

# Bio-DK-Mulsion™



With more and more research highlighting the importance of maintaining healthy vitamin D levels, patients require a form that is bioavailable, easy-to-take and in a clinically useful dosage.

**Bio-DK-Mulsion™** delivers 25 ug (1000 IU)/drop of vitamin D<sub>3</sub>, with vitamins K<sub>1</sub> (as phytonadione) and K<sub>2</sub> (as MK-7, menaquinone-7) in a micro-emulsified formula.

Vitamins D and K work synergistically to optimize bone and heart health. More specifically, vitamin K activates the matrix Gla-protein (MGP), a vitamin K dependent protein (VKDP) that helps direct calcium to bones and teeth, and away from the arteries. Both osteocalcin (responsible for putting calcium into bones) and MGP (preventing calcium deposits in arteries and soft tissues) are vitamin K dependent.

## Clinical Applications

- Healthy Calcium Balance
- Bone Health
- Cardiovascular Support
- Immune Function
- Neurological Benefits
- Healthy Weight Management
- Blood Sugar Regulation
- Micro-Emulsified for Greater Absorption
- Easy-to-Take Liquid
- 25 ug (1000 IU) Vitamin D<sub>3</sub> / **drop**
- Added Vitamins K<sub>1</sub> **48 ug** / K<sub>2</sub> **12 ug** / **drop**
- Backed by Clinical Data



Biotics Research Corporation was one of the first companies to launch an emulsified form of vitamin D in a liquid.

**Bio-DK-Mulsion®** is an oil-in-water micro-emulsions, where the vitamin D oil has been dispersed into microscopic particles to aid in absorption and assimilation. Implementing this principle of emulsion to a dry form, Biotics Research first used this proprietary process in its CoQ10 formulation.



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Clinical data shows this emulsified form increases bioavailability over 200% compared to the non-emulsified form. In addition, **Bio-DK-Mulsion™** is absorbed first through the lymphatic system, the body's preferred route of administration, and then transported to the blood circulation.

Vitamin D, a nutrient synthesized in our skin when exposed to sunlight, can also be found in some foods such as oily fish, beef liver, egg yolks, mushrooms and some fortified foods such as milk and breakfast cereal. Surprisingly, however, nearly half of the American population is deficient in vitamin D,<sup>(1)</sup> with serum of 25-hydroxy vitamin D concentrations less than 20 ng/mL (50 nmol/L).

While we are familiar with the importance of vitamin D in calcium absorption and bone metabolism, many may not be aware of burgeoning research on vitamin D, and the widening range of applications available for cholecalciferol, which can be classified as both a vitamin and a pro-hormone.<sup>(2)</sup>

## **Vitamin D Deficiency and Musculoskeletal Health**

Vitamin D deficiency is associated with dull, achy musculoskeletal pain that is incompletely responsive to both pharmacologic and manual therapies. The pain may be widespread or confined to a particular area, most commonly the lower back and lumbar spine. The process by which this occurs has been clearly defined:

1. Vitamin D deficiency causes a reduction in calcium absorption.
2. Production of parathyroid (PTH) hormone is increased to maintain blood calcium levels.
3. Increase PTH results in increased urinary excretion of phosphorous, which leads to hypophosphatemia.
4. Insufficient calcium phosphate results in deposition of unmineralized collagen matrix on the endosteal (inside) and periosteal (outside) surface of bones.
5. When the collagen matrix hydrates and swells, it causes pressure on the sensory-innervated periosteum resulting in pain.<sup>(3)</sup>

Several clinical investigations have shown vitamin D deficiency to be particularly common among people with musculoskeletal pain.<sup>(4,5)</sup> In addition, a study on patients with osteoarthritis (OA), a chronic degenerative disease of articular cartilage, shows vitamin D to have a positive influence on healthy inflammatory pathways.<sup>(6)</sup>

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This occurs via multiple pathways including direct genomic/nutrigenomic effect where vitamin D reduces gene expression for inflammatory pathways; the modulation of the microbiome; and, also, via the mitochondria.<sup>(7)</sup>

Because vitamin D may modulate inflammatory responses, preliminary evidence suggests vitamin D deficiency may also be particularly common among patients with inflammatory and autoimmune disorders.<sup>(8,9,10)</sup>

## **Non-Musculoskeletal Manifestations of Hypovitaminosis D**

Vitamins D and K are best known for their role in optimal bone and arterial health. As stated earlier, vascular calcification, a cause of cardiovascular morbidity and mortality, is an actively regulated process involving VKDPs, with MGP playing a major role in the process of vascular calcification. A recent study highlights that vitamin K<sub>2</sub> activates the soft tissue calcification inhibitor MGP offering beneficial cardiovascular effects.<sup>(11)</sup>

Vitamins D and K also help to keep the immune system in proper balance.

Mounting evidence suggests that vitamin D deficiency may be linked to several chronic diseases, including cardiovascular disease and cancer. Of particular interest is that vitamin D deficiency was found to be common in children with Type I Diabetes Mellitus (T1DM).<sup>(12)</sup> Helping sensitize the cells to insulin, vitamin D is also strongly associated with weight loss.

According to research<sup>(13)</sup>, vitamin D status is linked to body mass index (BMI). Vitamin D deficiency may be linked to metabolic syndrome through inflammatory pathways and, because vitamin D has an anti-inflammatory effect (increasing IL-10 and decreasing TNF alpha, among other changes in inflammatory markers), supplementation with vitamin D can be critical to a healthy weight management program.

Current research also indicates the role of vitamin D in neuronal health. Both the peripheral and central nervous systems have multiple sites of action for vitamin D. Vitamin D plays a role in the modulation of serotonin and melatonin synthesis and metabolism. Alterations in vitamin D levels appear to explain, at least in part, the adverse psychological effects of sunlight deprivation that occur due to geographic location and climate.<sup>(14)</sup> Vitamin D modulates neurodevelopment, neuroprotection, and immunomodulation through its interaction with receptor (VDR) and related enzymes (CYP27B1, CYP24A1). An imbalance in the vitamin D processing pathway (or a vitamin D deficiency) has been implicated with neuronal dysregulation.<sup>(15)</sup>

Finally, in a study conducted at the Children's Hospital in Boston, the micro-emulsified form of vitamin D was found to be safe and effective in infants and children. Conservative regimens increased 25(OH)D concentrations in vitamin D deficient children 202% in six weeks, essentially tripling blood levels, without increased risk of hypercalcemia commonly associated with large dose therapies.<sup>(16)</sup>

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## References

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Bio-DK-Mulsion™ is available in a 1 ounce bottle (#1021).

## Supplement Facts

Serving Size: 1 Drop  
Servings Per Container: 150

	Amount Per Serving	% Daily Value
Vitamin D3 (as cholecalciferol)	25 mcg	125%
Vitamin K (as K1 phytonadione and K2 menaquinone-7, 4:1 ratio)	60 mcg	50%

**Other ingredients:** Emulsifier base (water and arabic gum), sesame oil and olive oil.

**This product is gluten and dairy free.**

**RECOMMENDATION:** 1 drop each day as a dietary supplement or as otherwise directed by a healthcare professional.

**CAUTION:** Those taking blood thinners should avoid supplementation with Vitamin K unless specifically recommended and monitored by their physician. Pregnant and nursing mothers should avoid supplemental intakes higher than the RDI (90 mcg) unless specifically recommended and monitored by their physician.

### KEEP OUT OF REACH OF CHILDREN

Store in a cool, dry area.  
Sealed with an imprinted safety seal for your protection.

Product # 1021 Rev. 12/18

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These statements have not been evaluated by the Food and Drug Administration. These products are not intended to diagnose, treat, cure, or prevent any disease.