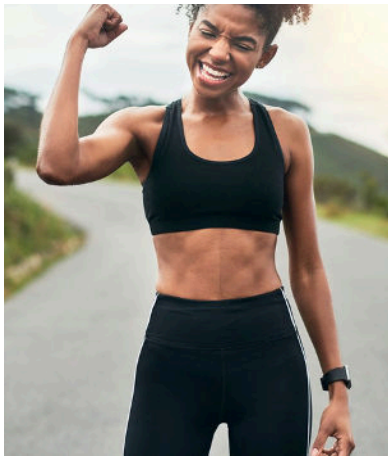
PINED3™
Sustainable botanical D3



The World's Most Stable Vegan Vitamin D3

100% plant-based Cholecalciferol from pine, a direct alternative to lanolin

For decades, fortifying products with Vitamin D3 meant relying on lanolin, which is extracted from sheep's wool. This creates a major hurdle for strict vegan brands and raises animal welfare questions. Until now, the alternatives were compromises:

- Vitamin D2 has a lower consumer perception regarding bio-efficacy.
- Lichen-derived D3 faces major challenges with supply chain stability, high costs, and scalability.

PineD3™ / PhytoD3™ solves this bottleneck. It is a next-generation, 100% vegan Vitamin D3 powder, sustainably sourced from sterols from pine tree bark. It delivers a bio-identical, high-yield Cholecalciferol with a potency of at least 100,000 IU per gram. It is a scalable, sustainable, and plant-based alternative to animal-sourced D3 for the European fortification market, and it meets both R&D requirements and consumer ethics.

Vitamin D Sources: Comparative Overview

Source	Molecule	Vegan	Origin / Process	Strengths	Limitations
Pine D3 (pine)	D3	Yes	Pine sterols/oil (co-product of the paper industry), conversion followed by UV irradiation	Vegan and D3 (not D2), renewable supply, powder/oil/beadlets/CWD formats	Still a recent offering, often manufactured in China, regulatory recognition varies by country
Lanolin (sheep's wool)	D3	No	Lanolin cholesterol, 7-dehydrocholesterol, UV irradiation	Dominant source, wide availability, lowest cost, very large clinical study base	Animal origin, excludes vegan and often vegetarian use, weaker "clean label" perception
Lichen	D3	Yes	Extraction from lichens (*Cladonia* genus)	First vegan D3, natural narrative	Limited resource, high cost, lower scalability
Microalgae	D3 (strain-dependent)	Yes	Algae cultivation	Vegan, marine and sustainable narrative	Few suppliers, high cost, lower concentrations
UV mushrooms	D2	Yes	UV-irradiated ergosterol	Vegan, natural	It is D2, not D3, and D2 is generally considered less effective at raising 25(OH)D
Cod liver / fish oil	D3	No	Natural extraction	Natural, also provides omega-3	Not vegan, variable content, risk of contaminants, taste

I. Mechanism of Action: Ultra-Stable Protective Matrix



PineD3™ is embedded in an advanced protective matrix that isolates the cholecalciferol molecules. This:

- **Prevents degradation** caused by light, air, and heat.
- **Withstands industrial processing** and challenging food processing conditions.
- **Ensures long-term stability**: 36-month shelf life for global supply chains.

II. Key Health Benefits

- **Bone, joint & dental health**: Regulates calcium and phosphorus absorption for bone and dental maintenance.
- **Immunity & cellular vitality**: Triggers systemic immune defenses and modulates inflammatory pathways.

III. Application Profile

- **Plant-based dairy**: Its clean, milk-white dispersion fortifies vegan milks, yogurts, and spreads without altering color or taste.
- **Nutraceuticals**: Excellent powder flowability for clean-label vegan capsules, tablets, and dry lifestyle mix formulas.
- **Sports nutrition & beverages**: Blends into functional sports nutrition and healthy beverage lines.
- **Challenging processes**: Suitable for demanding food processing conditions, baking, clear liquids, and premium vegan supplements.

IV. Quality, Safety & Regulatory Status

- **Microbiology**: Total aerobic count < 1,000 CFU/g; negative for pathogens.
- **Heavy Metals (ICP-MS testing)**: Lead ≤ 0.5 ppm; mercury < 0.2 ppm.
- **Certifications**: cGMP, ISO 22000, UK Vegan Society Vegan Certified, Kosher, Halal, and Non-GMO Project Verified.
- **Regulatory**: Full, transparent regulatory package for European market entry.

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