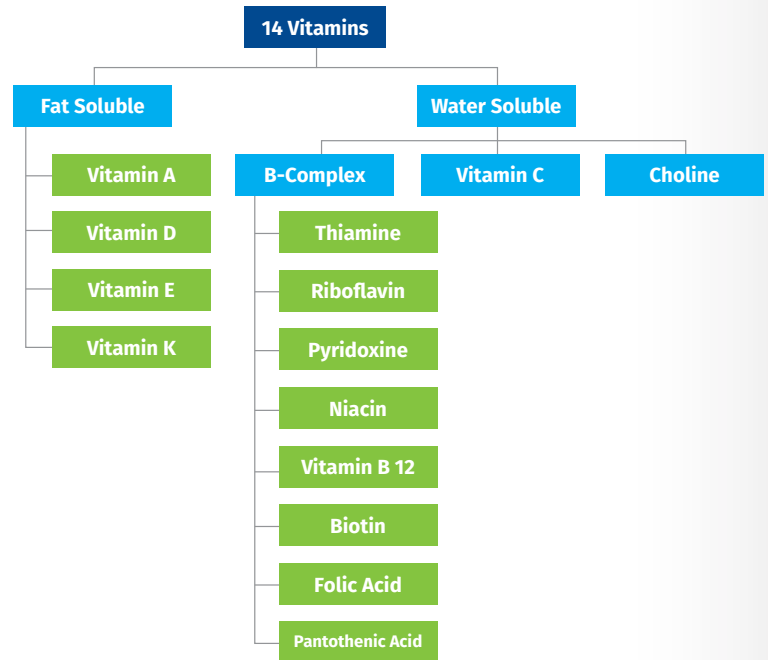


Vitamin Summary

► What are vitamins?

A class of nutrients defined as being organic substances essential in small quantities for normal metabolism, growth, health and survival. Not a chemical class.



► Function of vitamins and deficiency symptoms

Vitamins	Basic function(s)	Deficiency disorders/diseases
Vitamin A	Retinal pigments, epithelial cell differentiation, gene transcription	Blindness, xerophthalmia, keratomalacia, impaired growth
Vitamin D	Intestinal Ca absorption, bone Ca mobilization, renal Ca resorption, regulation of PTH secretion, possible function in muscle	Rickets, osteomalacia
Vitamin E	Antioxidant protector for membranes	Nerve, muscle degeneration
Vitamin K	Clotting factors and their Ca-binding proteins	Impaired blood clotting
Vitamin B ₁	Coenzyme for various energy metabolism enzymes	Beriberi, polyneuritis, Wernicke-Korsakoff syndrome
Vitamin B ₂	Soenzyme for numerous flavoproteins that catalyze redox reactions in fatty acid synthesis/degradation, TCA cycle	Dermatitis
Vitamin B ₆	Coenzyme for amino acid metabolism	Symptoms vary by species
Vitamin B ₁₂	Coenzyme for conversion of methylmalonyl-CoA to succinyl-CoA, methyl group transfer from 5-CH ₃ -FH ₄ to homocysteine in methionine synthesis	Megaloblastic anemia, impaired growth
Pantothenic Acid	Co-substrate for activation/transfer of acyl groups to form esters, amides, citrate, triglycerides, etc.	Symptoms vary by species
Niacin	Co-substrate for many dehydrogenases, e.g., TCA cycle respiratory chain	Pellagra
Folic Acid	Coenzyme for transfer of single-carbon units	Megaloblastic anemia
Biotin	Coenzyme for carboxylations	Dermatitis, cracked hooves
Choline	Component of acetylcholine and the membrane structural component phosphatidylcholine	Perosis (deformity of leg bones in young birds), fatty liver
Vitamin C	Co-substrate for hydroxylations in collagen synthesis, steroid metabolism	Scurvy

Vitamin Formulations

Basic Vitamin Formulations

- Crystalline (example: niacin)
- Spray Dry (example: A500 WS)
- Beadlet
- Encapsulated (example: ROVIMIX® A1000)
- Adsorbate (example: E50 Ads)

Specialized forms (examples: Stay-C®; HyD®)

Summary Of Loss Activity Rankings (Shurson et al. 1996)



Most Stable

- Cal pan
- Vit E
- B2
- Biotin
- Niacin
- Vit D
- Choline
- Folic Acid
- B12
- B1
- B6
- Vit A
- Vit K3

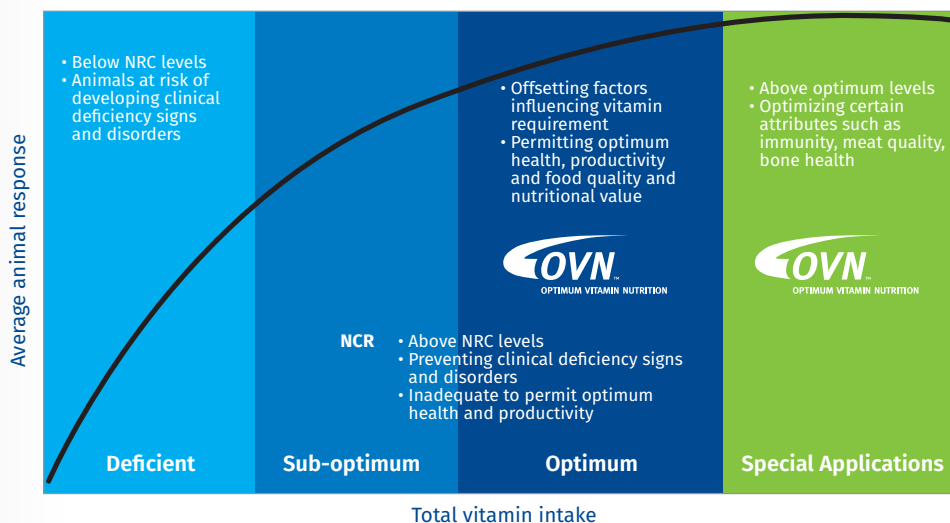
Least Stable

What is OVN?

Optimum Vitamin Nutrition (OVN™) is about feeding animals the right amounts of high-quality vitamins produced with the lowest environmental footprint, appropriate to their life stage and growing conditions.

- OVN is a sustainable way to achieve:
 - Optimum health and performance
 - Better quality and nutritional value of animal origin foods
 - Check. Adjust. For More Sustainable Farming

The OVN Concept



Learn more about vitamins at dsm.com/anh-na:



What is a Vitamin Requirement - How is it Defined?



What Does Optimum Vitamin Nutrition Mean to Me?

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