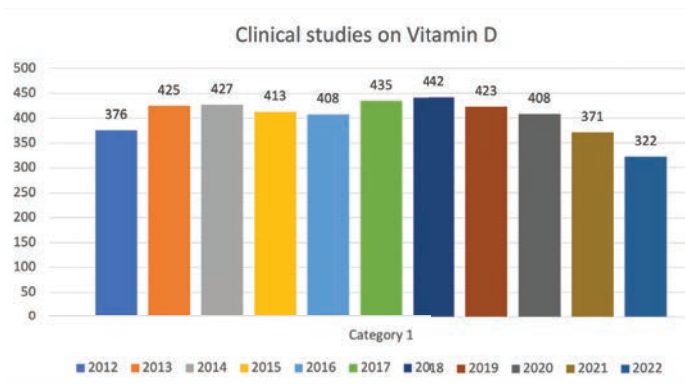
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The prevalence of vitamin D deficiency and insufficiency (i.e., inadequate levels) is significant. The journal *Nutrients*¹ indicated that 29 percent of the U.S. population is vitamin D deficient and an additional 41 percent are vitamin D insufficient. 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 three clinical studies on vitamin D were conducted).

Vitamin D Benefits

Many of the aforementioned 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.³⁻⁸





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 mar-



ket is projected to reach \$1.9 billion in 2027. That’s a CAGR of 7.1 percent.⁹

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 D3¹⁰—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 (genetically modified organism) 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. My personal favorite is one extracted from reindeer lichen aka, *Cladonia rangiferina* (VegaDelight from Nutraland USA). What’s so special about reindeer lichen? Keep reading.

Reindeer Lichen (*Cladonia Rangiferina*)

Researchers have identified reindeer lichen as being able to provide a predictable vitamin D source for humans.¹¹ 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 degrees Celsius) in the reindeer lichen.¹² So, let’s take this opportunity for a closer look at 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.¹³ 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.¹⁴ *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 percent 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.¹⁵

Reindeer Lichen Use as Medicine

Reindeer lichen has historically been used to treat colds, arthritis, fever, jaundice, constipation, convulsions, cough and tuberculosis.¹⁶ 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.¹⁷

Inuit of Baffin Island boil reindeer lichen to make a broth, which is then used for sickness and eye infections. The Ojibwa of North-eastern 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.¹⁸

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.¹⁹ Other naturally containing nutrients include protein, fiber, fat, niacin, calcium and carbohydrates.²⁰ More significantly, reindeer lichen is also a source of vitamin D.^{21,22} 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.²³

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. Research²⁴ 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.²⁵ Reindeer lichen is listed in the IUCN Red List as “Least Concern (LC).”^{26,27} 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.”²⁸

“...Reindeer lichen naturally contains a number of different *nutrients*. This includes zinc, potassium, phosphorus, sulfur, boron, copper and magnesium ... More significantly, reindeer lichen is also a source of vitamin D...”

Vitamin D3 From Reindeer Lichen

There are four reasons that vitamin D3 from reindeer lichen is my favorite vegan source of this nutrient. One is reindeer lichen's history of safe and effective use as a food and medicine in traditional cultures as previously discussed. The second reason is that it is naturally non-GMO. A third reason is its sustainability, also previously discussed. The fourth reason is transparency. Reindeer lichen is identified as the specific lichen source in the vegan vitamin D3 material (VegaDelight from Nutraland USA). There are other lichen and algae sources of vitamin D3 available, but as of this writing and to the best of my knowledge, the suppliers don't indicate the lichen or algae species being used. From my perspective, this is problematic considering that:

- There are more than 20,999 lichen species^{29,30} some of which are rare or endangered, and some that contain toxic compounds as well.
- There are about 320,500 algae,^{31,32} 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.

Conclusion

Vitamin D deficiency and insufficiency is prevalent. This is problematic considering vitamin D's critical role 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, a vegan source of D3 from reindeer lichen is available. As of this writing, and to the best of my knowledge, this is the only vegan source of D3 that publicly identifies the species from which it is extracted with documented sustainability. **VR**

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of your Who, Why, What and How.

Build an activation plan around these initiatives that target employees at different levels of experience and longevity in your store. For example, a briefing on these concepts would be helpful as part of new hire training. However, for your longer-term employees, find ways to offer constant reminders. Bring up these concepts during annual reviews. Create signage and posters for the break room or back office walls.

Ultimately, these core elements need to provide influence on your business decisions as well. Whenever you look to bring in a new item, change a policy, or create a new service offering, ask yourself if it is compatible with your brand's vision.

Finally, your customers need to see these elements in their day-to-day experience. Externally, it should be evident in every possible touchpoint with your customers. Create large signage in high-traffic areas highlighting what you value most, your vision/mission and even testimonials from real customers that reference who you are in service of.

In summary, there are a few areas to hone

in on this customer experience for purpose-driven brands. Create exceptional offerings that matter to your target consumer. Provide benefits to your community wherever possible. Don't talk at your customers, talk with them. Build a community of engaged customers within your store. Finally, create alignment with your staff by implementing programs that implement this purpose in the everyday lives of your team.

Phase 3: Measurement

Where many great brands fall is a failure to continually align the unique aspects of the brand with the business itself. Develop a scorecard for your staff to ensure you constantly develop your purpose and elevate your overall branding.

In many ways, the answers here are subjective. First and foremost, are your employees committed to your business and consumers? Are they engaged? Are your customers finding you to be indispensable in their lives? Do they understand the value you offer? You identified a core segment of consumers you want to grow with early on. Are you doing so? Do those customers talk

about you to your friends and family? How relevant are you to them? And finally, are you making a difference?

In Conclusion

Building a brand is a journey. Understand consumer needs, identify your brand's Who, Why, What and How, implement branding throughout your store, and hold yourself accountable by measuring results. **VR**



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Passionate about the natural products industry, he has worked with retailers across the country to help them better market the strengths of their businesses, driving increased revenue and brand recognition within their communities.

In addition to his role at Enzymedica, Sensenbrenner serves as a current member of the SENPA Board of Directors.

SUPPLEMENT SCIENCE

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