

Panbonis®



Panbonis®: the unique, safe, and natural source of the bioactive form of vitamin D₃ for monogastric animals

- + Improves calcium and phosphorus metabolism
- + Improves eggshell quality
- + Increases the number of saleable eggs
- + Improves FCR
- + Helps to reach 500 eggs per hen housed
- + Improves fertility
- + Improves piglet vitality and litter homogeneity
- + Shortens parturition time

Origin and benefits of Panbonis®

Panbonis® is a complementary feed that contains a standardized level of 1,25 dihydroxycholecalciferol-glycosides ($1,25(\text{OH})_2\text{D}_3\text{-gly}$) from dried and ground *Solanum glaucophyllum* leaves. After harvesting, the leaves are dried, packed, and shipped to Herbonis.

At arrival, the leaves are stored and ground close to the production date. Each batch is analyzed for the level of $1,25(\text{OH})_2\text{D}_3$ -equivalents via our in-house optimized analytical procedures. After standardization of the active ingredient level, each batch of the final product is analyzed and sanitized before dispatch.

Herbonis cultivates its own variety of *Solanum glaucophyllum* (waxy-leaf nightshade) to being able to control the full supply chain. This plant is one of the few that produce the source of the bioactive form of vitamin D_3 in glycosidic form. Herbonis has obtained exclusivity for the use of this cultivated *Solanum glaucophyllum* variety, with a constant high level of the active ingredient in its leaves, almost entirely in glycosidic form.

$1,25(\text{OH})_2\text{D}_3\text{-gly}$ can only be absorbed after the sugar molecule is released from $1,25(\text{OH})_2\text{D}_3$ by specific enzymes that are present in the intestine. This gradual process ensures a slow release of the bioactive component. Once absorbed, it does not need additional activation steps like vitamin D_3 or 25-hydroxycholecalciferol ($25(\text{OH})\text{D}_3$) do, which means that Panbonis® can directly support the animal's metabolism even when specific activation enzymes in liver and kidney are limited.

- + Supports the crucial role of vitamin D_3
- + 100% Natural
- + GMO-free
- + Standardized content of the active ingredient
- + Gradually absorbed from the intestine
- + Considered a complementary feed in the EU
- + High processing and storage stability

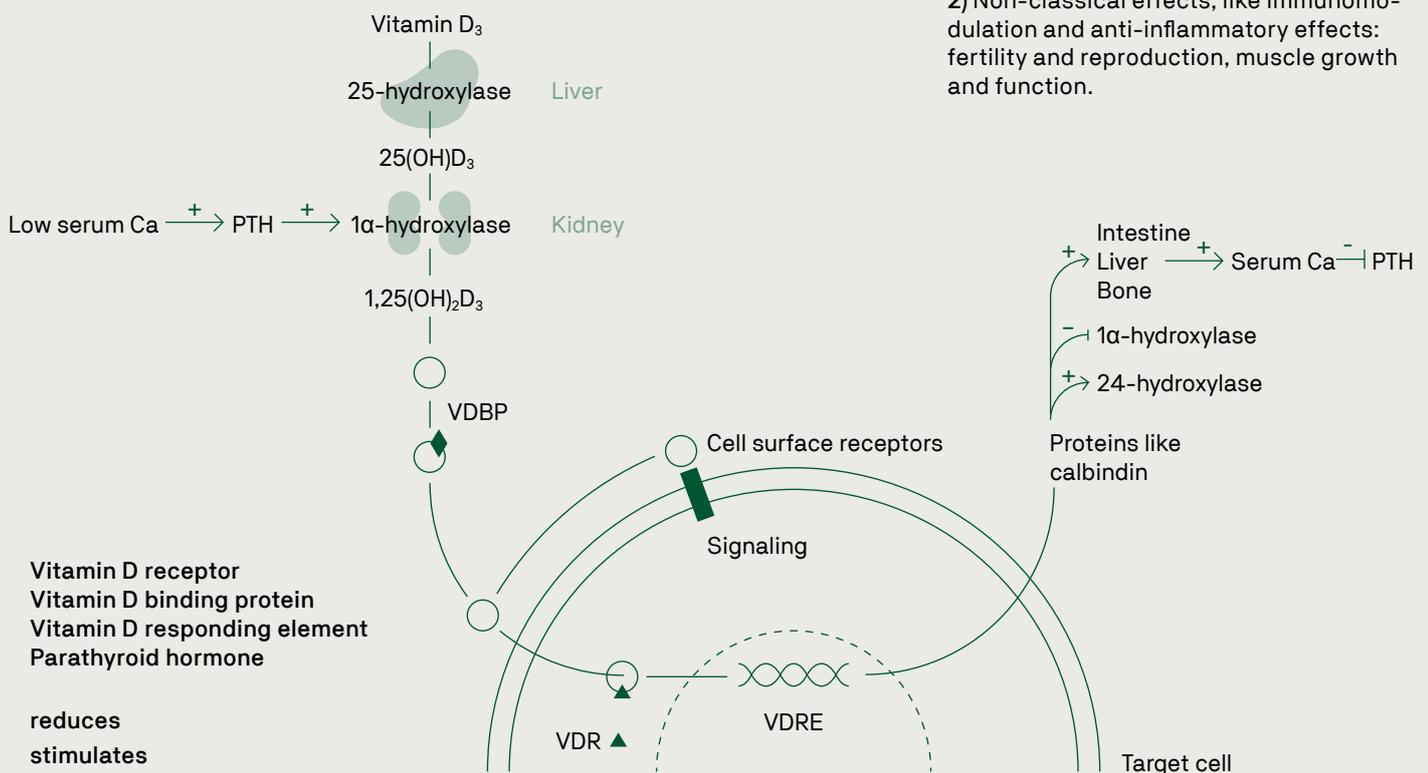
Vitamin D₃ metabolism

Vitamin D₃ is one of 13 known vitamins. It is formed in the skin when exposed to sunlight. Besides, it is usually added to the diet via premixes to prevent vitamin D₃ deficiencies. Vitamin D₃ needs two enzymatic activation steps in the body before it becomes metabolically active. During the first step that takes place in the liver, 25(OH)D₃ is formed by the enzyme 25-hydroxylase. 25(OH)D₃ is the storage form of vitamin D₃. Its content in blood can be used to determine vitamin D₃ status in the body. However, at this point, 25(OH)D₃ is not yet bioactive and it needs another activation step into 1,25(OH)₂D₃ by the enzyme 1 α -hydroxylase, which mainly takes place in the kidneys. These activation processes are quite efficient when the liver and kidneys function properly. However, they can be compromised in case of inflammations, mycotoxicosis (which can

affect both liver and kidney metabolism), or other metabolic disorders, resulting in a secondary vitamin D₃ deficiency. Moreover, in old laying hens and fast-growing modern broilers, there are indications that the 1 α -hydroxylase activity in the kidneys is too low for efficient activation of 25(OH)D₃. In such conditions, vitamin D₃ status can be directly supported by adding the natural 1,25(OH)₂D₃-gly to the feed. After removing the sugar molecule in the intestinal tract, the free 1,25(OH)₂D₃ is absorbed and can directly support the metabolic effects of vitamin D₃.

Excess of 25(OH)D₃ and 1,25(OH)₂D₃ is enzymatically degraded by 24-hydroxylase and excreted as calcitroic acid via bile in the intestinal lumen. Figure 1 shows a simplified representation of vitamin D₃ metabolism and regulation.

Figure 1
Vitamin D₃ absorption,
metabolism, and regulation



Metabolic effects of vitamin D₃

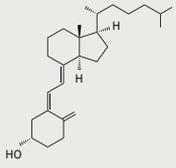
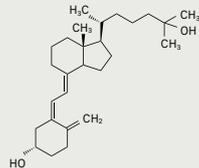
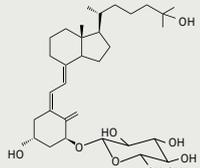
1) Classical effects: maintenance of calcium and phosphorus homeostasis in the body, stimulation of bone calcification, eggshell formation, and prevention of milk fever (hypocalcaemia) in dairy cows.

2) Non-classical effects, like immunomodulation and anti-inflammatory effects: fertility and reproduction, muscle growth and function.

Vitamin D₃ (metabolites) in animal feed

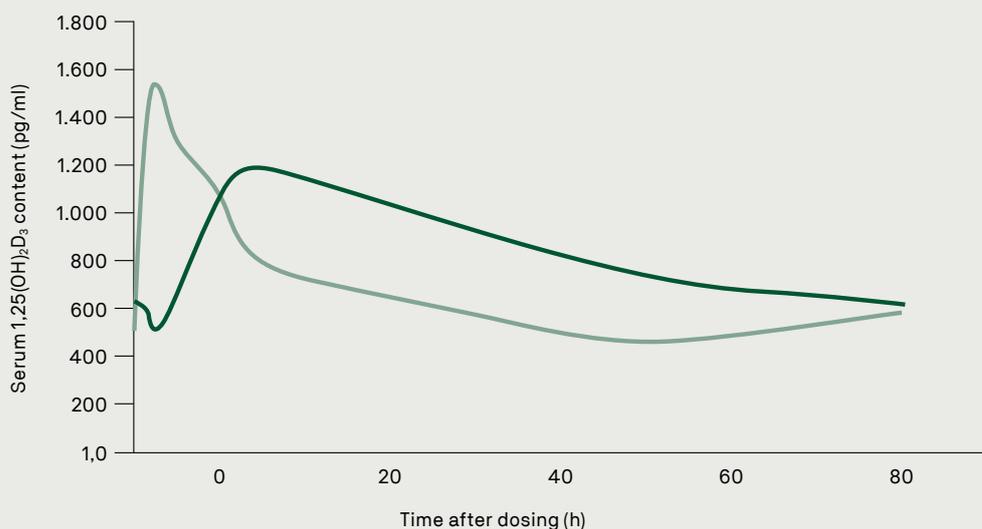
The following three vitamin D₃ metabolites can be used to supplement animal feed:

1. Vitamin D₃- the most common source
2. 25-hydroxycholecalciferol (25(OH)D₃)- either produced in a chemical process or through fermentation
3. 1,25-dihydroxycholecalciferol-glycosides (1,25(OH)₂D₃-gly)- an entirely natural source of the bioactive form of vitamin D₃. Some characteristics of the vitamin D₃ and its metabolites, as used in animal nutrition, are summarised in Table 1.

	Vitamin D ₃	25(OH)D ₃	Panbonis®
Structure			
Principal molecule	Vitamin D ₃	25(OH)D ₃	1,25(OH) ₂ D ₃ -gly
Solubility	Fat-soluble	Fat-soluble	Water-soluble
Biological task	Basic form	Storage form	Glycosides of the bioactive molecule
Enzymatic activation steps	<u>2 steps:</u> In liver and kidney	<u>1 step:</u> In kidney	No activation needed: Cleavage of glycosides in the intestine

Special benefits of Panbonis®

Figure 2
Serum 1,25(OH)₂D₃ content in blood during 72 hours after a single oral dose of 1 µg of 1,25(OH)₂D₃/kg BW given as synthetic 1,25(OH)₂D₃, or as 1,25(OH)₂D₃-gly in piglets.



In the intestine, the sugar molecule is cleaved from 1,25(OH)₂D₃-gly. Thereby, the free molecule becomes gradually available for absorption, and unlike its precursors – vitamin D₃ and 25(OH)D₃ – it does not need additional enzymatic activation steps in the liver and/or kidneys. Once the biological task is completed, 1,25(OH)₂D₃ is quickly inactivated and excreted. 1,25(OH)₂D₃ does not pass into animal products.

Figure 2 shows how the pharmacokinetics of 1,25(OH)₂D₃-gly are different from the free 1,25(OH)₂D₃, most notably in the delay in response time and the prolonged release, which are related to cleaving the glycoside bond before absorption. Glycosylation also increases the safety margin and shelf life of Panbonis® compared to free 1,25(OH)₂D₃.

How to use Panbonis®

Product Profile

Heat stable during feed processing (expanding, pelleting and expanding-pelleting)

Shelf life: 24 months, when stored in a dry place at room temperature

Particle size: 0.2 mm;
>90 % between 0.05 - 1.6 mm

Packaging: 20 kg bags

Available for organic production as Panbonis®Green

Dosage:
The general dosage is 50 - 200 g of Panbonis® 10 per metric ton of feed, providing 0,5 - 2 µg of 1,25(OH)₂D₃ -equivalents/kg of feed. Because it is supplied in addition to the usual supplementation level of vitamin D₃, there is no need to adjust the premix.

Contact us to find customized information.

The product is a complementary feed according to EC 767/2009 regulation and available in two concentrations, 10 ppm (Panbonis® 10) and 20 ppm (Panbonis® 20).

It should be used on top of recommended vitamin D₃ sources.

The recommended application of Panbonis® 10 and Panbonis® 20 for different animal categories (in addition to the legislative maximum inclusion levels of vitamin D₃ and 25(OH)D₃ is given in the table below:



Poultry	Panbonis® 10	Panbonis® 20
Meat producing poultry		
Broiler	50 - 100 g/MT	25 - 50 g/MT
Turkey (phase 1 till 4)	50 - 100 g/MT	25 - 50 g/MT
Egg producing poultry		
Pullets	100 g/MT	50 g/MT
Laying hens	100 g/MT	50 g/MT
Breeding hens	100 g/MT	50 g/MT
Swine		
General dose range:	50 - 200 g/MT	25 - 100 g/MT
Recommendation for pigs:		
Piglets / Grower / finisher	50 - 100 g/MT	25 - 50 g/MT
Gestating sows and Lactating sows	75 - 100 g/MT	40 - 50 g/MT
Boars	100 g/MT	50 g/MT



For more information
please visit
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