

# OVN Optimum Vitamin Nutrition® Guidelines 2022



Check and adjust vitamin levels for more sustainable farming.



OUR VISION  
ON VITAMINS

# CONTRIBUTION OF VITAMINS TO MORE SUSTAINABLE FARMING

Today, the crucial issues relating to the production of food are changing. Key concepts such as productivity and efficiency continue to be of vital importance, but more and more the emphasis is on the significance of terms such as sustainability, animal health and welfare as well as the quality of animal origin food and how much food is wasted.

Continuous development in the field of animal nutrition is becoming essential to meet current and future challenges such as replacement of antibiotics, higher incidence of more aggressive animal diseases and a growing focus on more Sustainable Farming where our industry has a critical role to play in shaping a better world. We at DSM believe that supporting animal species with appropriate vitamins can help make production more sustainable (SDG 12, 13) and help get the world closer to zero hunger (SDG 2) as well as healthy lives (SDG 3).



*If not us, who? If not now, when?*  
**WE MAKE IT POSSIBLE**

# OUR VISION ON VITAMIN NUTRITION

We believe that every single animal should receive the right level of vitamins. The reason is simple: vitamins are vital to their health, well-being and performance. Vitamins are the foundation for balanced animal nutrition.

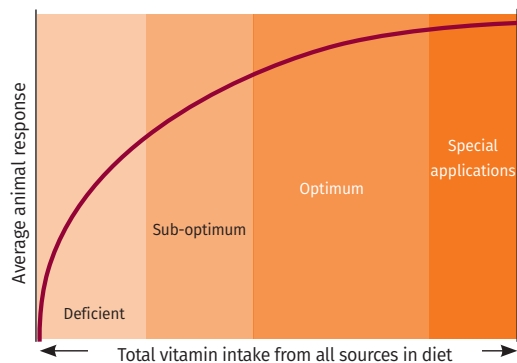
OVN Optimum Vitamin Nutrition® is about feeding animals high quality vitamins, produced with the lowest environmental footprint, in the right amounts, appropriate to their life stage and growing conditions, to optimize:

- **Animal Health and Welfare**
  - ▶ good for animals
- **Animal Performance**
  - ▶ good for producers
- **Food Quality & Food Waste**
  - ▶ good for consumers and the planet

To accomplish this, we are intensely engaged in research and development, and we focus on partnering with all important stakeholders – leading scientists, universities, genetic companies, independent research institutes and producers. This enables us to develop and produce a complete line of high quality vitamins and support the feed industry with our Vitamin Supplementation Guidelines.

All ingredients in animal feed are regularly evaluated and likewise vitamin levels require the same degree of attention. We therefore encourage the feed industry and all other stakeholders to **check** the vitamin levels in their feed and **adjust** them accordingly **for more sustainable farming.**

# OVN OPTIMUM VITAMIN NUTRITION® CONCEPT



## Legend

**‘Total vitamin intake from all sources in the diet’:** total quantity of vitamins from natural sources plus supplementation.

**‘Average animal response’:** average productivity or health response of animal to vitamin

intake e.g. growth rate, feed efficiency, reproductive performance, immunity.

**‘Deficient’:** a level of vitamin supplementation below NRC or other published recommendations which puts animals at risk of developing clinical deficiencies and disorders.

**‘Sub-optimum’:** vitamin supplementation, which meets or slightly exceeds NRC or other published recommendations, which should prevent, under good conditions, deficiency signs but inadequate for achieving optimum health and well-being, performance and nutritional value of animal-origin foods. Deficiency signs can occur in presence of stress and diseases.

**‘Optimum’:** cost-effective range of vitamin supplementation optimizing animal health and

well-being, animal performance and the quality and nutritional value of animal-origin foods.

**‘Special applications’:** levels of vitamin supplementation which are safe and focused in improving certain attributes e.g. meat quality and immunity.

## Factors influencing vitamin needs of domestic animals under commercial production conditions

**Direct factors – stressors on animals:** disease, confinement, restricted feeding, antagonists, anti-nutritional factors (e.g., mycotoxins), air quality, temperature.

**Indirect factors – variation of vitamin levels in feedstuffs:** bioavailability, stability, quality of feedstuffs.

# GUIDELINES FOR OVN OPTIMUM VITAMIN NUTRITION®

DSM Vitamin Supplementation Guidelines are designed to provide Optimum Vitamin Nutrition (OVN™) of animals under typical industry practice.

OVN™ is a cost-effective range of vitamin supplementation optimizing animal health and well-being, animal performance and the quality and nutritional value of animal-origin foods. The supplementation levels required to attain Optimum Vitamin Nutrition generally exceed the levels needed to prevent signs of clinical deficiency.

OVN™ levels compensate for the many factors which can influence animals' requirements and corresponding feed levels, thus ensuring that vitamin fortification does not limit performance. OVN™ levels are ranges for consideration, depending on several factors, such as health status and husbandry conditions. They are based

on extensive university and industry research, published requirements, animal genetics recommendations and practical experience.

All OVN™ levels are expressed in terms of vitamin activity to be added to diet. In general amounts given are per kg air-dry feed, except for ruminants and horses (per animal day).

The vitamin amounts stated are those which should be provided to the animal in the feed at the point of consumption. Additional vitamins should be added to the product to account for processing and shelf-life storage losses to achieve the targeted consumption amounts of vitamins.

These losses can be variable. Please ask your local DSM representative for information about typical levels of process and storage loss.

For some vitamins additional supplementation is indicated: these levels are safe and focused on improving certain attributes e.g. meat quality and immunity. The listed vitamin levels are only guidelines and, in all cases, national feed legislation must be followed.



A group of fluffy yellow chicks standing on a bed of straw. The chicks are in the foreground, with one in the center looking towards the camera. The background is a warm, golden-brown color, suggesting an indoor or sheltered environment. The lighting is soft and warm, highlighting the texture of the chicks' feathers and the straw.

**POULTRY**

**POULTRY**

# BROILERS<sup>1</sup>

## OVN OPTIMUM VITAMIN NUTRITION®

Category/phase	Duration	Vitamin A	Vitamin D <sub>3</sub>	25OHD <sub>3</sub> (Hy-D®)	Vitamin E <sup>3,4</sup>	Vitamin K <sub>3</sub>	Vitamin B <sub>1</sub>	Vitamin B <sub>2</sub>	Vitamin B <sub>6</sub>	Vitamin B <sub>12</sub> <sup>7</sup>	Niacin	Biotin	d-Pan-tothenic acid	Folic acid	Vitamin C <sup>8</sup>	Choline
Units		IU	IU	mg	mg	mg	mg	mg	mg	mg	mg	mg	mg	mg	mg	mg
<b>Broilers</b>																
 Starter	1 – 10 days	12,600 – 15,700	4,200 – 5,200	0.069	160 – 210 <sup>5</sup>	3.2 – 4.2	3.2 – 4.2	8.4 – 10.5	4.2 – 6.3	0.021 – 0.042	64 – 84	0.26 – 0.42	16 – 21	2.1 – 2.6	105 – 210	420 – 740
Grower	11 – 24 days	10,500 – 13,100	4,200 – 5,200	0.069	55 – 105 <sup>6</sup>	3.2 – 4.2	2.1 – 3.2	7.4 – 9.5	4.2 – 6.3	0.021 – 0.032	64 – 84	0.26 – 0.42	12.6 – 19	2.1 – 2.6	105 – 210	420 – 740
Finisher	25 days – market	10,500 – 13,100	4,200 – 5,200	0.069	55 – 105 <sup>6</sup>	3.2 – 4.2	2.1 – 3.2	6.3 – 8.4	4.2 – 6.3	0.021 – 0.032	53 – 84	0.26 – 0.42	10.5 – 15.8	2.1 – 2.6	105 – 210	420 – 630
<b>Broiler breeders</b>																
 Starter/ Grower (Pullets)	1 – 18 weeks	10,500 – 13,100	3,150 – 5,200	0.069	105 – 160 <sup>5</sup>	3.2 – 6	2.5 – 5	9 – 15	4.2 – 6.2	0.025 – 0.05	32 – 62	0.26 – 0.42	15 – 20	1.6 – 3	105 – 160	370 – 740
Layers and male breeders	19 weeks – end	12,600 – 15,700	3,150 – 5,200	0.069 <sup>2</sup>	105 – 160	6 – 9	3.5 – 6	13 – 20	5 – 8	0.035 – 0.07	55 – 70	0.3 – 0.6	16 – 25	2.5 – 5	105 – 160	370 – 740

### Local limits need to be observed.

<sup>1</sup> Added per kg air-dried feed. OVN™ levels are ranges for consideration, depending on several factors, such as husbandry conditions and health status.

<sup>2</sup> Add 60 mg/kg CAROPHYLL® Red to improve hatchability. MaxiChick™ (Hy-D® 1,25% and CAROPHYLL® Red) is a DSM Patent and Trademark.

<sup>3</sup> When dietary fat is higher than 3% then add 5 mg/kg feed for each 1% dietary fat

<sup>4</sup> Under heat stress conditions increase level up to 200 mg/kg

<sup>5</sup> For optimum immune function increase level up to 300 mg/kg



<sup>6</sup> For optimum meat quality increase level up to 200 mg/kg

<sup>7</sup> Use upper level as reference for animal protein free diets and when cobalt is supplemented at very low levels or removed

<sup>8</sup> Recommended under heat stress condition and to enhance reproductive performance in breeders. Use ROVIMIX® STAY-C35 for reducing loss during processing

# TURKEYS<sup>1</sup>

## OVN OPTIMUM VITAMIN NUTRITION®

Category/phase	Duration	Vitamin A	Vitamin D <sub>3</sub>	25OHD <sub>3</sub> (Hy-D®)	Vitamin E <sup>3,4</sup>	Vitamin K <sub>3</sub>	Vitamin B <sub>1</sub>	Vitamin B <sub>2</sub>	Vitamin B <sub>6</sub>	Vitamin B <sub>12</sub> <sup>7</sup>	Niacin	Biotin	d-Pan-tothenic acid	Folic acid	Vitamin C <sup>8</sup>	Choline
Units		IU	IU	mg	mg	mg	mg	mg	mg	mg	mg	mg	mg	mg	mg	mg
<b>Turkeys</b>																
Starter	1 – 6 weeks	12,600 – 15,700	4,200 – 5,200	0.092	160 – 210 <sup>5</sup>	4.2 – 5.2	4.7 – 5.2	16 – 21	6.5 – 7.5	0.042 – 0.052	105 – 160	0.26 – 0.42	32 – 37	4.2 – 6.2	105 – 210	1,050 – 1,250
 Grower	7 – 12 weeks	10,500 – 12,600	3,200 – 5,200	0.092	65 – 85	3.2 – 4.2	3.2 – 5.2	11 – 16	5.5 – 7.5	0.032 – 0.042	85 – 105	0.26 – 0.32	21 – 26	2.1 – 3.1	105 – 210	525 – 1,050
Finisher 1	13 – 18 weeks	8,400 – 10,500	3,200 – 4,200	0.092	32 – 52 <sup>6</sup>	3.2 – 4.2	3.2 – 4.2	8.5 – 10.5	3.2 – 6.2	0.022 – 0.032	65 – 85	0.21 – 0.26	16 – 21	2.1 – 2.6	105 – 210	420 – 630
Finisher 2	19 weeks to market	6,300 – 9,400	3,200 – 4,200	0.092	32 – 52 <sup>6</sup>	3.2 – 4.2	2.2 – 3.2	8.5 – 10.5	3.2 – 6.2	0.016 – 0.026	52 – 63	0.21 – 0.26	16 – 21	2.1 – 2.6	105 – 210	420 – 630
<b>Turkey breeders</b>																
Starter	1 – 6 weeks	12,600 – 14,700	4,200 – 5,200	0.092	105 – 160 <sup>5</sup>	4.2 – 5.2	4.7 – 5.2	16 – 21	6.5 – 7.5	0.042 – 0.052	105 – 160	0.42 – 0.62	32 – 37	4.2 – 6.2	105 – 210	1,050 – 1,250
 Grower	7 – 29 weeks	8,400 – 10,500	4,200 – 5,200	0.092	65 – 85	2.2 – 4.2	2.2 – 3.2	11 – 16	6.5 – 7.5	0.032 – 0.042	65 – 85	0.42 – 0.62	26 – 31	2.2 – 3.2	105 – 210	1,050 – 1,250
Layers and male breeders	Laying phase	12,600 – 14,700	4,200 – 5,200	0.0922	105 – 160	4.2 – 5.2	4.2 – 5.2	16 – 21	6.5 – 7.5	0.042 – 0.052	85 – 125	0.42 – 0.62	32 – 37	4.2 – 6.2	105 – 210	525 – 1,050

### Local limits need to be observed.

<sup>1</sup> Added per kg air-dried feed. OVN™ levels are ranges for consideration, depending on several factors, such as husbandry conditions and health status.

<sup>2</sup> Add 60 mg/kg CAROPHYLL® Red to improve hatchability. MaxiChick™ (Hy-D® 1,25% and CAROPHYLL® Red) is a DSM Patent and Trademark.

<sup>3</sup> When dietary fat is higher than 3% then add 5 mg/kg feed for each 1% dietary fat

<sup>4</sup> Under heat stress conditions increase level up to 200 mg/kg

<sup>5</sup> For optimum immune function increase level up to 300 mg/kg



<sup>6</sup> For optimum meat quality increase level up to 200 mg/kg

<sup>7</sup> Use upper level as reference for animal protein free diets and when cobalt is supplemented at very low levels or removed

<sup>8</sup> Recommended under heat stress condition and to enhance reproductive performance in breeders. Use ROVIMIX® STAY-C35 for reducing loss during processing

# LAYERS<sup>1</sup>

## OVN OPTIMUM VITAMIN NUTRITION®

Category/phase	Duration	Vitamin A	Vitamin D <sub>3</sub>	25OHD <sub>3</sub> (Hy-D®)	Vitamin E <sup>3,4</sup>	Vitamin K <sub>3</sub>	Vitamin B <sub>1</sub>	Vitamin B <sub>2</sub>	Vitamin B <sub>6</sub>	Vitamin B <sub>12</sub> <sup>7</sup>	Niacin	Biotin	d-Pan-tothenic acid	Folic acid	Vitamin C <sup>8</sup>	Choline
Units		IU	IU	mg	mg	mg	mg	mg	mg	mg	mg	mg	mg	mg	mg	mg
<b>Hens and Duck layers</b>																
 Starter (pullets)	1 – 10 weeks	12,600 – 14,000	3,200 – 4,200	0.069	55 – 100 <sup>5</sup>	3.2 – 6	2.1 – 2.6	7 – 10	4.7 – 6	0.026 – 0.032	52 – 65	0.16 – 0.21	16 – 18	1.5 – 2	105 – 160	210 – 420
Grower (pullets)	11 weeks – 2% lay	10,500 – 13,000	3,200 – 4,200	0.069	35 – 100	3.2 – 6	2.1 – 2.6	5.5 – 6.5	3.2 – 5.5	0.025 – 0.03	35 – 65	0.12 – 0.2	12.6 – 15.7	1.5 – 2	105 – 160	210 – 420
Layers	Laying phase	8,500 – 13,000	3,200 – 4,200	0.069	25 – 50	3 – 6	2.6 – 3.2	5.5 – 7.5	4 – 5.5	0.02 – 0.03	35 – 55	0.12 – 0.2	8.5 – 12.5	1.5 – 2.5	105 – 210	320 – 520
<b>Layer breeders</b>																
 Pullets, layers and male breeders	1 week to end	12,600 – 15,700	3,200 – 4,800	0.069 <sup>2</sup>	55 – 105 <sup>5</sup>	2.1 – 5.2	2.6 – 5	10.5 – 15	5.2 – 7	0.022 – 0.05	47 – 66	0.26 – 0.42	15.8 – 21	2.1 – 3.4	160 – 210	315 – 525

### Local limits need to be observed.

<sup>1</sup> Added per kg air-dried feed. OVN™ levels are ranges for consideration, depending on several factors, such as husbandry conditions and health status.

<sup>2</sup> Add 60 mg/kg CAROPHYLL® Red to improve hatchability. MaxiChick™ (Hy-D® 1,25% and CAROPHYLL® Red) is a DSM Patent and Trademark.

<sup>3</sup> When dietary fat is higher than 3% then add 5 mg/kg feed for each 1% dietary fat

<sup>4</sup> Under heat stress conditions increase level up to 200 mg/kg

<sup>5</sup> For optimum immune function increase level up to 300 mg/kg




<sup>6</sup> For optimum meat quality increase level up to 200 mg/kg

<sup>7</sup> Use upper level as reference for animal protein free diets and when cobalt is supplemented at very low levels or removed

<sup>8</sup> Recommended under heat stress condition and to enhance reproductive performance in breeders. Use ROVIMIX® STAY-C35 for reducing loss during processing

# OTHER POULTRY<sup>1</sup>

OVN OPTIMUM VITAMIN NUTRITION®

Category/phase	Duration	Vitamin A	Vitamin D <sub>3</sub>	25OHD <sub>3</sub> (Hy-D®)	Vitamin E <sup>3,4</sup>	Vitamin K <sub>3</sub>	Vitamin B <sub>1</sub>	Vitamin B <sub>2</sub>	Vitamin B <sub>6</sub>	Vitamin B <sub>12</sub> <sup>7</sup>	Niacin	Biotin	d-Pan-tothenic acid	Folic acid	Vitamin C <sup>8</sup>	Choline
Units		IU	IU	mg	mg	mg	mg	mg	mg	mg	mg	mg	mg	mg	mg	mg
 <b>Ducks and Geese</b>	-	12,600 – 15,700	3,200 – 5,200	0.069	42 – 84	3.1 – 5.2	2.1 – 3.1	5.2 – 7.3	5.2 – 7.3	0.022 – 0.05	63 – 84	0.21 – 0.26	10.5 – 15.7	1.5 – 2.1	105 – 210	315 – 525
 <b>Partridges, quails and pheasants</b>	-	12,600 – 14,100	3,200 – 4,200	0.069	52 – 84	2.1 – 4.2	2.1 – 4.2	5.2 – 7.3	4.2 – 6.3	0.031 – 0.052	52 – 84	0.21 – 0.26	15.7 – 26.2	1.6 – 2.1	105 – 210	420 – 630
 <b>Ostrich and emu</b>	-	12,600 – 16,800	3,200 – 4,200	0.069	42 – 63	2.1 – 4.2	3.1 – 5.2	10.5 – 21	6.3 – 8.4	0.052 – 0.105	84 – 105	0.21 – 0.37	12.6 – 21.0	2.1 – 4.2	210 – 260	630 – 840

## Local limits need to be observed.

<sup>1</sup> Added per kg air-dried feed. OVN™ levels are ranges for consideration, depending on several factors, such as husbandry conditions and health status.

<sup>2</sup> Add 60 mg/kg CAROPHYLL® Red to improve hatchability. MaxiChick™ (Hy-D® 1,25% and CAROPHYLL® Red) is a DSM Patent and Trademark.

<sup>3</sup> When dietary fat is higher than 3% then add 5 mg/kg feed for each 1% dietary fat

<sup>4</sup> Under heat stress conditions increase level up to 200 mg/kg

<sup>5</sup> For optimum immune function increase level up to 300 mg/kg

<sup>6</sup> For optimum meat quality increase level up to 200 mg/kg

<sup>7</sup> Use upper level as reference for animal protein free diets and when cobalt is supplemented at very low levels or removed

<sup>8</sup> Recommended under heat stress condition and to enhance reproductive performance in breeders. Use ROVIMIX® STAY-C35 for reducing loss during processing




SWINE

SWINE

# SWINE<sup>1</sup>

## OVN OPTIMUM VITAMIN NUTRITION®


Category/phase	Duration	Vitamin A	Vitamin D <sub>3</sub>	25OHD <sub>3</sub> (Hy-D®)	Vitamin E <sup>2</sup>	Vitamin K	Vitamin B <sub>1</sub>	Vitamin B <sub>2</sub>	Vitamin B <sub>6</sub>	Vitamin B <sub>12</sub> <sup>6</sup>	Niacin	Biotin	d-Pan-tothenic acid	Folic acid	Vitamin C <sup>7</sup>	Choline	β-Carotene	
Units		IU	IU	mg	mg	mg	mg	mg	mg	mg	mg	mg	mg	mg	mg	mg	mg	
<b>Fattening pigs</b>																		
	Pre-starter	< 5 kg	10,500 – 22,500	1,890 – 2,100	0.05	105 – 160 <sup>3</sup>	8.5 – 11	3.8 – 5.8	10.5 – 16	6.4 – 8.4	0.052 – 0.072	63 – 84	0.32 – 0.52	32 – 52	1.6 – 3.3	210 – 260	525 – 840	-
	Starter	5 – 30 kg	10,500 – 16,000	1,890 – 2,100	0.05	105 – 160 <sup>3</sup>	5.2 – 6.4	3.2 – 5.2	10.5 – 16	6.4 – 8.4	0.042 – 0.062	38 – 58	0.32 – 0.52	26 – 46	1.6 – 2.6	105 – 210	260 – 420	-
	Grower	30 – 70 kg	7,350 – 10,500	1,570 – 2,100	0.05	64 – 105 <sup>4</sup>	2.1 – 4.2	2.1 – 3.1	7.3 – 10.5	2.6 – 4.7	0.032 – 0.052	21 – 50	0.2 – 0.4	26 – 47	1.1 – 1.6	-	157 – 315	-
	Finisher	70 kg to market	5,250 – 8,400	1,050 – 1,570	0.05	64 – 105 <sup>4</sup>	2.1 – 4.2	1.1 – 2.1	6.3 – 10.5	2.1 – 3.7	0.032 – 0.052	21 – 42	0.105 – 0.21	26 – 47	0.52 – 1.05	-	105 – 210	-

### Local limits need to be observed.

- <sup>1</sup> Added per kg air-dried feed. OVN™ levels are ranges for consideration, depending on several factors, such as husbandry conditions and health status.
- <sup>2</sup> When dietary fat is higher than 3% then add 5 mg/kg feed for each 1% dietary fat
- <sup>3</sup> For optimum immune function increase level up to 250 mg/kg

- <sup>4</sup> For optimum meat quality increase level up to 250 mg/kg for 90 to 120 days before slaughter
- <sup>5</sup> For optimum piglet health increase level up to 250 mg/kg during late pregnancy and lactation
- <sup>6</sup> Use upper level as reference for animal protein free diets and when cobalt is supplemented at very low levels or removed

- <sup>7</sup> Recommended under heat stress condition and to enhance reproductive performance in breeders. Use ROVIMIX® STAY-C35 for reducing loss during feed processing
- <sup>8</sup> For improved sow fertility the suggested level must be fed **per animal per day** immediately after weaning until confirmed conception

Category/phase	Duration	Vitamin A	Vitamin D <sub>3</sub>	25OHD <sub>3</sub> (Hy-D®)	Vitamin E <sup>2</sup>	Vitamin K	Vitamin B <sub>1</sub>	Vitamin B <sub>2</sub>	Vitamin B <sub>6</sub>	Vitamin B <sub>12</sub> <sup>6</sup>	Niacin	Biotin	d-Pan-tothenic acid	Folic acid	Vitamin C <sup>7</sup>	Choline	β-Carotene	
Units		IU	IU	mg	mg	mg	mg	mg	mg	mg	mg	mg	mg	mg	mg	mg	mg	
<b>Breeders</b>																		
	Replacement gilts	-	10,500 – 13,100	1,900 – 2,100	0.05	84 – 105	2.5 – 4.4	1.05 – 2.2	6.3 – 10.5	5.3 – 8.4	0.032 – 0.052	30 – 50	0.32 – 0.52	16 – 33	3.7 – 5.7	210 – 315	270 – 525	-
	Sows	Gestation	10,500 – 15,700	1,570 – 2,100	0.05	105 – 160 <sup>5</sup>	4.7 – 5.2	2.1 – 2.6	6.3 – 10.5	3.7 – 5.7	0.032 – 0.052	32 – 47	0.52 – 0.84	37 – 42	3.7 – 5.7	210 – 315	525 – 840	-
		Lactation	10,500 – 15,700	1,570 – 2,100	0.05	105 – 190 <sup>5</sup>	4.7 – 5.2	2.1 – 3	6.3 – 10.5	3.7 – 5.7	0.032 – 0.052	40 – 100	0.52 – 0.84	37 – 42	3.7 – 5.7	210 – 315	525 – 840	300 <sup>8</sup>
	Boars	-	10,500 – 15,700	1,570 – 2,100	0.05	105 – 160	4.7 – 5.2	1.05 – 2.2	6.3 – 10.5	3.7 – 5.7	0.032 – 0.052	32 – 47	0.52 – 0.84	21 – 33	3.7 – 5.7	210 – 525	525 – 840	-

### Local limits need to be observed.

- <sup>1</sup> Added per kg air-dried feed. Local limits need to be observed. OVN™ levels are ranges for consideration, depending on several factors, such as husbandry conditions and health status.
- <sup>2</sup> When dietary fat is higher than 3% then add 5 mg/kg feed for each 1% dietary fat
- <sup>3</sup> For optimum immune function increase level up to 250 mg/kg

- <sup>4</sup> For optimum meat quality increase level up to 250 mg/kg for 90 to 120 days before slaughter
- <sup>5</sup> For optimum piglet health increase level up to 250 mg/kg during late pregnancy and lactation
- <sup>6</sup> Use upper level as reference for animal protein free diets and when cobalt is supplemented at very low levels or removed

- <sup>7</sup> Recommended under heat stress condition and to enhance reproductive performance in breeders. Use ROVIMIX® STAY-C35 for reducing loss during feed processing
- <sup>8</sup> For improved sow fertility the suggested level must be fed **per animal per day** immediately after weaning until confirmed conception







RUMINANTS

RUMINANTS

# RUMINANTS<sup>1</sup>

OVN OPTIMUM VITAMIN NUTRITION®

Category/phase	Vitamin A <sup>4</sup>	Vitamin D <sub>3</sub> <sup>4</sup>	25OHD <sub>3</sub> <sup>4</sup> (Hy-D®)	Vitamin E	Vitamin K <sub>3</sub>	Vitamin B <sub>1</sub>	Vitamin B <sub>2</sub>	Vitamin B <sub>6</sub>	Vitamin B <sub>12</sub>	Niacin	Biotin	d-Pan-tothenic acid	Folic acid	Vitamin C	Choline	β-Carotene
Units	IU	IU	mg	mg	mg	mg	mg	mg	mg	mg	mg	mg	mg	mg	mg	mg
<b>Calves</b>																
 Milk replacer (0–3 months)	20,000 – 32,000	2,000 – 4,000		150 – 200	1.0 – 1.5	2.5 – 5.0	2.5 – 4.5	2.5 – 4.5	0.04 – 0.08	9.0 – 18	0.05 – 0.1	7 – 9	0.2 – 0.3	250 – 500	500 – 750	100 <sup>14</sup>
Starter dry feed	7,500 – 10,000	2,200 – 3,000		135 – 200												
<b>Heifers (dairy replacement)</b>																
 Growing	20,000 – 60,000	6,000 – 16,350		300 – 500							10 – 20 <sup>12</sup>					300 – 500 <sup>15</sup>
4–6 weeks precalving	80,000 – 100,000	20,000 – 25,000	3 <sup>5</sup>	2,000 – 3,000						6,000 – 12,000 <sup>11</sup>	20 <sup>12</sup>					500 – 1,000 <sup>16</sup>
<b>Beef Cattle</b>																
 Growing	25,000 – 50,000	6,000 – 9,000		200 – 300		60 – 250 <sup>9</sup>					10 – 20 <sup>12</sup>					
Fattening and finishing	40,000 – 80,000	5,000 – 7,000	1	500 – 2,000 <sup>6</sup>		60 – 250 <sup>9</sup>					10 – 20 <sup>12</sup>					
 Beef cows	40,000 – 70,000	5,000 – 10,000		350 – 500							20 <sup>12</sup>					300 – 500 <sup>15</sup>

## Local limits need to be observed.

<sup>1</sup> Supplementary amount/head/day except calves amount/kg air-dried feed. OVN™ levels are ranges for consideration, depending on several factors, such as husbandry conditions and health status.

<sup>2</sup> From dry-off to 3 weeks before calving

<sup>3</sup> From 3 weeks before calving to calving

<sup>4</sup> Local limits need to be observed

<sup>5</sup> 3 weeks before calving

<sup>6</sup> Upper level for improved color case-life, 100 to 120 days pre-slaughter

<sup>7</sup> Upper level from 3 weeks pre-partum until 4 weeks post-partum

<sup>8</sup> Upper level for optimum udder health

<sup>9</sup> Upper level for cattle on high concentrate rations

<sup>10</sup> In high concentrate diets

<sup>11</sup> From 2 weeks before parturition until peak lactation

<sup>12</sup> For optimum hoof health and optimum meat marbling

<sup>13</sup> For optimum hoof health and milk yield




<sup>14</sup> For 2 weeks after colostrum period

<sup>15</sup> 6–8 weeks before 1st insemination/mating when intake of green forage is low

<sup>16</sup> Lower level 8 weeks before 1st calving, upper level 4 weeks before 1st calving when intake of green forage is low

<sup>17</sup> Lower level during entire dry period (Far-off and Close-Up); upper level 3–4 weeks before calving (close-up only)

<sup>18</sup> Dry and fresh beginning during the dry period until pregnancy is confirmed

Category/phase	Vitamin A <sup>4</sup>	Vitamin D <sub>3</sub> <sup>4</sup>	25OHD <sub>3</sub> <sup>4</sup> (Hy-D <sup>®</sup> )	Vitamin E	Vitamin K <sub>3</sub>	Vitamin B <sub>1</sub>	Vitamin B <sub>2</sub>	Vitamin B <sub>6</sub>	Vitamin B <sub>12</sub>	Niacin	Biotin	d-Pan-tothenic acid	Folic acid	Vitamin C	Choline	β-Carotene
Units	IU	IU	mg	mg	mg	mg	mg	mg	mg	mg	mg	mg	mg	mg	mg	mg
<b>Dairy cows</b>																
 Dry cows, far-off <sup>2</sup>	80,000 – 120,000	25,000 – 30,000		1,100 – 4,000 <sup>7</sup>						6,000 – 12,000	20 – 40 <sup>13</sup>					500 – 1,000 <sup>17</sup>
Dry cows, close-up <sup>3</sup>	80,000 – 120,000	25,000 – 30,000	3 <sup>5</sup>	2,000 – 4,000 <sup>7</sup>						6,000 – 12,000	20 – 40 <sup>13</sup>					500 – 1,000 <sup>16</sup>
Lactation	100,000 – 150,000	25,000 – 40,000	1	600 – 1,000 <sup>8</sup>						6,000 – 12,000 <sup>11</sup>	20 – 40 <sup>13</sup>					300 – 500 <sup>18</sup>
 Breeding bulls	50,000 – 80,000	5,000 – 10,000		300 – 500							20 <sup>12</sup>					
 Sheep and goats	10,000 – 15,000	400 – 600		300 – 600		200 <sup>10</sup>					5 <sup>12</sup>					30 – 50

### Local limits need to be observed.

<sup>1</sup> Supplementary amount/head/day except **calves** amount/kg air-dried feed. OVN™ levels are ranges for consideration, depending on several factors, such as husbandry conditions and health status.

<sup>2</sup> From dry-off to 4 weeks before calving

<sup>3</sup> From 3 weeks before calving to calving

<sup>4</sup> Local limits need to be observed

<sup>5</sup> 3 weeks before calving

<sup>6</sup> Upper level for improved color case-life, 100 to 120 days pre-slaughter

<sup>7</sup> Upper level from 3 weeks pre-partum until 4 weeks post-partum

<sup>8</sup> Upper level for optimum udder health

<sup>9</sup> Upper level for cattle on high concentrate rations

<sup>10</sup> In high concentrate diets

<sup>11</sup> From 2 weeks before calving until peak lactation

<sup>12</sup> For optimum hoof health and optimum meat marbling

<sup>13</sup> For optimum hoof health and milk yield

<sup>14</sup> For 2 weeks after colostral period

<sup>15</sup> 6-8 weeks before 1st insemination/mating when intake of green forage is low

<sup>16</sup> Lower level 8 weeks before 1st calving, upper level 4 weeks before 1st calving when intake of green forage is low

<sup>17</sup> Lower level during entire dry period (Far-off and Close-Up); upper level 3-4 weeks before calving (close-up only)

<sup>18</sup> Dry and fresh beginning during the dry period until pregnancy is confirmed










AQUACULTURE

AQUACULTURE

# AQUACULTURE<sup>1</sup>

OVN OPTIMUM VITAMIN NUTRITION®

Units	Vitamin A	Vitamin D <sub>3</sub>	250HD <sub>3</sub> (Hy-D®)	Vitamin E	Vitamin K <sub>1</sub>	Vitamin B <sub>1</sub>	Vitamin B <sub>2</sub>	Vitamin B <sub>6</sub>	Vitamin B <sub>12</sub>	Niacin	Biotin	d-Pantothenic acid	Folic acid	Vitamin C <sup>6</sup>	Choline	Astaxanthin
	IU	IU	mcg	mg	mg	mg	mg	mg	mg	mg	mg	mg	mg	mg	mg	mg
 Salmon/ Trout <sup>2</sup>	4,000 – 8,000	2,500 – 8,000	80 – 800	200 – 600 <sup>5</sup>	8 – 12	15 – 30	25 – 40	20 – 35	0.17 – 0.25	150 – 200	1 – 1.2	40 – 60	10 – 15	200 – 1,000 <sup>7</sup>	500 – 4,000	50 – 100 <sup>8</sup>
 Tilapia <sup>2,9</sup>	8,000 – 11,000	1,500 – 2,000	–	100 – 750	5 – 10	10 – 20	15 – 20	15 – 25	0.02 – 0.05	80 – 120	0.5 – 1	40 – 50	10 – 20	150 – 1,500	600 – 1,200	
 Carp <sup>2</sup>	8,000 – 11,000	1,500 – 2,000	–	100 – 900	5 – 10	10 – 20	15 – 20	15 – 25	0.02 – 0.05	80 – 120	0.5 – 1	40 – 50	4 – 7	150 – 400	600 – 1,800	
 Catfish <sup>2</sup>	8,000 – 11,000	1,500 – 2,000	–	100 – 300	5 – 10	10 – 20	15 – 20	15 – 25	0.02 – 0.05	80 – 120	0.5 – 1	40 – 50	4 – 7	150 – 1,000	600 – 1,100	
 Seabass/ Seabream <sup>2</sup>	8,000 – 12,000	1,700 – 2,200	–	200 – 400	8 – 12	20 – 30	20 – 30	20 – 25	0.1 – 0.2	100-140	0.8 – 1	50 – 100	4 – 6	150 – 200	600 – 1,000	50 – 150
 Eel <sup>2</sup>	8,000 – 12,000	1,500 – 2,000	–	150 – 300	3 – 6	15 – 25	20 – 30	10 – 15	0.1 – 0.2	80 – 120	0.3 – 0.5	50 – 60	4 – 6	150 – 900	800 – 1,200	
 Shrimp <sup>3</sup>	7,000 – 12,000	4,000 – 6,500 <sup>4</sup>	–	150 – 300	40 – 60	50 – 150	40 – 80	50 – 175	0.02 – 0.05	100 – 250	1 – 2.25	100 – 180	10 – 20	250 – 500	600 – 6,500	50 – 200

## Local limits need to be observed.

<sup>1</sup> Added per kg air-dry feed. OVN™ levels are ranges for consideration, depending on several factors, such as husbandry conditions and health status.

<sup>2</sup> Amount to be increased by 30% for fry and broodstock

<sup>3</sup> At low stock density (<10pl/m<sup>2</sup>) the lower levels are recommended

<sup>4</sup> Upper level for low salinity rearing

<sup>5</sup> Additional 200 mg/kg may be required to optimise flesh quality dependent on dietary fat levels

<sup>6</sup> Use ROVIMIX® STAY-C®35 for reducing losses during processing

<sup>7</sup> During winter feeding for wound healing and immune function: total 1000 mg/kg feed

<sup>8</sup> For flesh pigmentation

<sup>9</sup> Amount to be increased by 30-50% during winter period





**DOGS & CATS**



**DOGS & CATS**

# DOGS & CATS

## OVN OPTIMUM VITAMIN NUTRITION®

	Vitamin A <sup>1</sup>	Vitamin D <sub>3</sub>	Vitamin E <sup>2</sup>	Vitamin K <sub>3</sub> (menadione) <sup>3</sup>	Vitamin B <sub>1</sub>	Vitamin B <sub>2</sub>	Vitamin B <sub>6</sub>	Vitamin B <sub>12</sub> <sup>4</sup>	Niacin	d-Pantothenic acid	Folic acid	Biotin <sup>5</sup>	Vitamin C <sup>6</sup>	Choline	β-Carotene <sup>7</sup>
	IU	IU	mg	mg	mg	mg	mg	mg	mg	mg	mg	mg	mg	mg	mg
 Dogs	7,100 – 23,000	640 – 1,100	50 – 500	1.7 – 2	3 – 8	7 – 60	2 – 60	0.04 – 0.1	19 – 170	17 – 150	0.3 – 2	0.3 – 10	100 – 200	2,100 – 3,000	10 – 150
 Cats	9,000 – 25,000 <sup>1</sup>	750 – 1,300	51 – 550	1 – 2 <sup>3</sup>	7 – 10	5 – 27	4 – 14	0.03 – 0.10	60 – 170	8 – 60	1 – 2	0.1 – 0.80	100 – 200	3,200 – 3,300	10 – 50

**Expressed as unit/kg pet food with energy density of 4000 kcal ME/kg on dry matter basis. The dietary vitamin concentration should be corrected for energy density if the pet food energy density is greater than 4000 kcal/kg. Local limits need to be observed.**

<sup>1</sup> Vitamin A: preformed vitamin A is vital in the diet for cats.

<sup>2</sup> Vitamin E: supplemental levels should at least be 10 mg/kg of pet food for each 1% of dietary PUFA on dry matter basis. Higher levels above are recommended to support the total antioxidant capacity of the dog and cat.

<sup>3</sup> Vitamin K as Menadione: supplementation is particularly important for cat food that contains >25% fish when fed for a long period of time.

<sup>4</sup> Vitamin B<sub>12</sub>: higher levels of supplementation might need in vegetarian diets as plant is a poor source of this vitamin.

<sup>5</sup> Biotin: higher level is recommended for the improvement of coat and skin condition of cats and dogs.

<sup>6</sup> Use Rovimix Stay-C® 35 (L-Ascorbyl-2-Polyphosphate) for significantly improved retention of the vitamin during process and storage and to support the total antioxidant capacity of dogs and cats.

<sup>7</sup> β-Carotene: recommended for supporting the total antioxidant capacity of dogs and cats and as a modulator of immune function.









A photograph of two brown horses, an adult and a foal, standing in a field. The adult horse is on the right, looking towards the camera. The foal is on the left, also looking towards the camera. The background is a soft-focus landscape with trees and a warm, golden light. An orange horizontal bar is at the top right, and another orange horizontal bar is at the bottom right.

## HORSES & OTHERS

HORSES &  
OTHERS

# HORSES & OTHERS

OVN OPTIMUM VITAMIN NUTRITION®

		Vitamin A	Vitamin D <sub>3</sub>	Vitamin E	Vitamin K <sub>3</sub> (menadione) <sup>3</sup>	Vitamin B <sub>1</sub>	Vitamin B <sub>2</sub>	Vitamin B <sub>6</sub>	Vitamin B <sub>12</sub>	Niacin	d-Panto- thenic acid	Folic acid	Biotin	Vitamin C <sup>6</sup>	Choline	β-Carotene
	Weight (kg)	IU	IU	mg	mg	mg	mg	mg	mg	mg	mg	mg	mg	mg	mg	mg
 Foals <sup>1</sup> , 1st year	250	25,000 – 30,000	5,000 – 5,500	250 – 550	6 – 12	25 – 30	15 – 20	15 – 20	0.15 – 0.3	25 – 50	25 – 40	6 – 24	2.0 – 3.0	275 – 550	300 – 600	
 Leisure horses <sup>1</sup>	550	35,000 – 45,000	3,500 – 4,500	550 – 1,100	6 – 12	40 – 66	30 – 44	25 – 35	0.15 – 0.35	55 – 85	45 – 65	6 – 24	15 – 20		600 – 1,200	
 Race horses <sup>1</sup>	550	65,000 – 80,000	6,500 – 8,500	1,100 – 3,000	6 – 12	70 – 110	50 – 75	40 – 55	0.15 – 0.55	110 – 220	50 – 88	6 – 24	15 – 20	1,100 – 2,200	1,000 – 1,200	
 Mares and Stallions <sup>1</sup>	550	65,000 – 80,000	6,500 – 8,500	1,100 – 2,500	6 – 12	70 – 110	50 – 75	40 – 55	0.15 – 0.55	110 – 220	50 – 88	6 – 24	15 – 30	1,100 – 2,200	1,000 – 1,200	1,000 – 1,250 <sup>7</sup>
 Rabbits <sup>2</sup>		8,000 – 12,000	800 – 1,200	40 – 60	1 – 2	1 – 2	3 – 6	2 – 3	0.01 – 0.02	40 – 60	10 – 14	0.2 – 0.5	0.10 – 0.20 <sup>5</sup>	150 – 250	600 – 800	10 – 20
 Mink & Foxes <sup>2</sup>		10,000 – 15,000	1,500 – 2,000	100 – 200 <sup>3</sup>	1 – 2	20 – 50 <sup>4</sup>	10 – 20	10 – 20	0.03 – 0.06	20 – 40	8 – 20	0.6 – 1.0	0.30 – 0.60	100 – 200		

## Local limits need to be observed.

<sup>1</sup> Added per animal per day. OVN™ levels are ranges for consideration, depending on several factors, such as husbandry conditions and health status.

<sup>2</sup> Added per kg air-dry feed. OVN™ levels are ranges for consideration, depending on several factors, such as husbandry conditions and health status.

<sup>3</sup> Dietary fat higher than 3%: additional 5 mg/kg feed for each 1% dietary fat

<sup>4</sup> When feeding raw fish: additional 50 mg/kg feed

<sup>5</sup> For fur production rabbits: 0.6 mg/kg feed

<sup>6</sup> Recommended under heat stress condition and to enhance reproductive performance in breeders. Use ROVIMIX® STAY-C35 for reducing loss during feed processing

<sup>7</sup> To be fed prior to estrus and through pregnancy up to 10 weeks post parturition or at any time when the diet is low in β-Carotene



# CONVERSION FACTORS



# CONVERSION FACTORS AND STANDARD DSM VITAMINS

Vitamin (active substance)	Unit	Conversion factor active substance form to vitamin form	Product form	Content (min.)	Formulation technology	Application*
Vitamin A (retinol)	IU	1 IU Vitamin A = 0.344 µg Vitamin A acetate (retinyl acetate)	ROVIMIX® A 1000	1,000,000 IU/g	Beadlet	M, P, EXP, EXT
			ROVIMIX® A 500 WS	500,000 IU/g	Spray-dried powder water dispersible	MR/W
			ROVIMIX® A Palmitate 1.6	1,600,000 IU/g	Oily liquid, may crystallize on storage	Oily solution
			ROVIMIX® AD3 1000/200	Vitamin A 1,000,000 IU/g Vitamin D <sub>3</sub> 200,000 IU/g	Beadlet	M, P, EXP, EXT
Vitamin D <sub>3</sub> (cholecalciferol)	IU	1 IU Vitamin D <sub>3</sub> = 0.025 µg Vitamin D <sub>3</sub>	ROVIMIX® D3-500	500.000 IU/g	Spray-dried powder, water dispersible	M, P, EXP, EXT, MR/W
			ROVIMIX® AD3 1000/200	Vitamin A 1,000,000 IU/g Vitamin D <sub>3</sub> 200,000 IU/g	Beadlet	M, P, EXP, EXT
25OHD <sub>3</sub> (25 hydroxy-cholecalciferol)	mg	1 µg 25OHD <sub>3</sub> = 40 IU Vitamin D <sub>3</sub>	ROVIMIX® Hy-D® 1.25%	1.25% 25OHD <sub>3</sub> (12.5 g/kg)	Spray-dried powder, water dispersible	M, P, EXP, EXT, W
Vitamin E (tocopherol)	mg	1 mg Vitamin E = 1 IU Vitamin E = 1 mg all-rac-α-tocopheryl acetate	ROVIMIX® E-50 Adsorbate	50% (500 g/kg)	Adsorbate on silicic acid	M, P, EXP, EXT
			ROVIMIX® E 50 SD	50% (500 g/kg)	Spray-dried powder, water dispersible	M, P, EXP, EXT, MR/W
Vitamin K <sub>3</sub> (menadione)	mg	1 mg of Vitamin K <sub>3</sub> = 2 mg of Menadione Sodium Bisulfite (MSB) 1 mg of Vitamin K <sub>3</sub> = 2.3 mg of Menadione Nicotinamide Bisulfite (MNB)	K <sub>3</sub> MSB	Menadione: 51.5% (515 g/kg)	Fine crystalline powder	M, P, EXP, EXT, MR/W
			ROVIMIX® K <sub>3</sub> MNB	Menadione: 43% (430 g/kg) Nicotinamide: 30.5% (305 g/kg)	Fine crystalline powder	M, P, EXP, EXT
Vitamin B <sub>1</sub> (thiamine)	mg	1 mg of Vitamin B <sub>1</sub> = 1.233 mg of Thiamine mononitrate	ROVIMIX® B <sub>1</sub>	98% (980 g/kg)	Fine crystalline powder	M, P, EXP, EXT
Vitamin B <sub>2</sub> (riboflavin)	mg		ROVIMIX® B <sub>2</sub> 80-SD	80% (800 g/kg)	Spray-dried powder	M, P, EXP, EXT, MR/W

Vitamin (active substance)	Unit	Conversion factor active substance form to vitamin form	Product form	Content (min.)	Formulation technology	Application*
Vitamin B <sub>6</sub> (pyridoxine)	mg	1 mg Vitamin B <sub>6</sub> = 1.215 mg Pyridoxine hydrochloride	ROVIMIX® B <sub>6</sub>	99% (990 g/kg)	Fine crystalline powder	M, P, EXP, EXT, MR/W
Vitamin B <sub>12</sub> (cyanocobalamin)	mg		Vitamin B <sub>12</sub> 1% Feed Grade	1% (10 g/kg)	Fine powder	M, P, EXP, EXT
			ROVIMIX® B <sub>12</sub>	1% Feed Grade 1% (10 g/kg)	Spray-dried powder	M, P, EXP, EXT
Vitamin B <sub>3</sub> (Niacin; nicotinic acid and nicotinamide)	mg	1 mg Nicotinic acid = 1 mg Niacin	ROVIMIX® Niacin	99.5% (995 g/kg)	Fine crystalline powder	M, P, EXP, EXT
		1 mg Nicotinamide (or Niacinamide) = 1 mg Niacin	ROVIMIX® Niacinamide	99.5% (995 g/kg)	Fine crystalline powder	M, P, EXP, EXT, MR/W
Vitamin B <sub>7</sub> (d-Biotin)	mg	1 mg of Biotin = 1 mg D-Biotin	ROVIMIX® Biotin ROVIMIX® Biotin HP	2% (20 g/kg) 10% (100 g/kg)	Spray-dried powder water dispersible	M, P, EXP, EXT, MR/W
Vitamin B <sub>5</sub> (d-Pantothenic acid)	mg	1 mg d-Pantothenic acid = 1.087 mg Calcium d-pantothenate or 2.174 mg Calcium dl-pantothenate	ROVIMIX® Calpan	98% Calcium d-pantothenate (980 g/kg) Calcium 8.2 – 8.6% (82 – 86 g/kg)	Spray-dried powder water dispersible	M, P, EXP, EXT, MR/W
Vitamin B <sub>9</sub> (Folic acid)	mg		ROVIMIX® Folic 80 SD	80% (800 g/kg)	Spray-dried powder water dispersible	M, P, EXP, EXT, MR/W
Vitamin C	mg	1 mg Vitamin C = 1 mg L-Ascorbic acid	STAY-C® 35	35% of total phosphorylated ascorbic acid activity (350 g/kg)	Spray-dried powder	M, P, EXP, EXT
			STAY-C® 50	50% of total phosphorylated sodium salt ascorbic acid activity (500 g/kg)	Spray-dried powder	M, P, EXP, EXT, MR/W
			ROVIMIX® C-EC	97.5% (975 g/kg)	Ethyl-cellulose coated powder	M, P, MR/W
			Ascorbic acid	99 – 100% (990 – 1000 g/kg)	Crystalline powder	MR/W

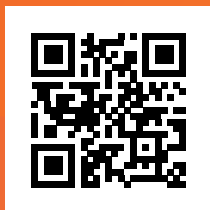
Vitamin (active substance)	Unit	Conversion factor active substance form to vitamin form	Product form	Content (min.)	Formulation technology	Application*
β-Carotene	mg		ROVIMIX® β-Carotene 10%	10% (100 g/kg)	Beadlet	M, P, EXP, EXT
			ROVIMIX® β-Carotene 10% P	10% (100 g/kg)	Cross linked beadlet	M, P, EXP, EXT
Astaxanthin	IU		CAROPHYLL® Pink 10%-CWS	10% astaxanthin	Beadlet (Cold Water Soluble)	M, P, EXP, EXT, W
			CAROPHYLL® Pink	8% astaxanthin	Beadlet	M, P, EXP, EXT

\* M: Mash; P: Pellet; EXP: Expansion; EXT: Extrusion; MR/W: Milk replacer/Water  
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