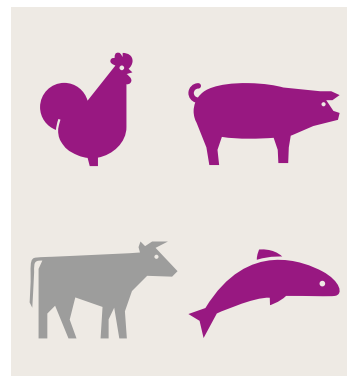


# ThreAMINO®

A highly effective source of the amino acid L-Threonine.

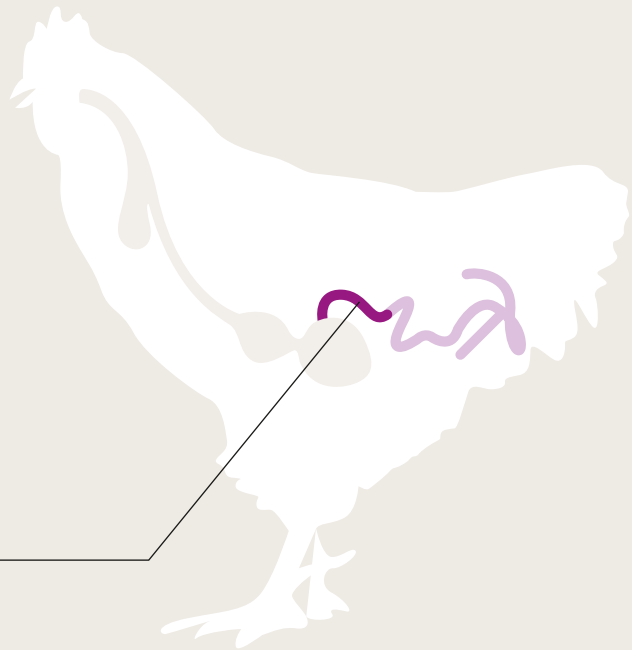
ThreAMINO® optimizes feed formulations, reduces the cost of animal production and minimizes nitrogen excretion.



# We are what we feed

The world's population continues to grow – and the challenge of securing enough healthy food is growing with it. As meat, fish, eggs and dairy products represent a large share of global needs, the science of animal nutrition has a key role to play in addressing the food challenge. The future depends on innovative, sustainable and efficient feed concepts.

.....  
**THREONINE MAKES UP 30% OF TOTAL AMINO ACIDS IN MUCIN AND 10% IN IMMUNE GLOBULINS, HELPING MAINTAIN A HEALTHY GUT.**  
.....



# 30%

30% of total amino acids in mucin is threonine



## POPULATION GROWTH

The UN expects the world population to grow to more than 9 billion by the year 2050. Scientific data show that a nation's demand for meat and other forms of animal protein increases with affluence.



## FOOD AVAILABILITY, ACCESSIBILITY AND AFFORDABILITY

Functional feed ingredients and innovative animal nutrition concepts will play a key role in ensuring worldwide food security.



## SHORTAGE OF RESOURCES

Across industries, sustainable technologies and methods are needed to avert shortages of clean water and other resources. Nowhere is this challenge more pressing than in the food industry.

## 3 QUESTIONS

### The people who make up Evonik

#### 1. How would you describe your work at Evonik?

I am responsible for growing and further developing Evonik's global amino acid business. We call this 'efficient nutrition' as methionine, threonine and lysine are essential ingredients of efficient low-protein diets. Evonik's amino acids help our customers to improve their bottom line and safeguard the integrity of animal nutrition.

#### 2. Which product feature do you like most?

The fact that our amino acids help the industry to make meat production more economical and, at the same time, more sustainable. Amino acids in feed formulations play an important part in reaching our global sustainability goals. Sustainability is our aspiration and not just a buzz word, and our team has been working towards this goal for more than 60 years.

#### 3. What is the most rewarding aspect of your job?

Working for our customers all around the world in an international team: it is exciting to support our customers and business partners in further developing their businesses in different countries. Being at the forefront of the global feed and food industry with an incredible team is one of the most rewarding aspects of my job.



**"We support our customers in improving their bottom line with amino acids that are effectively enhancing the growth and health of livestock such as swine, poultry and fish."**

**DR. JAN-OLAF BARTH**

*Head of Efficient Nutrition  
Product Line*

# Better feed, better livestock production

For more than a decade the use of L-Threonine in feed has been consistently improving the quality and productivity of livestock. This amino acid optimizes feed formulations, reduces the cost of animal production and minimizes nitrogen excretion. It also significantly improves gut health and the immune system, allowing efficient feed digestion.

Scientific research demonstrates the effectiveness of threonine, which is typically the 2<sup>nd</sup> or 3<sup>rd</sup> limiting amino acid in modern feeding concepts, depending on animal species, sex, age, genetics and the feed ingredients mix.

More importantly, it also facilitates balancing for the optimum dietary amino acid profile, especially for an optimum ratio between lysine and threonine. With feed accounting for up to two thirds of total livestock production costs, feed quality and production efficiency have a great impact on overall profitability.

Cutting feed costs is not easy, as anything that compromises nutrient value can lead to impaired growth over the course of the production process. Precise supplementation with highly concentrated amino acids is the key to success, yet not all sources deliver optimum results.

# Ideal protein diets – less crude protein, more profitability

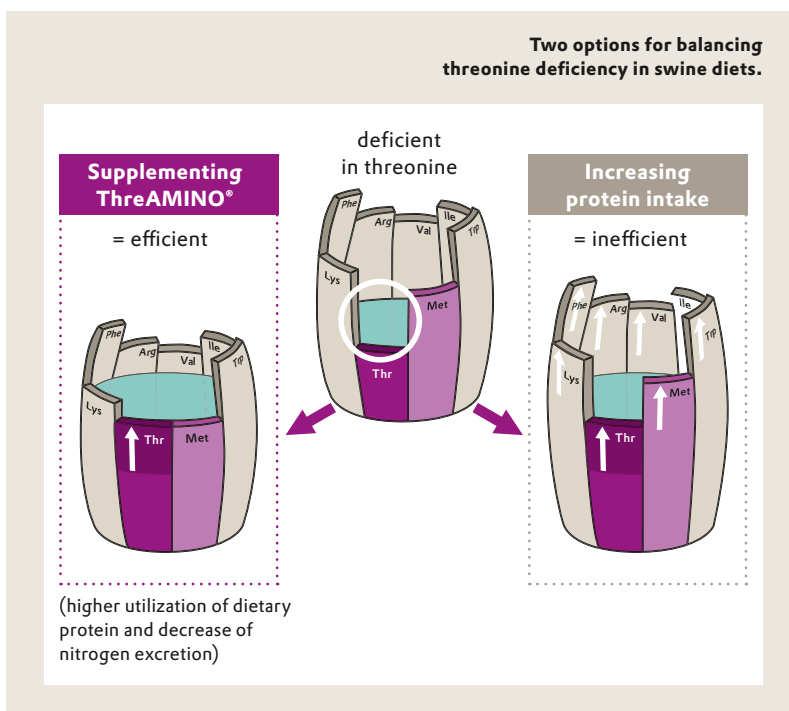
A high-protein feed mix may guarantee sufficient amino acids for livestock growth, but at high cost. The game-changing ideal protein concept uses precise amino acid calculations and meets the needs with cost-effective feed additives.

The ideal protein concept is one of the most important advances in animal nutrition. It is based on the fact that animals need a balanced or ideal pattern of amino acids to maximize growth performance and nitrogen retention. All absorbed amino acids in excess compared to the first limiting amino acid are catabolized and increase nitrogen excretion. The concept takes lysine, which is almost exclusively utilized for body protein accretion, as a starting point. The amount of lysine required, adjusted to the genetic potential of different animals and production conditions, is used as a reference to define the need for other essential amino acids. This ideal ratio is the key to calculating the right amount of amino acids and reducing crude protein. The result: optimized growth performance and maximized nitrogen utilization.

## Amino acids vs. crude protein

Crude protein is among the most costly components of livestock feed. Recent price developments have further underscored the fact that formulating diets to meet amino acid recommendations using high levels of intact protein sources is simply inefficient. In addition to high costs, the disadvantages include metabolic stress placed on animals catabolizing and excreting excessive amino acids.

Drawing on scientific findings and decades of hands-on experience, Evonik has established amino acid recommendations for different types of livestock. The resulting reduction in crude protein requirements and targeted use of amino acids – the ideal protein concept – maximize growth performance and profitability, while lowering environmental impact.



Animal nutritionists have long known that animals do not need crude protein itself, but rather the essential amino acids it contains. Yet high-protein diets were the only way to provide safety margins, ensuring that more than enough of the required amino acids are contained. Today, precise amino acid calculations make it possible to reduce safety margins and fine-tune feed composition. This approach, the ideal protein concept, saves money, boosts animal health and cuts down nitrogen emissions.



# Best results in **three steps**



Precise analysis of raw materials is essential for high feed quality. Evonik offers three tools to support the process: AMINONIR®, AMINONIR® Prox and AMINONIR® NRG. Your benefit: quick calculations of nutrients and accurate estimations of energy content in feed raw materials.



Nutritionists can accurately design feeds only if they know the animal's needs at different growth phases and the composition of each feed ingredient. For all major species, Evonik offers specific recommendations with AMINODat® 5.0.



Feed is more effective if ingredients are accurately dosed and homogeneously mixed. Evonik's dosing system AMINOSys® helps ensure quality while allowing narrower amino acid safety margins for lower cost. More than 600 AMINOSys® customers worldwide can attest to its effectiveness.

# ThreAMINO® Facts

ThreAMINO®, available with white to light brown granular form and grey to beige powder form, is a crystalline feed supplement – with a threonine content of 98.5% feed grade and serves for the adequate supply of the essential amino acid which cannot be synthesized by the animal and therefore needs to be ingested with the feed. ThreAMINO® can be processed into premixes, mineral feeds, compound feeds and in milk replacer, by any technical procedure. Its technical properties guarantee for homogeneous mixability and stability against demixing.

## PRODUCTION

ThreAMINO® is produced by a fermentation process.

## NUTRITIONAL MATRIX

| NUTRIENT                 | MATRIX VALUE |           |
|--------------------------|--------------|-----------|
| Threonine content        | 98.5%        |           |
| Digestibility            | 100.0%       |           |
| Crude protein (N x 6.25) | 72.4%        |           |
| Metabolizable energy     | [MJ/kg]      | [kcal/kg] |
| DE swine                 | 16.9         | 4,030     |
| ME swine                 | 16.0         | 3,830     |
| NE swine                 | 12.4         | 2,960     |
| ME poultry               | 14.6         | 3,490     |

## SPECIFIC VALUES

|                         |      |
|-------------------------|------|
| Assay (%) min.          | 98.5 |
| Ash (%) max.            | 0.5  |
| Loss on drying (%) max. | 0.5  |

# How ThreAMINO<sup>®</sup> works

ThreAMINO<sup>®</sup> is produced in a fermentation process using high-potential microbial strains. Apart from being an essential element of protein synthesis, threonine plays an important role in maintenance requirements, feather synthesis, gut health and the immune system.

In addition, threonine serves a variety of other vital functions in livestock. ThreAMINO<sup>®</sup> is a good example of Evonik's dedication and innovative drive, contributing significantly to the value chain in modern livestock production all over the world. This explains why global demand for L-Threonine has experienced double-digit growth rates since the commercial application took off in the mid-90s.

A growing global population and increasing per capita income will continue to stimulate the demand for a high-quality, cost-effective, as well as environmentally friendly responsible food supply – ThreAMINO<sup>®</sup> from Evonik is the key to meeting that demand.

Comparison of laying hen feed formulations with and without ThreAMINO<sup>®</sup> using average European 2019 raw material prices

|                               | Feed 1 without ThreAMINO <sup>®</sup> | Feed 2 with ThreAMINO <sup>®</sup> |
|-------------------------------|---------------------------------------|------------------------------------|
| Corn, %                       | 49.46                                 | 51.46                              |
| SBM 48, %                     | 22.25                                 | 20.46                              |
| DDGS Corn, %                  | 10.00                                 | 10.00                              |
| Soybean oil, %                | 4.02                                  | 3.71                               |
| MetAMINO <sup>®</sup>         | 0.19                                  | 0.21                               |
| Biolys <sup>®</sup> , %       | 0.04                                  | 0.11                               |
| ThreAMINO <sup>®</sup> , %    | –                                     | 0.02                               |
| Feed cost, EUR/t              | 232.42                                | 228.69                             |
| Difference in diet cost EUR/t |                                       | 3.73                               |
| Crude Protein in diet %       | 17.2                                  | 16.5                               |

The global demand for L-Threonine has experienced double-digit growth rates since the commercial application took off in the mid-90s.



# Species

ThreAMINO® significantly improves the diets of different species, including poultry, swine and aquatic animals. Livestock production, animal health and the environment can all benefit when feed is supplemented with optimum amounts of high-quality ThreAMINO®.



## POULTRY

Threonine is the third limiting amino acid in commercial poultry diets. To precisely meet the threonine requirement, diets are commonly supplemented with L-Threonine. As an essential amino acid, threonine is needed as a building block for synthesizing proteins that are incorporated into feathers, body tissues, eggs and also functional protein such as enzymes. Threonine also plays an important role in gut health and digestion as it is highly concentrated in mucine. Also its high content in immune globulins emphasizes its important role for well being of poultry. Especially in low protein diets requirement of threonine seems to be elevated. Supplementing L-Threonine improves the amino acid balance of poultry diets and consequently improves growth performance, feed efficiency and nitrogen utilization.



## SWINE

In commercial swine diets, threonine is usually the second limiting amino acid after lysine. Fortifying diets with L-Threonine and, thus, balancing the dietary amino acid profile will be reflected in an improved feed efficiency, growth, and reproductive performance. At the same time, inclusion of L-Threonine helps to reduce the crude protein level in swine diets and consequently the nitrogen excretions. Reduced feed costs are certainly associated with balancing the dietary amino acid profile with L-Threonine.



## AQUACULTURE

Balancing aqua diets with L-Threonine is not very common yet although the salmon sector demonstrates the beneficial impact of this amino acid for years. As for other species, threonine is an essential amino acid for aqua species, is third limiting after methionine and lysine, and needs to be supplied with feed at suitable amounts. Balancing fish feed with supplemental L-Threonine significantly improves body weight gain, feed conversion ratio as well as protein utilization. It is also part of an effective strategy to replace fish meal with alternative protein sources as well as to reduce excess dietary protein. This improves sustainability in aquaculture in terms of both economics and environmental impact.

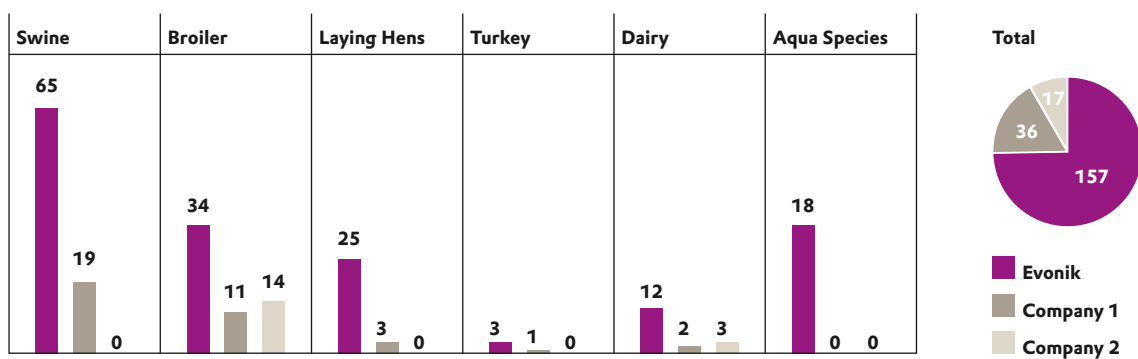
# Scientific proof

At Evonik, we are committed to science and how we can harness it to master challenges. This is why research is part of our day-to-day business.



In addition, we publish articles in scientific magazines, the trade press and produce our own customer magazines AMINONews® and AMINOTec®. We also report commercial trial results via Facts&Figures.

Due to the high number of articles and the continuous publishing rate we are happy to put together a selection of relevant articles according to your needs – simply ask.



Based on SCOPUS search for species and affiliation limited to Articles and Reviews for the years 2012 to 2016

# A winning combination



## GLOBAL NETWORK

- World-scale plants on different continents
- Local offices for close interaction
- Product availability in more than 100 countries



## MYAMINO PLATFORM

- eBusiness and eCommerce
- Digitalization of many services
- Wide range of experts to support, even beyond customer service



## PRODUCTS & SERVICES

- High quality products and services
- In-house R&D for continuous improvement and development
- From single product to complex solutions



## SUPPLY CHAIN

- Resilient supply chain
- Own warehouses in many countries
- Speaking the language, understanding regional differences



## EXPERT LEVEL

- Experienced, knowledgeable local staff
- Own publications, technical articles and technical customer seminars
- Individual technical support onsite

Animal Nutrition has a global network with world-scale plants on different continents for reliable and constant supply. In case of extraordinary local incidents like flooding, hurricanes or material shortages, we can switch production and deliver to another site. Our local offices serve as regional hubs and ensure our products arrive in time, benefitting customers in more than 100 countries.

Digitalization will be key in the future and we want to play our part. myAMINO is our customer platform where we bundle all our eBusiness and eCommerce activities. Reachable 24/7 regardless of time zones and easy access for automated processes and sharing documents – lifting the bar for customer experience.

Evonik stands for high-quality products and services, always well thought out to deliver high performance and added value. Our in-house R&D is a guarantee for continuous improvement and development. This accounts for single products, as well as complex solutions. Our own laboratories and NIR services are contributing to this promise.

We are proud of our resilient supply chain and experience to deliver products in nearly every country worldwide. To shorten lead times, we have more than 60 warehouses globally.

But what sets us apart is our people. Animal Nutrition has experts on all levels. From chemistry, biology and engineering to data scientists, interdisciplinary working towards one goal: sciencing the global food challenge.

We have experienced, knowledgeable, local staff for direct contact, and we share our knowledge through our own publications, technical articles, or technical customer seminars. If needed, we also provide individual technical support on site.

Let us know how we can be an asset for your company.

# Evonik at a glance

Evonik is one of the world leaders in specialty chemicals. The company is active in more than 100 countries around the world and generated sales of €13.1 billion. In 2019 Evonik goes far beyond chemistry to create innovative, profitable and sustainable solutions for customers. More than 32,000 employees work together for a common purpose: We want to improve life, today and tomorrow.

The focus of the business of the Nutrition & Care division is on health and quality of life. It develops differentiated solutions for active pharmaceutical ingredients, medical devices, nutrition for humans and animals, personal care, cosmetics, and household cleaning. The Animal Nutrition business line is one of Evonik's key end markets.

## EVONIK ANIMAL NUTRITION

Evonik Animal Nutrition is a highly reliable, globally operating provider of science-driven products and services for sustainable and efficient production of meat, fish, eggs and milk. The organization is marked by scientific excellence and sensitivity to the needs of our customers and society.

## OUR MISSION

We use science to improve sustainability, health and efficiency along the food chain to feed growing populations with animal protein for generations to come.

## WHAT WE STAND FOR

Our unique combination of scientific excellence and customer-centered products and services sets us clearly apart. Our customers know they can count on us, because everything we do is firmly rooted in proven science and implementation expertise.



## IN DIALOG

You can reach us in many ways – by email, social media, telephone, or a personal visit.



Check out our video –  
We are Evonik  
Animal Nutrition

**EVONIK OPERATIONS GMBH**  
Animal Nutrition Business Line

[evonik.click/animalnutrition](http://evonik.click/animalnutrition)

**Learn more about  
ThreAMINO®**

[evonik.click/threamino](http://evonik.click/threamino)



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