DSM
BRIGHT SCIENCE. BRIGHTER LIVING.

HEALTH • NUTRITION • MATERIALS

Ingredients for Pet Nutrition

Product Handbook and Catalog for 2017/2018

Table of Contents

DSM – Bright Science. Brighter Living.™

Our Company

Royal DSM N.V. is a global science-based company active in health, nutrition and materials. By connecting its unique competencies in Life Sciences and Materials Sciences DSM is driving economic prosperity, environmental progress and social advances to create sustainable value for all stakeholders simultaneously. DSM delivers innovative solutions that nourish, protect and improve performance in global markets such as food and dietary supplements, personal care, feed, pharmaceuticals, medical devices, automotive, paints, electrical and electronics, life protection, alternative energy and bio-based materials. DSM's 20,750 employees deliver annual sales of €7.7 billion. The company is listed on NYSE Euronext. More information can be found at www.dsm.com.

Who We Are

Who we are as a company is the result of strategic choices that we have made. These in turn are based on our mission and our core value; they define what we believe in and how we go about our business.

Our Brand Promise

Bright Science. Brighter Living™. This sums up who we are, what we stand for and what we aim to achieve. These four words are the shorthand for our mission, our beliefs and our behaviors – a promise that we make to the world in which we operate. Bright Science refers to the unique way in which we combine Life Sciences and Materials Sciences disciplines, technologies and talents. We partner with customers and other stakeholders – then we share ideas, insights and inspiration to create innovative and sustainable solutions that address the key challenges facing society today. Brighter Living refers to our commitment to creating products and solutions that make a positive difference to people's lives. We are constantly seeking new ways to improve quality of life, and we seek to make a positive contribution to the lives of people today and generations to come.

Our Mission

Our purpose is to create brighter lives for people today and generations to come. We connect our unique competences in Life Science and Materials Sciences to create solutions that nourish, protect and improve performance.

Our Core Value

Our mission is supported by our core value: Sustainability. Everything we do should contribute to a more sustainable world. To us, achieving sustainability means simultaneously pursuing economic performance, environmental quality and social responsibility. In other words, we strive to create value on the three dimensions of People, Planet and Profit simultaneously.

Sustainability as a DSM Strategy

DSMs is aiming to improve peoples' lives and environmental impact, through the way we take care of our people and own operations, and how we translate this into products and innovations.

The world has joined forces in 2015 by defining 17 common Sustainable Development Goals (SDGs), adopted by the United Nations. The SDGs cover a 15 year time frame to 2030 and include 169 targets. DSM contributes to all goals but particularly focusses on the following SDGs: SDG 2: No Hunger, SDG 3: Good Health, SDG 7: Renewable Energy/ SDG 13: Climate Action and SDG 12: Responsible Consumption and Production.

SUSTAINABLE DEVELOPMENT GOALS

More about DSMs contribution to the Sustainable Development goals: https://www.dsm.com/corporate/sustainability/managing-sustainability/the-global-goals.html

Society is faced with challenges, and business has an increasingly important responsibility to contribute by addressing these societal challenges. By anticipating the global trends and societal issues with its portfolio of products and services, DSM wants to create positive societal impact and further develop a sustainable business.

Our key sustainable focus areas: 'Nutrition', 'Climate change & renewable energy' and 'Circular and bio-based economy' create the right market context in which DSM's solutions can flourish. Sustainability then becomes a business growth driver and defines operational aspirations.

With Sustainability as a Business Growth Driver at DSM, we offer our customers sustainable and scalable solutions, integrating sustainability benefits in our value propositions and customer engagement.

Key Sustainability Focus Areas:

- Nutrition
- Climate Change and Renewable Energy
- Circular and Bio-Based Economy

Sustainability as Business Growth Driver

Brighter Living Solutions: Eco+ and People+

- Profitable Solutions Better for People and Planet
- Aspiration: 65% of DSM Products by 2020

Securing Sustainable Operations

Operation Aspirations	Long-Term Goals
• Leading in reporting benchmarks	Gold Class DJSI
• GHG efficiency improvements	40-45% (2008-2025)
• Energy efficiency improvements	>10% (2016-2025)
• Purchased electricity from renewables	50% by 2025
• Employee engagement favorable score	75% by 2020
• Safety: Frequency recordable index	.25 by 2020

Our Brighter Living Solutions are measurably better for the planet (Eco+) and people (People+). This strategy is aimed at driving profitable growth through science-based, sustainable solutions addressing the global societal issues of our time. Taking an example from our animal nutrition and health business, new ingredients from our Clean Cow dairy industry initiative demonstrated a 30% plus reduction in methane emissions and increases milk production, with no negative impact on animal welfare. We also strive for 65% of our products to have a measurably better impact on planet or people than competitors, based on standardised sustainability metrics.

DSM's Sustainability strategy is rooted in securing safe and sustainable operations, and an engaged workforce. Within our sites and factories we aim for substantial greenhouse gas (GHG) emmisions and energy improvement, and we aim to reach more renewable electricity and high employee safety and engagement. This is exemplified in our Dalry Scotland vitamin C production facility where the cradle to gate footprint of our product is lower than competing products. The smaller environmental footprint is possible because of superior emission control and waste water management, and an efficient heat and power station that exports electricity to the grid and receives credits for avoided electricity from other sources. DSM is building on strong foundations to secure our position as a sustainable company.

Apart from its focus on action to mitigate climate change, DSM recognizes resource scarcity as an important societal issue. To secure future availability of natural resources, we need to apply principles of careful resource management and unlock more value from the limited resources that are available. DSM has the opportunity to mitigate resource scarcity with solutions that prevent of food waste, including food preservation, increasing the durability of materials, enabling re-use of materials and reducing the use of scarce resources by creating renewables. In order to reduce the demand from our economy on nature's limited resources, DSM is committed to extending the lifetime of materials and products, and leveraging partnerships.

With the large societal issues in mind, we have identified different and distinct levers that drive our product innovation. These levers, help developers and marketers to understand how a measurably better impact can be made for planet and people. The different drivers can all be substantiated with life cycle assessments that address the environmental and social impacts of products impacts along their life cycle. The drivers are also used to review our innovations under development. By doing so we want to steer our full portfolio of products and innovations towards the best positive impact on society.

With our Brighter Living Solutions, Eco+ and People+ we provide products and innovations that are measurably better for people and planet.

WFP World Food Programme wfp.org | DSM — Improving nutrition. Improving lives.

sightandlife

DSM Nutritional Products

Representing the Life Sciences competency of Royal DSM N.V., DSM Nutritional Products contributes €5,169 million to annual sales in 2016 and is organized around three market-facing entities: Animal Nutrition & Health, Human Nutrition & Health and Personal Care. More about DSM Nutritional Products: https://www.dsm.com/corporate/about/business-entities/dsm-nutritional-products.html

Animal Nutrition & Health addresses the nutrition additives segment of the feed and pet food markets. Human Nutrition & Health largely addresses nutrition and functional ingredients segment of the food markets. Personal Care is focusing on the actives and ingredients in the sun care, skin care and hair care industries.

DSM is the only producer who can supply the complete range of vitamins and carotenoids in the most suitable forms for all possible animal and human uses.

DSM has established leadership positions across all three areas of the ingredients business: feed, food and personal care. DSM is one of the world's leading producer of vitamins. DSM is working from its strong global presence in key value-added ingredients offered through an international infrastructure and reach.

DSM is uniquely involved in all three steps of the value chain: the production of pure active ingredients, their incorporation into sophisticated forms, and the provision of tailored premixes. Being the only fully integrated player allows DSM to differentiate itself all the way through the chain.

Managing the interdependencies between active ingredients, forms and premixes, which have important implications for innovation, logistics, and value delivery, is a core competence of DSM.

Striving to earn the title of "Trusted Partner"!

DSM Nutritional Products, Animal Nutritional & Health, Approach to Quality and Safety

Petfood manufacturers and the suppliers that serve them are aware that pet food is a very highly regulated industry. Its standards for safety and quality are equal to, or in some cases, surpass those of the human food industry in some countries.

From a business perspective, managing safety and quality is about mitigating risk to your product's brand. The owners of a retail brand of pet food or snack that harms a companion animal will experience a cascade of events detrimental to their business. These events include immediate loss of sales, scrutiny by the regulatory authorities, possible lawsuits, and public rejection; events that may be severe enough to destroy the brand.

As a leading supplier to this industry, DSM has a global quality and safety standard for our products, including premix, with the goal of meeting or exceeding the expectations of the leading petfood brand owners in the market. Our global quality standard is based upon our 5 Q Values.

Our 5 Q Values take into consideration: Food Safety, Trusted Supply Chain, Closing the Loop, Traceability, and Sharing and Learning.

The DSM quality and safety program is designed around ***food safety*** standards and managed by a worldwide team of qualified quality and safety managers passionate about food safety. These experts are responsible for administrating our quality and safety program, which includes as the central element the Hazard Analysis of Critical Control Points (HACCP), which follows World Health Organization standards and comprises sanitation standards, pest control systems, and minimizing cross-contamination. We also know that for this program to be successful it is important to create a high level of internal awareness around every aspect of safety and quality along the entire supply chain, creating a company culture that lives out safety and quality behaviors that embrace well-designed SOPs. DSM is dedicated to standardizing and ensures the integrity our program across the globe by conducting routine audits of all DSM facilities by a Corporate Operational Audit team (COA). Our facility managers will tell you that they would rather have our customers audit them than the COA team due to the strict guidelines.

The integrity of our food safety program is the basis for a ***Trusted Supply Chain***. This starts with vendor qualification and management processes in line with food safety standards. Success is achieved further through our supply chain by leveraging our excellence in analytics based on our long history in the chemical and biosciences industries, maintaining robust and integrated documentation, goods receipt, and warehouse management systems.

Mindful of the risks to both our customers and the sustainability of our business, perpetual improvement of this food safety program is part of our business strategy, we call ***Closing the Loop***. This means, that we not only have the tools in place to do a thorough root cause analysis on deviations, we have the tools in place for change management, the process and techniques to manage the people side of change. This assures the adoption and the realization of a change are well in control and the risk minimized. To ensure we are Closing the Loop, our food safety mindset is integrated into our ideation and innovation workstreams.

The process of manufacturing bioactive micro nutrients and microorganisms, and blends of these micro ingredients, is complex from a quality assurance perspective. We sell these micro ingredients to producers of retail products covering a broad array of dietary needs, ranging from concentrated dietary supplements to pet foods designed to deliver 100% of the animal's nutritional needs. Due to this complexity, and the safety concerns associated with these types of retail products, it makes sense that ***Traceability*** is included as one of our 5 Q values. At DSM, the integrity of our quality systemis constantly checked and trained in mock recall and track & trace exercises to provide an assurance of safety and functionality. Rapid and accurate notification of a recall to our customers is the heartbeat of our emphasis on Traceability – only topped by the constant work to prevent these cases.

The DSM 5 Q values ***Sharing and Learning*** help us stay ahead of the curve. By DSM managing quality and safety on a global scale, using Compliance Quality Management (CQM) TrackWise® system and other companywide web-based training tools, every DSM employee becomes integrated into our global quality and safety program.

Having the right quality and safety processes in place are mandatory, but at DSM we believe you can only achieve the highest level of risk mitigation if you integrate a consciousness of quality and safety across all employees and it becomes part of your company's culture.

Our company recognizes that with business growth becoming more dependent on offering premium petfoods, and a heightened awareness of food safety among consumers, suppliers need to be trustworthy partners oriented towards mutual success. DSM strives to earn the title of "Trusted Partner"!

Innovation Starts with an Idea!

It is not only about the idea, it's what you do with it!

Idea Generation, often called "Ideation" is the creative process of generating, evaluating and communicating new ideas. Within DSM, this takes place in a variety of ways:

Innovation Idea Generator: A continuous exchange of ideas. Often the "seed" that gets people to think in new ways. Every DSM employee has access to a simple tool to enter their ideas for consideration.

Ideation Workshops: A direct way to brainstorm, collect & evaluate ideas during highly participative workshops, or as we call them "play shops" events.

Campaigns, Challenges & Competitions: Topic-specific focus to solve a specific question or problem. A fast way of gathering ideas.

Coaching & Shaping ideas: A process of facilitation to shape the idea by identifying the potential value design prototypes, run pilots or proof-of-concepts.

Business Service Modeling: We use the Enterprise Design Canvas to combine the powers of Innovation & Business Architecture!

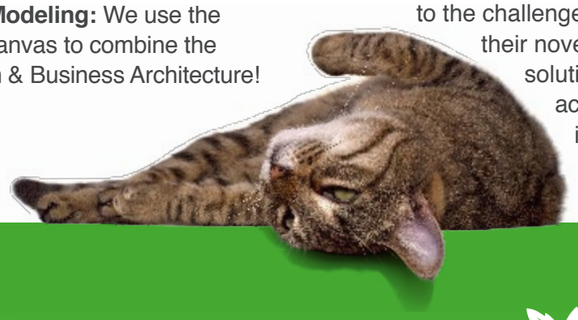
DSM Venturing is an active investor in start-up companies, which create innovative products and services in Life Sciences and Materials Sciences that contribute to the quality of life. DSM Venturing's mission is to explore emerging markets and technologies in order to support DSM's innovation and growth strategy.

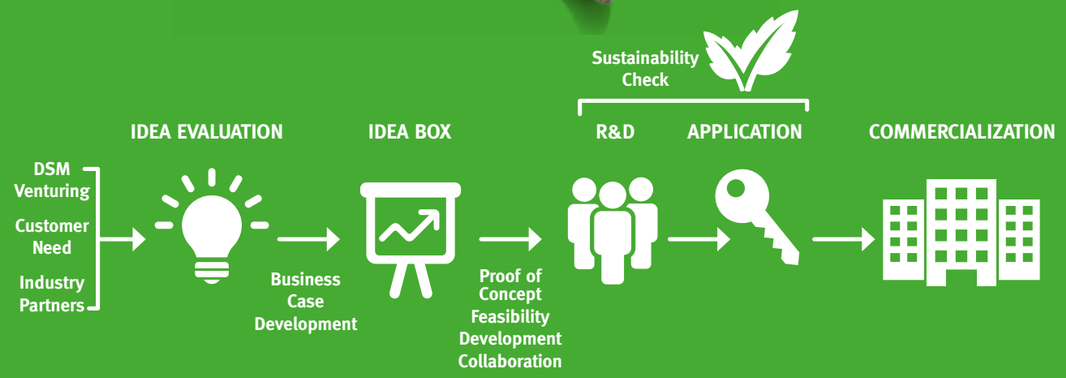
Besides financial support, we offer start-up companies access to DSM's knowledge base, resources and networks creating a business relationship based on mutual benefits and shared learning.

To DSM businesses we offer a window to the world of innovations that are taking place in the global start-up community; an inroad to collaborations/ partnerships/licenses/supply & marketing relations with start-up companies; and an option to spin in 'outside' innovations.

DSM Venturing is an integral part of DSM's open innovation approach, focused on teaming up with innovative players all over the world.

Customer need plays an important role in the ideation process at DSM. We starts by listening to the challenges our customers face and their novel ideas that lack commercial solution. Mutual success is often achieved when both parties view ideation within a framework of collaboration.





Seeking ideation from *Industry partners* combines the benefits of a mutual attraction to a particular market with often very different perspectives on the approach to solving a problem. Couple this with differences in core competencies and experience, it is not hard to envision how this would yield a novel approach.

At DSM Nutritional Products, ideas from all sources are channeled into what we call the idea box. In this stage of the process, dedicated innovation project managers review the ideas for alignment with our core competencies, scope relative to the markets we serve, and economic feasibility. The best candidates for further exploration are prioritized and formal projects are created. The project managers build a preliminary business case with minimum impact to those involved in daily business operation. This clears a rather significant resource management issue that often stalls the innovation process.

In the project phase, these new ideas will undergo a series of steps which *include proof of concept trials, sustainability check, and an application-specific evaluation*. During this phase we often collaborate with key accounts which can shorten the development cycle and provide our customer a first-to-market advantage.

Ultimately project success leads to *commercialization*, making the idea available to the world.

History of DSM

Re-Invention of a Successful Company

1902

DSM founded as Netherlands state owned mining company "DSM – De Staats Mijnen." Mining activities focus on the Limburg region in the South of the Netherlands.

1920

Bituminous quality of coal leads to diversification into fertilizers, utilizing the ammonium from coking gas resulting in production of first ammonia based fertilizer.

DSM

1940

Construction of Central Laboratory in Geleen.

1963

DSM's first Steam-cracking installation opened.

1950's

In response to global decline in coal use and increasing importance of polymers, DSM focuses on providing industrial chemicals and raw materials for synthetic fibers and yarns based on oil and natural gas.

1989

DSM shares floated at the Dutch stock exchange (today Euronext).

1975

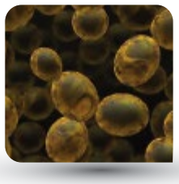
Dutch Prime Minister officially closed the country's last mine.

1970's-1980's

DSM diversifies into high performing plastics and fine chemicals.

1990's

DSM moves into products for the food and pharmaceutical industries as well as performance materials for the automotive and electronics sector.



1996

DSM acquires biotech and fermentation company Gist-Brocades, a global leader in yeast, yeast extracts, antibiotic production and enzymes, broadening DSM into a life science company.

Hoffman-La Roche

1933

Commences industrial synthesis of vitamin C based on the process of Nobel prize winner Tadeusz Reichstein.

1938

Establishment of industrial production of vitamin A, B1, B2, E and K.

1950

Development of the chemical synthesis of ß-carotene.

2015

- Acquisition of Aland, which was founded in 1990 and is one of the leading Vitamin C manufacturers in China. In 2014 the company realized net sales of about USD 110 million in vitamin C with around 1,800 employees.
- DSM and CVC Capital Partners finalize their partnership, ChemicalInvest, for DSM's Polymer Intermediates and Composite Resins.

The world's strongest fiber:

In the 1990's DSM developed Dyneema®, the world's strongest fiber. Initially developed for cut resistant fabrics and bullet proof vests it is 40 times stronger than steel. Now used in numerous applications ranging from fishing lines to ropes in offshore applications, high performing fabrics or reinforced & durable materials for vehicles and power plants. Latest focus is on the use of Dyneema in invasive medical applications.

Industrial biocatalysis:

In the early 1970's DSM implemented the first industrial biocatalytic process. Chiral amino acids are produced using specific enzymes, able to synthesize target enantiomers with exceptional purity. A whole toolbox of enzymes and chemical catalysts is now available for producing chiral ingredients for the pharmaceutical industry.

Clean antibiotics production:

In 1996 DSM pioneered the first commercial production of semisynthetic antibiotics based on microbial fermentation instead of chemical synthesis. Identifying new enzymes and constructing new biosynthetic pathways by modern genetic technologies allowed a dramatic decrease in the environmental impact of antibiotic production.

Sustainability through enzymes:

40 years experience in enzyme application has resulted in a large range of enzymes based solutions. DSM's global alliance with Novozymes (DK) provides a wide range of feed enzymes which, together with enzyme solutions for second generation biofuel and biogas processes, makes a tremendous impact on a sustainable development of global food production.

High yielding cell culture technology:

Since 2002 DSM, in collaboration with Crucell (NL), has developed a leading technology for the production of antibodies applying human cell lines. The technology allows human cells to be cultivated in high density resulting in an efficient biosynthesis at high quality. DSM is licensing out this technology to its customers and acts as development and manufacturing partner.

Bio-based performance materials:

In 2010 DSM started to introduce a series of bio-based resins for the automotive industry, proven to match the high performance and speed of traditional chemical products. Palapreg® ECO and EcoPaXX® are composed of more than 50% renewable resources helping the industry to meet sustainability targets. They are used in bodyworks, engine compartments and transparent casings for head lamps.

2005

World's largest production plant for vitamin E opens in Sisseln Switzerland.

2003

DSM acquires Roche's Vitamins and Fine Chemicals Division, forming DSM Nutritional Products, providing the full range of fat-soluble and water-soluble vitamins, carotenoids, long chain polyunsaturated fatty acids, enzymes and nutra-ceuticals to the feed, pet food, food, pharmaceutical and personal care industry.

2006

Global premix strategy initiated to grow the global premix network for high-quality mixes.

2008

New regional headquarter inaugurated in Shanghai (China).

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2011

- DSM acquires Martek Biosciences
- Rebranding of One DSM

2012

DSM acquires Ocean Nutrition and Fortitech

2013

DSM acquires Tortuga

2014

- DSM opens the China Animal Nutrition Center in Bazhou, China. It is focusing on swine and poultry nutrition and has the capability to conduct world-class scientific and application research.
- POET-DSM Advanced Biofuels, LLC, a joint venture of Royal DSM and POET, LLC, opened the first commercial scale cellulosic ethanol plant in the U.S.
- Royal DSM and JLL Partners create a joint venture, Patheon N.V., combining Patheon Inc. with the pharmaceutical assets of DSM.

Nutritional Ingredient Production

Backward integration underpins superior quality standards

DSM Nutritional Products operates nine bulk manufacturing and formulation sites across Europe, the United States, Latin America and China. These sites produce the majority of DSM's nutritional ingredients, which are sold either as straight products or as premixes and vitamin concentrates.

Our products are micro ingredients whose functionality is specific and whose impact can be enormous. It is therefore imperative to manufacture, package, store and ship them in accordance with the highest quality standards. Whether provided as straight products in bulk or as premixes tailored to individual customer needs, our products always meet the most stringent quality requirements.

We work to a unique global quality standard. This is rooted in the official regulations that give us our license to operate and is supplemented by our owninternal quality systems. Full backward integration allows us to assure quality at every step of the supply chain. We deliver to our customers via a dedicated logistics network based on three main distribution centers. These are located in Venlo (NL), Belvidere (USA) and Singapore.

Belvidere, USA
Located adjacent to the Delaware River in New Jersey this is the production site for arachidonic acid and formulations of various vitamins including vitamin E for food applications.

Freeport, USA
Freeport, Texas is the location of a site specializing in the production of beta carotene and intermediates for other carotenoids.

Kingstree, USA
The Kingstree, South Carolina plant is dedicated to the production of nutritional lipids by algal and fungal fermentation.

Naperville, USA
Hydroxy-vitamin D destined for feed applications is produced at this site near Chicago.

Nova Scotia, Canada
The plant in Mulgrave, Nova Scotia is dedicated to fish oil processing and refinement while the plant in Dartmouth, Nova Scotia is dedicated to microencapsulation of these oils.

Mairinque, Brazil
Formerly Tortuga, this DSM site produces a full range of organic mineral chelates for use in the animal nutrition and health industry.

Dalry, UK
Located in Ayrshire, Scotland the site is involved in the production of vitamin C and related derivatives and also the production of Panthenol and Ca-Pantothenate.

Leon, Spain
DSM's Leon site is dedicated to the production of natural carotenoids, such as beta-carotene and lycopene.

Village Neuf, France
Formulations of several vitamins and carotenoids are produced at Village Neuf which is also the production site for STAY-C® stable vitamin C forms for feed applications. The site also includes a premix unit for food applications and the DSM Research Center for animal nutrition.

Grenzach, Germany
Located adjacent to the Rhine in Southern Germany, this site primarily focuses on the production water soluble B vitamins, vitamin D and vitamin C derivatives. In addition intermediates used in the production of carotenoids are produced.

Sisseln, Switzerland
Sisseln is the production site for several carotenoids and vitamins A & E. Other operations include the purification and formulation of Ω3 fatty acids, the formulation of several vitamins for various applications and the custom synthesis of pharmaceutical intermediates. Sisseln is also home to our pilot plant and development center.

Novozymes, Denmark
Novozymes is DSM's Feed Enzymes Alliance partner for more than 10 years, researching, producing and formulating a portfolio of enzymes for use in the animal nutrition and health industry across the globe.

Xinghuo, China
The Xinghuo site is located close to Shanghai. It is specialized in the formulation of vitamin E for feed applications and also includes a premix production facility for food and feed applications.

Premixes and Blending

Product services where customers need them

Delivering Flexible Precision Nutrition

Pet owner and consumer awareness level surrounding the health benefits relating to vitamins and minerals, and other functional ingredients is high, often supporting the 'reason to believe' important label claims such as supporting immune function and bone and joint health. Consequently, this growing health benefit awareness, has led to the use of a more diverse list of micronutrients and functional ingredients in pet foods to support specific dietary label claims.

DSM has over 50 years of experience producing premixes for use in animal nutrition products. Premixes are blends of micronutrient and other functional ingredients as well as suitable carriers. Our experts work closely with customers to develop premixes that deliver the ingredient solutions needed to substantiate functionality claims made on labels, ensure accurate addition of these ingredients into pet foods, treats and supplements, all with the goal of achieving the highest possible food nutritional quality and safety. In addition to meeting functionality claims, we can often meet non-GMO, organic, country of origin and grain free requirements.

We have a global network of over 40 premix plants to ensure that we are close to where our customers are.

Why do you need a premix?

Individually weighing and adding many of the very low inclusion micronutrient ingredients separately during the pet food production process carries a high risk. Weighment inaccuracies and poor distribution of very small amounts of the separate micro-ingredients within the final pet food product could affect its nutritional quality or even safety at the point of consumption. Premixing micro ingredients together, for incorporation into the pet food, treat or supplement macro material mix ensures the active micronutrient particles are distributed more uniformly throughout the final product. DSM premixes are a critical link in the pet food supply chain and allow accurate, safe, and homogeneous micronutrient and functional ingredient inclusion into pet food products.

DSM Premix Production

Premixes produced by DSM are backed through our global assurance of safety and quality. DSM continuously evaluates its responsibilities and the implication of our footprint in the feed and pet food supply chain. DSM's premix production and ingredient supply chain is designed around food standards and our 5 Q values: Food Safety, Trusted Supply Chain, Closing the Loop, Traceability, and Sharing and Learning, discussed at length on page 4.

10 Things You Need to Know About Premixes

Approximately 80% of the pet food industry uses premixes in the production of their complete and balanced pet food products. A premix is a blend of micronutrients that are individually added to pet food in "micro" amounts. Combining these ingredients in a premix simplifies the weighing process and improves accuracy in mixing and distribution of these micro-nutrients throughout the food. But, if you think a premix is "just a blend," think again.

Based on more than 50 years of experience producing micronutrients and premixes for the animal nutrition and health industries, ask your DSM representative to share the facts about **The 10 Most Important Things You Need to Know About Premixes:**

1. Nutrient form quality
2. Nutrient form potency
3. Nutrient form stability
4. Nutrient form physical characteristics
5. Carriers and other adjuncts
6. Mixing equipment and procedure
7. Premix formulation and use rate
8. Quality program
9. Handling of premixes
10. Pet food process and point of addition

Integrated Supply Chain
DSM manufactures their own range of ROVIMIX® vitamins along with many other key micronutrients. DSM therefore has a unique ability to control the origin of many ingredients used within a premix. DSM's integrated vitamin production and premix supply chain is unrivalled.

Vendor Control
Strict control of all ingredients used in premix is essential. Since we are not restricted to only supplying the ingredients that we produce, non-DSM raw materials are sourced from suppliers in compliance with our 5 Q Values. We understand the importance of selecting and sourcing ingredients that will protect brand equity for all in the supply chain.

Track and Trace
Traceability is a vital component of pet food safety. DSM's sophisticated global production, quality, purchasing and raw material intake systems are linked. DSM sites use a bar coding system which allows ingredients used to be tracked through from intake at the premix plant– the entire premixing process and finally to delivery to the customer. This means we can rapidly track and trace any ingredient used in any premix, meeting the prompt response times demanded by our customers should the need arise.

Analytical Expertise
DSM premixes are formulated and manufactured to meet the highest standards for product quality, safety, efficacy, and traceability while meeting strict regulatory requirements. Routinely, premix quality, plus individual ingredients are checked in our own laboratories located at the premix sites and at our global analytical centers.

Nutritional sufficiency against specification, undesirable residues and routine micro-biological testing is carried out in accordance with DSM quality requirements, local and global regulation. Regular dispersion tests are also carried out to check the efficiency and quality of our premix mixing to ensure we deliver a homogenous premix to our customers.

Europe
Our network of thirteen (13) premix plants across Europe, the Middle East, and South Africa allow us the flexibility needed to supply and serve customers in the region.

North America
Our four (4) North American premix plants assure customers service reliability in the supply of premixes across the United States and Canada.

Latin America
DSM premix is produced in most Latin American countries with a total of thirteen (13) premix plants.

China
DSM has the fastest expanding network of premix plants in China and serves most areas of the country from six (6) sites.

Asia Pacific, Oceania
DSM has premix production capabilities in all the major feed/pet food producing and exporting countries in the region with a total of nine (9) plants.

Nutritional Ingredients

A Brief Guide to Vitamins

DSM produces an extensive portfolio of nutritional ingredients for use in pet food products and supplements including minerals, vitamins, carotenoids, and long chain polyunsaturated fatty acids. These products deliver a wide range of health benefits to all pet species.

Vital for the efficiency of a broad array of functions in the body, the DSM vitamin range contains all the vitamins crucial for healthy, thriving, long-living pets.

Vitamin A

Necessary for vision, growth, and tissue differentiation. Is important for keeping the skin, eyes, and inner linings of the body healthy and resistant to infection. Vitamin A is also needed for the maintenance and growth of teeth, nails, hair, bones and glands.

Vitamin D

Helps the body maintain and utilize the levels of calcium and phosphorus needed to build strong bones and teeth. Recent studies have shown additional benefits such as supporting immune health, weight management, and cancer prevention.

Vitamin E

Helps protect cell membranes, maintain the immune system, prolong the life of red blood cells, maintain a healthy circulatory system, and improve vitamin A use. Important for the health & proper functioning of body tissues. Is an antioxidant, neutralizing free radicals.

Vitamin K

Essential for the clotting of blood and may help maintain bone health.

Vitamin B1, Thiamine

Helps the body use its major source of energy, carbohydrates. Thiamine is also essential for proper muscle coordination, the maintenance of peripheral nerve tissue, and for normal growth.

Vitamin B2, Riboflavin

Helps the body transform proteins, fats, and carbohydrates into energy. Helps maintain healthy skin and eyes and is also necessary for building and maintaining body tissues.

Vitamin B3, Niacin

Niacin and niacinamide are essential for fat synthesis, protein metabolism, and the conversion of food to energy.

Vitamin C, Ascorbic Acid

Aids in the production of collagen, which provides support to muscles, vascular tissues, bones, & cartilage. Aids the absorption of iron and improves teeth and gum health. Is an important water soluble antioxidant. Enhances the immune response and plays a protective role against cardiovascular disease, cataracts, and certain cancers.

Vitamin B5, Pantothenic Acid

Essential for the formation of certain nerve-regulating substances and hormones. It is also required for metabolism of proteins, fats, and carbohydrates.

Vitamin B6, Pyridoxine

Necessary for energy metabolism, the formation of certain proteins, and the use of amino acids. It also helps the nervous system to function properly and is essential to a healthy immune system and heart health.

Vitamin B12, Cyanocobalamine

Necessary for the formation of DNA and the production of healthy red blood cells. Helps maintain the nervous system and is essential to maintaining mental function. Vitamin B12, along with B6 and folate, is essential to heart health.

Vitamin B9, Folic Acid

Required for the formation of red blood cells, certain body proteins, and genetic materials for the cell nucleus. Emerging science suggests it may play an important role in reducing risk of cardiovascular disease, dementia, and certain cancers.

Vitamin H, Biotin

Necessary for synthesizing fatty acids and breaking down protein and carbohydrate molecules. Helps in the maintenance of the thyroid and adrenal glands, nervous system, reproductive tracts, and skin.

Nutritional Ingredients

Delivering Healthier Pets

DSM's portfolio of nutritional ingredients includes: a range of carotenoids used for either antioxidant functionality or pigmentation, natural sources of omega-3 fatty acids, and trace minerals; all supporting the health and wellness of pets.

Carotenoids

β-Carotene (ROVIMIX®, CaroCare®)

β-carotene is an important source of vitamin A, converted into vitamin A as required. The additional health promoting effects of β-carotene include antioxidant functionality protecting cells, tissues, and organs from free radical damage and as a contributor to the robustness of the pet's immune system.

Canthaxanthin (CAROPHYLL® Red)

Canthaxanthin is a carotenoid that has dual functionality in birds and fish, skin/feather pigmentation and biological antioxidant. As an example of pigmentation, the feathers of a flamingo can range from pink to red depending on the amount of canthaxanthin in its diet. The biological functionality as an antioxidant, protecting cells from free radical damage and sparing vitamin E.

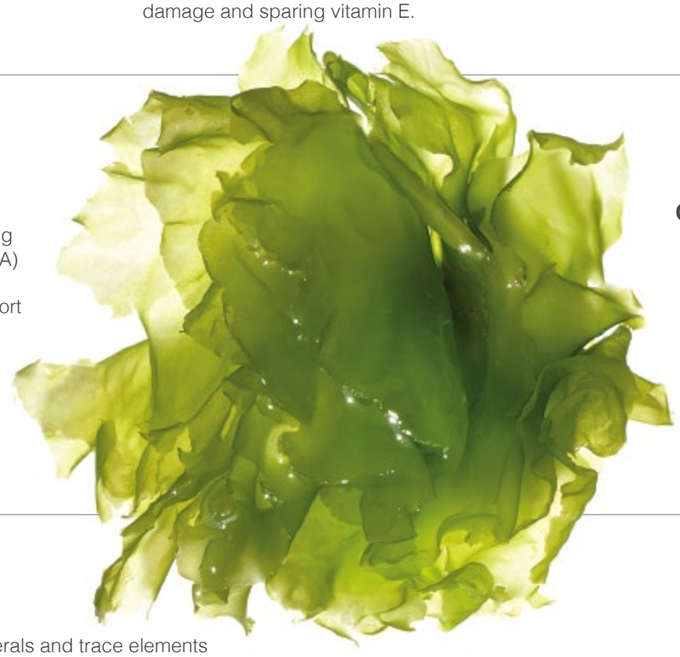
Astaxanthin (CAROPHYLL® Pink)

Besides pigmentation, astaxanthin is a carotenoid that is recognized as being one of the most powerful antioxidants found in nature. Other health benefits associated with astaxanthin include eye health and immune function support.

Nutritional Lipids

Omega-3 from Algae

DHA omega-3 derived by algal fermentation containing docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA), fatty acids that support cardiovascular, eye, and brain health (e.g. memory), and directly reduce cellular inflammation supporting joint, skin, and coat health.



Omega-3 from Fish

Highly refined and deodorized fish oils containing both eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA).

Minerals and Trace Elements

Examples of important minerals and trace elements

Selenium (Se)

Selenium is an antioxidant that protects cell membranes.

Iodine (I)

Iodine is essential for proper thyroid gland function.

Copper (Cu)

Copper is involved in energy production, connective tissue formation, iron metabolism, normal red blood cell formation, normal nervous system function, neurotransmitter synthesis and metabolism, melanin formation for pigmentation of hair and also has an antioxidant function as part of super oxide dismutase.

Manganese (Mn)

Manganese contributes to the formation and quality of the bones and joint cartilage while also playing an active role in the functioning of the mitochondria.

Zinc (Zn)

Zinc is involved as a co-enzyme in many cellular enzyme systems and impacts carbohydrate, lipid, protein and nucleic acid metabolism. It is crucial for collagen and keratin synthesis contributing to skin integrity and coat quality. It is also needed by the immune system and plays an important role in reproduction.

Iron (Fe)

Iron is an essential component of the oxygen carrying hemoglobin in the red blood cells and intramuscular myoglobin, helps support immune function, and is an integral part of many important enzymes systems including those supporting energy production, DHA synthesis, and functionality as a cellular antioxidant.

Knowing Pet Product Technologies

Understanding How Different Pet Product Technologies Influence the Application of Nutritional Ingredients

The pet food market is characterized by a wide variety of different product forms. This occurred because ingredient forms were developed to support changes in formulation, process conditions, and packaging.

Specially formulated nutritive and functional ingredients are often the key to the successful development of foods, treats, and supplement products. As a leader in nutritional ingredient form development, DSM offers a comprehensive range of ingredients suitable for the full range of manufacturing processes and formulation options our customers use to create products with distinct points of differentiation.

Wet Products

Wet food styles include loaf (pate) and chunk-in gravy foods and treats. Initially, meat and other ingredients are mixed with or without heat for various periods of time. This mixture is either placed in a container, sealed and cooked at a high temperature or cooked using a steam tunnel, formed into chunks, sealed in a container with gravy, and cooked again at a high temperature. For this application, nutritive ingredients need to be resistant to moisture, oxidation, enzymes, and extreme changes in temperature throughout manufacturing. Finally the finished product color must not be adversely affected plus remain shelf stable for 24 months.

Extruded Products

Extrusion, one of the harshest processing technologies, is used to produce food and treat products. This process typically requires ingredients to be exposed to high temperatures, pressure, moisture, sheer, rapid expansion, and a drying step. For this application, nutritive ingredients need to be resistant to rapid changes in temperature, pressure and moisture heat, sheer, and oxidation throughout manufacturing plus remain shelf stable for 18–24 months.

Baked Products

Food, treat, and flaked products are manufactured using baking. Initially, dough is formed exposing the ingredients to moisture and sometimes enzymes. The formed dough is heated to the desired degree of cook and dryness. For this application, nutritive ingredients need to be resistant to heat, moisture, enzymes, and oxidation throughout manufacturing plus remain shelf stable for 18–24 months.

Milk and Fatty Liquids

High fat (oil) paste and liquid products range from infant food to lubricants for the gastro-intestinal tract to aid mobility and control hairballs. During manufacturing these types of fatty liquids often experience high shear during mixing and homogenization, high temperatures during sterilization, and unwanted enzyme activity. For this application, nutritive ingredients may need to be resistant to UV light, oxidation, sheer, high and rapidly changing temperatures, enzyme activity, display high miscibility and emulsification properties during manufacturing plus remain shelf stable for 3 to 24 months without causing sedimentation or other negative product attributes.

Compressed Tablets

Tablets are swallowed, chewed or dissolved to deliver their functional ingredients. During manufacturing the ingredients may be ground and screened to obtain a uniform particle size. The final blend experiences pressure and sheer while forming the tablets. Depending on the packaging, the tablets may be exposed to moisture and oxygen. Some tablets are formulated to effervesce when added to water subsequently exposing the ingredients to moisture, changes in pH, and further oxidation for an undefined period of time. For this application, nutritive ingredients need to be resistant to pressure, shear, oxidation, and possibly reduction in particle size, changes in pH and moisture.

Injection Molding

This process is used to manufacture treats and chews where appearance, structure and actual product design are major challenges. This process usually involves high temperatures with a low sheer and moisture. For this application, nutritive ingredients need to be resistant to high and changing temperatures, and oxidation. The finished product color and hardness must not be adversely affected and remain shelf stable for 24 months.

Clear Solutions

Bottled waters are sometimes used to deliver functional ingredients. Unlike other liquid products, formulating while maintaining clarity is the challenge. In addition to the attributes associated with manufactured liquid products, nutritive ingredients for this application must not react to other ingredients, UV light or oxidation causing a loss of nutritive value, coloration or sedimentation.

Dry Mixes and Powders

Dry mixture products range from supplements to milk replacers. Dry blends require ingredients that can be dispersed readily throughout the mixture, not prone to particle segregation/separation and are chemically stable. Some are designed to be added to liquids and must be readily soluble or miscible. For this application, nutritive ingredients usually need to be uniform in particle size and density, chemically and heat stable, have a low propensity to create an electrostatic charge, not attract moisture plus resist oxidation through manufacturing and storage. The finished product color must also not be adversely affected.

Knowing Nutrient Form Technologies

Leveraging Nutrient Form Technology to Achieve Your Pet Product Nutrition Goals

Form Requirements Bioavailability:

The nutrient should have a chemical structure which is fully metabolized and the product formulation should provide protection but release the nutrient upon ingestion.

Stability:

The ingredient must remain stable "as is" or in blends and premixes. Therefore the ingredient must be adequately stabilized in a chemical and/or product form which when stored, transported, milled, or mixed, maintains its activity. The product form must be resistant to activity loss due to environmental factors such as temperature, moisture, and oxygen.

Uniformity:

The particle size and size distribution determines how well the nutrient isdispersed throughout the finished product, impacting the nutrient activity per serving. A uniform product minimizes the tendency for nutrients to segregate when mixed and transported with other micro-ingredients, allows adequate flow through equipment during production and reduces dust formation when handled.

Consistency in Potency:

For reliable dosing of a nutrient in production, potency must be consistent both particle-to-particle and lot-to-lot. The availability of appropriate dilutions supports the accuracy of dosing during production.

Dissolution Behavior:

The form of the nutrient dictates its aqueous (water) or non-aqueous (fats or oils) solubility or miscibility. These physical characteristics influence the distribution of the functional ingredient in the final pet product, its color, texture and/or shelf life

The pet food sector is becoming increasingly sophisticated with the demand for a wide range of ingredients with different matrices, textures, colors, shapes and nutritional functionality as suppliers look to differentiate their products on the retailers' shelves.

External Factors Influencing Vitamin Stability

VITAMIN	Temperature	Oxygen	Humidity	Light	pH Acid	pH Alkaline
Vitamin A	✓✓	✓✓	✓	✓✓	✓	●
Vitamin D3	✓	✓✓	✓	✓	●	✓
Vitamin E-Acetate	●	✓	●	●	●	✓
Vitamin K3	✓	✓	✓✓	✓	✓✓	✓✓
Vitamin B1	✓	✓	✓	●	●	✓✓
Vitamin B2	●	●	✓	✓	●	✓
Vitamin B6	✓✓	●	✓	●	●	●
Vitamin B12	✓✓	✓	✓	✓	●	●
Pantothenic Acid	✓	●	✓	●	✓	✓
Nicotinic Acid	●	●	●	●	●	●
Biotin	✓	●	●	●	●	●
Folic Acid	✓✓	●	✓	✓✓	✓✓	●
Vitamin C	✓✓	✓✓	✓✓	✓	●	✓

●=Stable ✓=Slightly Sensitive to Sensitive ✓✓=Very Sensitive

Product Form Requirements

	Heat Stable	Moisture Stable	Shear Tolerant	Resistant to Oxidation	Not Adversely Affected by Enzyme Activity	Low Coloration and/or Small Particle Size	Compression Tolerant	Resistant to UV Light	Proper Solubility or Miscibility
Extrusion	●	●	●	●					
Baking	●	●	●	●	●				
Restoring/Steaming	●	●	●	●	●	●			
Fresh/Frozen		●	●	●	●				
Injection Molding	●	●	●	●	●				
Dry Mixing/Powder	●		●	●		●			
Tableting/ Compression	●		●	●		●	●		
High Fat Liquid	●	●	●	●	●	●		●	●
Low Fat Liquid/Milk	●	●	●	●	●	●		●	●
Clear Water	●	●	●	●		●		●	●






Production of Ingredient Forms

Production: Functional ingredients such as vitamins or carotenoids are produced either by chemical synthesis, by fermentation, by extraction (often from a natural source) or by a combination of these technologies.

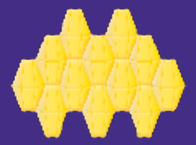
Modification: Once the basic functional compound is produced it may be further processed to develop a more stable chemical form, using processes such as crystallization of an organic salt, esterification and phosphorylation.

Formulation: To achieve specific product characteristics the ingredients then undergo a formulation process. Such formulation creates highly specified nutrient forms optimally equipped to meet the specifications within a pet food, food or feed product.

Formulation Technologies

Crystalline grades

Nutrient compounds are chemically modified to form organic salt which after drying are not further formulated but used "as is". Optionally crystalline material can be coated with ethyl cellulose which slows any possible detrimental influence of other ingredients present in the formula.


Nutrient in crystalline form

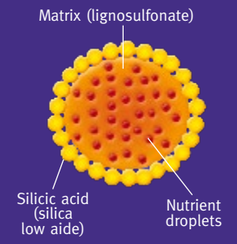
Adsorbates

Suitable carriers such as silica particles are prepared for adsorbing mainly fat soluble nutrients. Adsorption has the advantage of delivering an economically attractive dry form of an intrinsically stable nutrient, and results in a free-flowing powder with good mixability, flow-ability and dust characteristics.

Nutrient adsorbed on silica particle

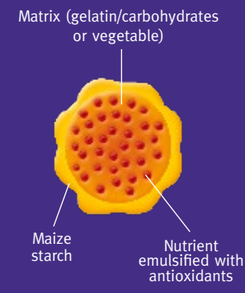
Spray-dried powders

Spray-drying is applied for many of the water soluble nutrients to enhance stability, handling and distribution. The nutrient compound is added into a dextrin solution. The solution is spray dried into a powder, which offers a variety of advantages including stabilizing the nutrients and delivering it in a digestible matrix.



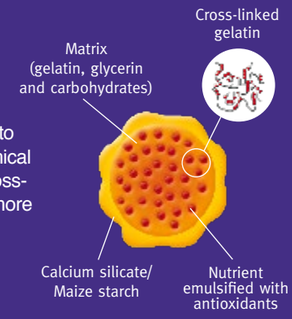
Beadlets

In beadlet technology nutrient compounds are emulsified in a gelatin, starch and glycerin matrix, with an antioxidant sometimes added to increase stability. The emulsion is then sprayed to form beadlets which are coated with corn starch to absorb excess moisture. Moist beadlets are dried to produce the finished beadlet. Micronization of the often oily functional ingredient allows the production of stable, yet dispersable beadlets for clear liquids.



Cross-linked Beadlet

Additional chemical bonds are introduced to create a hardened beadlet most commonly referred to as a cross-linked beadlet. A chemical reaction occurs which creates cross-linked bonds thereby creating a more rigid structure. This technology provides excellent stability and is used to protect nutrients in high temperature applications.



Pet Nutritional Solutions
by DSM

The humanization of pets has been the driver behind significant growth of premium and superpremium pet food and snack products across the globe. It is increasingly more difficult for those responsible for brand development to create points of differentiation based on nutritional claims considering regulatory and economic constraints. Although there are many functional ingredients being marketed to pet food manufacturers, those registered for use in pet foods which allow substantive health claims are rare.

DSM is uniquely positioned to provide nutritional solutions designed to help you make your products attractive to the health-conscious pet product consumers purchasing premium and superpremium products for their furry children. Here are a few reasons why:

- **GLOBAL LEADER IN NUTRIENT MANUFACTURING AND PREMIX**
  Beginning with the first synthesis of vitamins 100 years ago, we have unparalleled experience in the manufacture of a broad array of micronutrients, functional ingredients, and premix to create solutions in the best form for the application.

- **INGREDIENTS AS TOOLS**
  We leverage our broad portfolio of innovative, high-quality health nutrients and work with other leading ingredient manufacturers to create quality solutions.

- **KNOWLEDGE AND EXPERIENCE**
  We combine over 30 years of active engagement in the science of measuring animal and human nutrition and health efficacy with collaborative projects with academic and industry specialists to create robust solutions.

- **PET INDUSTRY DEDICATED TALENT**
  We have a dedicated team of pet industry specialists experienced in pet food manufacturing and marketing to create solutions that are relevant.

- **INVESTED IN STUDYING PET CONSUMER INSIGHTS AROUND THE GLOBE**
  Ultimately consumer perceptions drive the success of any nutritional solution, which is why we invest in studies to help us create solutions that help you be successful.

Talk to your DSM representative to learn how we can deliver the right solution for your brand.

Optimum Vitamin Nutrition
DSM Vitamin Supplement Guidelines

Leveraging the full potential of vitamins, nutrition that supports a long and healthy life.

Why are vitamins important to pets?

Vitamins are involved in most metabolic functions, as essential for companion animals as they are for humans. Although vitamins play a significant role in the health and well-being of companion animals, the animal feed industry only sets vitamin fortification levels for complete feeds at a minimum amount required to prevent overt clinical deficiency, without guidance on application specific considerations (e.g. process and storage loss).

The pet industry is beginning to consider vitamin requirements in the wider context of optimum levels, but the trend remains to only follow evidence based upon limited studies of low complexity. Such an approach generally negates experience or intelligent interpretation or extrapolation of aspects of physiological processes associated with diseases and comparative nutrition as the evidence based approach tends to only consider “hard” end points of trials.

In the context of determining Optimum Vitamin Nutrition for companion animals there should be perhaps a subtler set of considerations as to what constitutes a positive response to vitamin supplementation. OVN™ is a move to maintaining overall animal well-being rather than preventing a clear-cut deficiency, which includes functional improvements, like coat condition, outward signs of cognitive function, antioxidant status or stamina during exercise. This is an important point to recognize in your development of quality pet food.

Is OVN™ more than choosing the right vitamin levels in my product formulation?

OVN™ is a DSM solution designed to provide you with practical help formulating the correct vitamin supplement pack in alignment with your brand and business goals. How is this done?

- It starts with DSM’s OVN™ guidelines used to identify the amount of vitamin activity you need to target in your product at the time of consumption to meet NRC, AAFCO, and FEDIAF guidelines on minimum vitamin requirements plus any additional vitamin activity needed to support desired health claims.

- Our experts then select the most technologically advanced vitamin ingredient forms designed for the application, in compliance with key global regulations and DSM’s quality and safety program, and with the appropriate overages to account for losses through the product’s manufacturing process and storage ensuring the correct level of vitamins are consumed by the pet.

- These experts further formulate and produce a pre-blend or premix of these vitamin ingredients leveraging our knowledge and experience producing pet food premixes, considering many factors including proper dilution for accurate dosing and handling characteristics.

- No solution would be complete without a consumer friendly OVN™ logo as a symbol of the optimum vitamin nutrition inside your product.

Table of Products

Ingredient forms:
● Feed grade ○ Food grade

Not all products are available in every country but registration is possible.

Application:
Dry: Dry pet food and treats
Wet: Wet pet food and treats
Injection: Injection molded chews
Tablet: Tablet supplements
Powder: Powder supplements
Milk: Milk and low fat liquid products
Water: Water based liquid products

Icons like this provide a general indication the ingredient category is commonly registered for use in diets or supplements for that species.

Carotenoids

ß-Carotene

	Product Name	Product Description	Package Size (KG)	Country of Origin	Dry	Wet	Injection	Tablet	Powder	Milk	Water
●	ROVIMIX® β-Carotene 10%	Stabilized Beadlet	5, 20	France	•	•	•	•	•		
●	ROVIMIX® β-Carotene 10% P	Cross-Linked Beadlet	20	France	•		•				
○	β-Carotene 10% CWS	Beadlet, Cold Water Dispersible	1, 5, 25	Switzerland		•	•		•	•	•
○	β-Carotene 10% B	Cross-Linked Beadlet	5, 25	Switzerland	•						

Canthaxanthin

	Product Name	Product Description	Package Size (KG)	Country of Origin	Dry	Wet	Injection	Tablet	Powder	Milk	Water
●	CAROPHYLL® Red 10%	Beadlet	5, 20	France	•	•	•	•	•		

Astaxanthin

	Product Name	Product Description	Package Size (KG)	Country of Origin	Dry	Wet	Injection	Tablet	Powder	Milk	Water
●	CAROPHYLL® Pink 10% CWS	Beadlet, Cold Water Dispersible	5, 20	France	•	•	•	•	•		

Fat Soluble Vitamins

Vitamin A

	Product Name	Product Description	Package Size (KG)	Country of Origin	Dry	Wet	Injection	Tablet	Powder	Milk	Water
●	ROVIMIX® A 1000 (100 kIU/g)	Cross-Linked Beadlet	25	Switzerland	•	•	•				
●	ROVIMIX® AD3 1000/200 (1000 kIU A/g) (200 kIU D3/g)	Cross-Linked Beadlet, Stabilized Beadlet	25	Switzerland	•	•	•				
●	ROVIMIX® A 500 WS (500 kIU/g)	Spray Dried, Water Dispersible Beadlet	20	France			•	•	•	•	•
●	ROVIMIX® A 500 N (500 kIU/g)	Cross-Linked Beadlet, No Porcine Gelatin	25	China							
○	Vitamin A Palmitate 1.0 mIU/g	Oily Solution (Peanut Oil), Stabilized with Tocopherol	5	Switzerland						•	•
○	Vitamin A Palmitate 1.7 mIU/g	Oily Liquid, Stabilized with Tocopherol	5, 20, 190	Switzerland			•			•	
○	Dry Vitamin A Acetate 500 B (500 kIU/g)	Beadlet, Tablet Grade	5, 20, 25	USA	•	•		•	•		
○	Dry Vitamin A Palmitate, Type 250 S/N (250 kIU/g)	Spray-Dried, Starch Based	20	France			•		•	•	

Vitamin D3

	Product Name	Product Description	Package Size (KG)	Country of Origin	Dry	Wet	Injection	Tablet	Powder	Milk	Water
●	ROVIMIX® D3 500 (500 kIU/g)	Spray-Dried, Water Dispersible, Stabilized Powder	20	France			•	•	•	•	•
●	ROVIMIX® AD3 1000/200 (1000 kIU A/g), 200 kIU D3/g)	Cross-Linked Beadlet, Stabilized Beadlet	25	Switzerland	•	•	•				
○	Vitamin D3 1.0 mIU/g	Oily Solution, Stabilized with Tocopherol	5	Switzerland			•	•	•	•	•
○	Dry Vitamin D3 100 SD/S (100 kIU D3/g)	Spray-Dried, Cold Water Dispersible, Stabilized with Tocopherol	5, 20	Switzerland	•	•	•	•	•	•	•

Fat Soluble Vitamins (Cont.)

Vitamin E

	Product Name	Product Description	Package Size (KG)	Country of Origin	Dry	Wet	Injection	Tablet	Powder	Milk	Water
●	Tocopheryl Acetate Technical Grade (100% Basis)	Clear Viscous Oil	190	Switzerland	•	•	•				
●	ROVIMIX® E 50% Adsorbate (500 IU/gm)	Vitamin E Oil Adsorbed on Silicon Dioxide	20, 500, 900 20, 25, 700, 900 25, 500	Switzerland USA China	• • •	• • •			• • •		
●	ROVIMIX® E 50% SD (500 IU/gm)	Spray Dried, Water Dispersible Powder	20 25 25	France Switzerland USA		•	•	•		•	•
○	Dry Vitamin E 50% CWS/S (500 IU/g)	Spray-Dried, Cold Water Dispersible	20 20	France Switzerland			•			•	•
○	Dry Vitamin E 50%, Type SD (500 IU/g)	Spray-Dried, Powder	15	Switzerland USA	•	•		•	•		
○	Dry Vitamin E 75 HP (750 IU/g)	Beadlet, High Potency	20	USA				•			
○	dl-α-Tocopherols 70 IP	Liquid Antioxidant	5, 20	Switzerland		•				•	
○	Mixed Tocopherols 70 IP	Liquid Antioxidant, Natural Source, Non-GMO	18, 190	Argentina		•	•			•	
○	Mixed Tocopherols 95	Liquid Antioxidant, Natural Source	20, 190	USA		•	•			•	
○	Dry Mixed Tocopherol 30%	Dry Antioxidant, Natural Source	20	USA	•	•	•	•	•	•	•

Vitamin K, Menadione

	Product Name	Product Description	Package Size (KG)	Country of Origin	Dry	Wet	Injection	Tablet	Powder	Milk	Water
●	MSBC (Sodium Bisulfite Complex, 33%) Available in USA Only	Fine Crystalline Powder	25	Turkey Uruguay China	• • •	• • •	• • •	• • •	• • •	• • •	• • •
●	ROVIMIX® K3 MNB (Menadione Nicotinamide Bisulfite)	Fine Crystalline Powder	25								

Water Soluble Vitamins

Vitamin B1, Thiamine

	Product Name	Product Description	Package Size (KG)	Country of Origin	Dry	Wet	Injection	Tablet	Powder	Milk	Water
●	ROVIMIX® B1 (Thiamine Mononitrate)	Fine Crystalline Powder	25	Germany	•	•	•	•	•	•	•
○	Thiamine HCl (Thiamine Hydrochloride)	Fine Crystalline Powder	10	Germany	•	•	•			•	•
○	Thiamine Mononitrate	Powder	20	Germany	•	•					
○	Rocoat® Thiamine 33 1/3%	Coated Powder	5	USA	•	•		•			

Vitamin B2, Riboflavin

	Product Name	Product Description	Package Size (KG)	Country of Origin	Dry	Wet	Injection	Tablet	Powder	Milk	Water
●	ROVIMIX® B2 80-SD	Spray-Dried, Water Dispersible Powder	20	Germany	•	•	•	•	•	•	•
○	Riboflavin Tablet Grade	Tablet Grade	10	Germany				•			
○	Riboflavin Universal	Powder	10	Germany	•	•	•			•	•
○	Rocoat® Riboflavin 33 1/3%	Coated Powder	5	USA	•	•		•			

Water Soluble Vitamins

Vitamin B3, Niacin

	Product Name	Product Description	Package Size (KG)	Country of Origin	Dry	Wet	Injection	Tablet	Powder	Milk	Water
●	ROVIMIX® Niacin	Fine Crystalline Powder	25, 900	Switzerland	•	•		•	•		
●	ROVIMIX® Niacinamide	Fine Crystalline Powder	20, 900	China	•	•	•	•	•	•	•
○	Rocoat® Niacinamide 33 1/3%	Coated Powder	5	USA	•	•		•			

Vitamin B5, Pantothenate

	Product Name	Product Description	Package Size (KG)	Country of Origin	Dry	Wet	Injection	Tablet	Powder	Milk	Water
●	ROVIMIX® CalPan (Calcium Pantothenate)	Spray-Dried, Water Dispersible Powder	25	Great Britain	•	•	•	•	•	•	•
○	Calcium D-Pantothenate	Spray-Dried Powder	25	Great Britain	•	•	•	•	•	•	•

Vitamin B6, Pyridoxine

	Product Name	Product Description	Package Size (KG)	Country of Origin	Dry	Wet	Injection	Tablet	Powder	Milk	Water
●	ROVIMIX® B6	Fine Crystalline Powder	25 25	Germany China	•	•		•	•	•	•
○	Pyridoxine Hydrochloride	Crystalline Powder	20 20	Germany China	•	•	•	•		•	•
○	Rocoat® Pyridoxine Hydrochoride 33 1/3%	Coated Powder	5	USA	•	•		•			

Vitamin B9, Folic Acid

	Product Name	Product Description	Package Size (KG)	Country of Origin	Dry	Wet	Injection	Tablet	Powder	Milk	Water
●	ROVIMIX® Folic 80 SD	Spray-Dried, Water Dispersible Powder	20 25	France China	• •	• •	• •	• •	• •	• •	• •
○	Folic Acid	Powder	1, 25	Switzerland	•	•	•	•	•	•	•

Vitamin B12, Cobalamin

	Product Name	Product Description	Package Size (KG)	Country of Origin	Dry	Wet	Injection	Tablet	Powder	Milk	Water
●	Vitamin B12 1% Feed Grade	Crystalline Powder Dilution	20	France	•	•	•	•	•		
○	Vitamin B12 Crystalline	Crystalline Powder	0.01, 0.1, 1	France	•	•	•			•	•
○	Vitamin B12 0.1% WS	Crystalline Powder Dilution	5, 15	Switzerland				•	•	•	•

Vitamin H, Biotin

	Product Name	Product Description	Package Size (KG)	Country of Origin	Dry	Wet	Injection	Tablet	Powder	Milk	Water
●	ROVIMIX® Biotin (2% Biotin)	Spray-Dried, Water Dispersible Powder	20	France	•	•	•	•	•	•	•
●	ROVIMIX® Biotin HP (10% Biotin)	Spray-Dried, Water Dispersible Powder	20	France USA	•	•	•	•	•	•	•
○	D-Biotin	White Crystaline Powder	0.05, 1, 25	France				•	•		
○	Bitrit-1 Type A (1% Biotin)	Triturate, Powder	10, 50	USA	•	•	•			•	•

Water Soluble Vitamins (Cont.)

Vitamin C, Ascorbic Acid

	Product Name	Product Description	Package Size (KG)	Country of Origin	Dry	Wet	Injection	Tablet	Powder	Milk	Water
●	ROVIMIX® Stay-C® 35 (Sodium Calcium Ascorbyl Phosphate)	Spray-Dried Powder, Heat Stable	25, 800	France	•	•	•		•		
●	ROVIMIX® C-EC	Ethlcellulose-Coated Powder	25	Great Britain		•		•	•		
○	Stay-C® 50 (Sodium Ascorbyl Phosphate)	Spray-Dried Fine Powder, Heat Stable	5, 20	France	•		•	•		•	•
○	Ascorbic Acid	Crystalline Powder	25	Great Britain						•	•
○	Ascorbic Acid Fine Powder	Fine Powder	25	Great Britain			•		•		
○	Ascorbic Acid Fine Granular	Fine Granular Powder	25	Great Britain				•	•		
○	Ascorbic Acid 95% Granulation	Granular Powder	25	Great Britain				•	•		
○	Calcium Ascorbate	Powder	25	USA		•	•			•	•
○	Calcium Palmitate	Powder, Antioxidant	5, 25	Germany	•	•	•			•	•

Nutritional Lipids

Omega-3 Fatty Acids From Algae

	Product Name	Product Description	Package Size (KG)	Country of Origin	Dry	Wet	Injection	Tablet	Powder	Milk	Water
●	DHAgold® S-17-B Min. 17% DHA	Fine Dry Flakes of Microalgae	15	USA	•	•	•				
○	DHASCO® Min. 40% DHA	Microalgae Derived Oil	9, 18, 200	USA	•	•	•			•	
○	life'sOmega™ 60 Min. 30% DHA, 15% EPA Min. 60% Total Omega-3	Microalgae Derived Oil	1, 5, 23, 180	USA	•	•	•				
○	life'sDHA® S17-P100 Min. 17% DHA	Free-Flowing Powder of Microalgae Derived Oil	12.5	USA	•	•	•	•	•	•	

Omega-3 Fatty Acids From Fish

	Product Name	Product Description	Package Size (KG)	Country of Origin	Dry	Wet	Injection	Tablet	Powder	Milk	Water
○	MEG-3® 30% TG Oil Min. EPA + DHA area %, min. 30% Min. EPA + DHA content as T.G. 260 mg/g Min. EPA + DHA content as F.F.A. 250 mg/g	Marine Fish Oil	190	Peru	•	•	•			•	
○	MEG-3® 30% Powder Min. 150mg - Max 220mg EPA + DHA and 180mg Total Omega-3 per g	Microencapsulated Marine Fish Oil Powder	10	USA		•	•	•		•	•

Minerals

Mineral Preparations

	Product Name	Product Description	Package Size (KG)	Country of Origin	Dry	Wet	Injection	Tablet	Powder	Milk	Water
●	MICROGRAN® Co 5% BMP (Preparation of Cobalt Carbonate)	Free-Flowing, Micro Granules	25, 500	Italy	•	•	•	•	•	•	•
●	MICROGRAN® Se 1% BMP (Preparation of Sodium Selenite)	Free-Flowing, Micro Granules	25, 500	Italy	•	•	•	•	•	•	•
●	MICROGRAN® Se 4.5% BMP (Preparation of Sodium Selenite)	Free-Flowing, Micro Granules	25	Italy	•	•	•	•	•	•	•
●	MICROGRAN® I 10% BMP (Preparation of Calcium Iodate)	Free-Flowing, Micro Granules	25, 500	Italy	•	•	•	•	•	•	•

Mineral Chelates

	Product Name	Product Description	Package Size (KG)	Country of Origin	Dry	Wet	Injection	Tablet	Powder	Milk	Water
●	VEVOMIN™ Cu 13% (Cupric Chelate of Amino Acids, Hydrate)	Free-Flowing Powder	25	Canada	•	•	•	•	•	•	•
●	VEVOMIN™ Fe 12% (Ferrous Chelate of Amino Acids, Hydrate)	Free-Flowing Powder	25	Canada	•	•	•	•	•	•	•
●	VEVOMIN™ Mn 11% (Manganese Chelate of Amino Acids, Hydrate)	Free-Flowing Powder	25	Canada	•	•	•	•	•	•	•
●	VEVOMIN™ Zn 13% (Zinc Chelate of Amino Acids, Hydrate)	Free-Flowing Powder	25	Canada	•	•	•	•	•	•	•

Notes

Contact Us

To find out more about our ingredients for pet nutrition, please contact your nearest DSM Nutritional Products office.

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