

# Natural Vitamin K2-7

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**one**  
HEALTH

**MenaquinGold**<sup>®</sup>  
Natural Vitamin K2-7



# The future is golden with MenaquinGold® natural vitamin K2-7

Introducing MenaquinGold®, our natural vitamin K2-7 produced utilizing a patented chickpea fermentation process in our soy-free, non-GMO manufacturing facilities. With an FDA issued GRAS 'No objection letter' and supported by scientific research and clinical trials, MenaquinGold® is a key ingredient to building a healthier future.



This communication is only intended for business-to-business and health care professionals. The information has not been approved by authorities. Any claims in this brochure should not be perceived as approved claims and may therefore not be appropriate for marketing purposes of final products. Our ingredients are not intended to prevent, cure or treat any disease. This communication is not intended for consumers of final consumer goods.



# Consumers are seeking ingredients to help them live healthier, for longer

70%

**of Americans want to take control of their own health:**

Over 70% of Americans believe dietary supplements play an important part in lifestyle change<sup>1</sup>.

50%

**of women will fracture a bone in their lifetime:**

The impact of poor bone health can have irreversible consequences<sup>2</sup>.

80 Million

**Americans experience loss of arterial plasticity:**

In the US, heart health challenges are the leading causes of death<sup>3,4</sup>.

## Vitamin K2 is a key ingredient to building a healthier future

**Vitamin K2 market projected to grow by 10-20%:** Vitamin K2 market is \$100-130 growing at a CAGR of 10-20%. By 2024, market is projected to reach \$200-250 million<sup>5</sup>.

**Vitamin K2 makes calcium smart:** Vitamin K2 is involved in activating specific proteins responsible for effective calcium utilization, transporting calcium from blood vessels to bones<sup>6</sup>.

**Good for more than you think possible:** Emerging health benefits in other growing health areas, including nerve health<sup>7</sup> and sports performance<sup>8</sup>.



## What's in this brochure

So, you've got your hands on our product brochure for MenaquinGold®. Here's a quick overview of what's inside:

**Market interest for vitamin K2 is increasing**

**Consumers want clean labels**

**MenaquinGold®: Our natural, zero soy, FDA GRAS vitamin K2-7**

**MenaquinGold® is good for more than you think possible: How K2-7 supports our health across the life span in bone health, heart health, and beyond**

**Manufacturing MenaquinGold® and our flexible formulations**

Product specifications

Applications and combinations

About our in-house production

**We are OneHealth: Join our One-in-a-trillion journey to improving human health**





# Vitamin K2 helps consumers embrace a world of strength and opportunity

Vitamin K2 has been associated with health benefits within several areas. Bone<sup>9</sup> and heart health<sup>10,11,12</sup> are the areas supported by the largest body of evidence, but emerging science also indicates promising results related to sports performance<sup>13</sup> and nerve health<sup>14,15,16</sup>.

Vitamin K2 plays a unique role in human health at many stages of life. However, supplementation may be needed as not all diets contain vitamin K2 and intestinal production by gut bacteria may not be sufficient<sup>17</sup>.

At Novozymes OneHealth, our aim is to support consumers' lifestyles in effective ways. That's why we produce MenaquinGold<sup>®</sup>, a premium, natural vitamin K2-7. MenaquinGold<sup>®</sup> is a long-chain form of menaquinone with high bioavailability<sup>18</sup> and bioactivity compared to other menaquinone homologues and vitamin K1<sup>19</sup>.

## The vitamin K2 market is accelerating

Over the past decade, awareness of vitamin K2 has grown more than 10-fold<sup>20</sup> and increasingly, clinical studies supporting the benefits of supplementation are positively impacting K2 sales. In 2021, the vitamin K nutraceutical market reached almost \$2.7 billion (in retail price) and is expected to grow at double digit rates until 2025<sup>21</sup>. While in 2021, vitamin K2 made up approximately 40% of ingredient market revenue of vitamin K, vitamin K2 is projected to increase to 50% by 2025. In a recent study, just one fifth of US adults claimed to be aware of vitamin K2 insufficiency in the average American diet<sup>22</sup>. And yet, 75% were receptive to and interested in purchasing a vitamin K2 product after learning about the possible benefits of supplementation<sup>23</sup>.

The US is the world's biggest market for vitamin K, and K2 is expected to experience stronger growth than K1<sup>24</sup>. This is likely due to the two biggest areas supporting demand for K2; heart health and bone health<sup>25</sup>, both of which correlate with modern lifestyle-related health challenges. Vitamin K2 is a \$100-130 million market growing at a CAGR of 10-20%<sup>26</sup>. In 2024, the global K2 market is projected to reach \$200-250 million<sup>27</sup>.



**\$2.7**

billion retail market for vitamin K with expected double digit growth

**50%**

Vitamin K2 is projected to increase to 50% of vitamin K market

**75%**

are interested in purchasing a vitamin K2 product





# Consumers are seeking natural, non-synthetic nutraceuticals

Both market and consumer insights are highlighting the importance of natural and allergen free ingredients<sup>28,29</sup>. One recent study suggests almost half of American consumers prioritize natural products to avoid harmful ingredients<sup>30</sup>, and FMCG brands are phasing out synthetic ingredients in favor of cleaner labels<sup>31</sup>.

MenaquinGold® is a non-synthetic, natural form of vitamin K2-7. It is produced using the fermentation of chickpeas. Being of natural origin means menaquinGold is predominately *trans* isomers which is more biological active. *Cis* isomers arise from light exposure or as a by-product of synthetic production<sup>32</sup>.



# Fermenting ... Chickpeas? Manufacturing MenaquinGold® with zero soy

We've always believed it's the small things that can make a big difference, and chickpeas are a prime example! In certain markets, individuals are acutely concerned about GMOs<sup>33</sup> and increasingly, individuals are recognizing their allergy to soy products<sup>34</sup>. With consumers citing allergies and purity concerns as key deciding factors, ensuring our MenaquinGold® production facilities are soy-free has always been of utmost importance.

Our process of submerged fermentation with a *Bacillus licheniformis* strain is patented and thanks to our proprietary extraction method, we have good stability records by preventing the accumulation of metabolites that affect the long-term stability of vitamin K2-7.

While many suppliers claim 'soy-free' on their products, our MenaquinGold® is born from another legume all together and has had no contact with soy from outset, through production!

## Classified as GRAS with 'No Objection letter' response from the FDA

Novozymes OneHealth is proud to announce that the FDA has issued a GRAS (Generally Recognized As Safe) 'No Objection Letter' for MenaquinGold®. A "Letter of No Objection" from the FDA confirms they agree with our conclusion that vitamin K2 is generally recognized as safe (GRAS Notification GRN000887).



# K1 vs K2

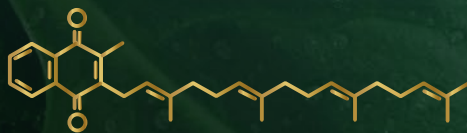
Vitamin K is a collective term for fat-soluble compounds. Discovered by the Danish nutritional biochemist Dr. Henrik Dam in 1929, the 'K' dedication reflected the compound's ability to support *Koagulation* (coagulation)<sup>35</sup>. That said, vitamin K1 (phylloquinones) and vitamin K2 (menaquinones) have little in common. Their functions and food sources differ. Vitamin K1 is typically found in green leafy veggies (spinach, lettuce and other leafy plants), whereas vitamin K2 is found in fermented products like aged cheeses, and the Japanese superfood natto. Vitamin K2 is also being produced in intestinal track by gut bacteria. However, the gut bacteria producing vitamin K2 is primarily present in the large intestine whereas absorption occurs predominantly in the small intestine<sup>36</sup>

They also diverge in terms of their mechanisms of action: While vitamin K1 primarily plays a role in blood coagulation (by activating certain processes in the liver), vitamin K2 works in the bloodstream, playing a key role in multiple health functions. As things stand, scientists have found 18 unique vitamin K2-dependent proteins in our bodies<sup>37</sup>!

In addition, vitamin K2 includes a range of related forms which differ in their number of sidechain isoprenyl groups. When there are four groups, it is vitamin K2-4 (or MK-4, for menaquinone K-4). If there are seven groups, it is K2-7 (or MK-7). Studies have shown that K2-7 has better bioavailability than other forms of vitamin K2<sup>38</sup> – that is, it is absorbed more easily by the body. It also has a longer half-life than vitamin K2-4<sup>39,40</sup>, which results in more stable serum concentrations.



Vitamin K1 molecular structure



Vitamin K2-4 molecular structure



Vitamin K2-7 molecular structure



# The golden nugget that supports human health

Heart and bone health are foundational to day-to-day living. While hearts and bones might commonly be thought of as separate body parts with distinct functions, the role of vitamin K2 in their functioning reveals how they are closely connected.

For decades there has been a collective, public focus on the importance of calcium intake for bone health. The role of vitamin D in aiding calcium absorption has also long been common knowledge. Yet, there is still a major gap in understanding the importance of vitamin K2 in the body's ability to effectively utilize calcium. But fear not; we're here to catch everyone up to speed!

Bone and heart health are closely linked. If someone consumes adequate amounts of calcium, it is possible they still lack calcium in their bones. This occurs when instead of being directed to the bones, calcium builds up in the arteries. A lack of calcium in the bones and its storage in the vessel wall is also known as the 'Calcium Paradox'. Vitamin K2 plays a vital role in this connection as it functions as a cofactor for the enzymatic activation of the crucial vitamin K dependent proteins (VKDP) Osteocalcin and Matrix Gla Protein, which are responsible for bone mineralization and preventing soft tissue calcification<sup>41</sup>. Inadequate amounts of vitamin K2 in the body can result in these key proteins being 'inactive' and hence, they are 'ineffective'. In short, calcium needs two guides: Vitamin D for absorption from the intestines into the bloodstream, and vitamin K2 for supporting it out of the bloodstream again.



**Making calcium 'smart':**

**K2 steers calcium away from blood vessels and into bones**






# Vitamin K2 in Bone Health

## For staying strong

Aging involves many physiological changes. A significant process associated with aging is a decline in bone mineral content, leading to reduced structural bone strength. This is particularly true for post-menopausal women. Vitamin K2 supports bone mineralization by activating human osteocalcin, which is essential to bind calcium effectively to the bone matrix<sup>42,43</sup>. It may also work synergistically with vitamin D to support the activity of osteocalcin, a calcium-binding protein involved in bone remodeling and calcium homeostasis. Vitamin K2 plays a dual role in bone health by both supporting the bone building process, and by decreasing bone reabsorption<sup>44</sup>. With the number of people aged 65 and older only growing, vitamin K2 is uniquely positioned to support this demographic group who are experiencing accelerated bone loss<sup>45</sup>.



# Vitamin K2 in Heart Health

## For staying strong so more time can be spent keeping up with the next generation

Vitamin K2 supplementation may be considered as a new and supportive approach in heart health through supporting arterial plasticity and blood flow<sup>46</sup>, and has been associated with numerous other heart health benefits<sup>47,48,49,50</sup>. A 2022 study found 68% of consumers in North America reported their interest in products addressing heart health<sup>51</sup>, indicating major market interest in the health benefits vitamin K2 can support.



# Beyond the basics

## Sport performance and Nerve health

Our proprietary research has shown a possible effect of how vitamin K2 may reduce nerve aches, numbness, and tingling<sup>52,53,54</sup>. Another recent proprietary study has indicated that vitamin K2 may have beneficial effects on sports performance<sup>55</sup>.



An aerial photograph of a large group of people swimming in the ocean. The water is a deep teal color, and the swimmers are scattered across the frame, creating a sense of movement and activity. The perspective is from directly above, looking down at the swimmers.

## What are the benefits of proprietary research?

At Novozymes OneHealth, we are committed to helping people live healthier and better lives by solving profound health challenges related to modern lifestyles. We engage in research related to the benefits of MenaquinGold® vitamin K2 as we truly believe it is good for more than you think possible. But how is our proprietary science valuable to you? Fundamentally, it provides a wealth of inspiration for your next concept addressing a variety of lifestyle-related issues. It also means that where applicable, customers can reference our science, with confidence.

## Vitamin K2 across the lifespan

Research indicates that children may require up to 8-10 times more vitamin K2 than adults to support their rapid growth and that children, and adults over the age of 40, both showed the greatest vitamin K2 deficiency and the highest responses to vitamin K2 supplementation<sup>56</sup>. From children building strong bones to seniors striving to prevent the frailties that may accompany aging, MenaquinGold® plays a supportive role in your health and wellness tool kit.



# Keep your options open with our flexible formulations

MenaquinGold® can be formulated as a standalone product or in combination with other functional ingredients. It can be incorporated in a tablet, capsule, softgel or sachet. With our multiple product grades and concentrations, you can add it to the dosage form that best meets your needs.

<b>Powder grade:</b>	is suitable for most dry blends including capsules and tablets.
<b>Extended Stability:</b>	is ideal for highly alkaline products such as calcium mineral complexes.
<b>Water-soluble version:</b>	is perfect for applications such as sachets, beverage powder blends, and liquids.
<b>Powder granules:</b>	available for tablet and capsule applications.
<b>Oil-soluble version:</b>	our vitamin K2-7 is also available in an MCT oil.

## We support various product specifications

We offer various grades of MenaquinGold to satisfy your needs. Our standard offerings are:

<b>Grade</b>	<b>Strenght</b>	<b>Possible Applications</b>
<b>Granule</b>	2500 PPM	Tablets, capsules
<b>Powder</b>	1000 PPM, 10000 PPM	Tablets, capsules
<b>Oil</b>	1500 PPM	Softgels
<b>Water soluble</b>	1000 PPM, 2000 PPM	Sachets



# Applications and combinations flourish with MenaquinGold®

MenaquinGold® has already been successfully formatted into various dosage forms and has been studied for both long-term and accelerated stability, meaning supplement formulators can be confident about the quality of our ingredients. MenaquinGold® can be combined with several ingredients to improve the functionality of formulation.

Here is a partial list of suitable combinational ingredients:

- Probiotics
- Calcium salts
- Vitamin D3
- Vitamin C
- Vitamin E
- Omega 3 fatty acids
- Zinc
- Carotenoids
- Tocotrienols
- Phytosterols

Our team can assist you to meet the growing demand for products fortified with vitamin K2-7.

Contact our team to learn more about options for formulations.





# Our patents

We have driven the advancement of the science and understanding around the benefits of vitamin K2-7 through our own extensive research on its production and applications. Along our journey, we've discovered several novel and critical functions of vitamin K2-7 in the body, and we've now filed three use patent applications, as well as two process patents.

## Manufactured in house, in state-of-the-art facilities

Our production site near Mumbai stretches across over 150,000 square feet (14,000 square meters). The state-of-the-art manufacturing facility is a center for excellence, equipped with a Quality Assurance laboratory, a microbiology laboratory, and a clean room facility.

The production hub is cGMP, NSF GMP, FSSC 22000 and non-GMO certified, and all products produced on site have Halal and Kosher approval. The center is home to our proprietary advanced, submerged fermentation technology that makes producing premium quality MenaquinGold possible. The facility is 100% free of soy.

## Our production hub works seamlessly with our Danish HQ and partners across the globe

Our global team works in sync to deliver MenaquinGold® to customers across the world. Our global presence means you will have access to support and guidance wherever you are located, at a sensible time of day. We know having peace of mind about your product is key in being able to serve your own customers well.







# We are the One-in-a-trillion company

Novozymes OneHealth is the Human Health unit of one of the world's leading biotech companies: Novozymes. We are on a journey to deliver clinically proven and targeted biological solutions of probiotics, enzymes, and other bioactives. We navigate in the unique microbiome with ambitious research that provides transparency and clear modes of action.

We are the lighthouse that illuminates the path to vibrant health. We stand out in the crowded consumer health market because we work with the latest biotechnologies to create proven products.

We are backed by Novozymes the world leader in biological solutions, dedicated to Rethinking Tomorrow. Novozymes is known in biotech to apply the highest standards and cutting-edge technologies - and that's exactly what we are bringing to the consumer health industry.

We rethink human health through unique innovation in selected consumer health categories powered by a venture mindset and entrepreneurial culture.

## Are you ready to be part of our One-in-a-trillion journey?



novozymes<sup>®</sup>   
**one**  
**HEALTH**







one  
in  
trillion





## Have we piqued your interest?

If you're interested in adding vitamin K2 to your product portfolio, we can support your business development opportunities. Let us guide you towards a solution that fits your brand's purpose and goals, and build a healthier future, together.





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**Want to know more?  
– Just reach out!**

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