

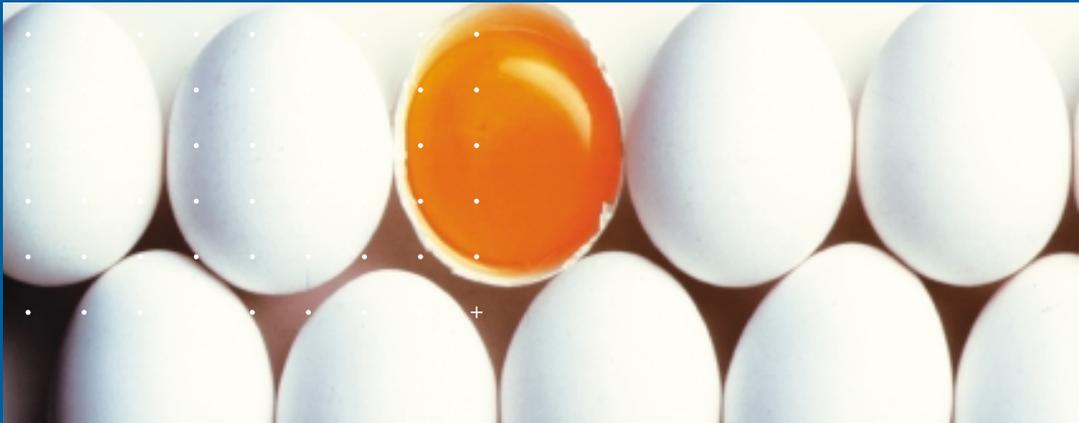
Hy•D[®]

Advanced vitamin D for poultry

a **DSM** Product



**Better bones, better welfare,
better performance and more eggs**



DSM Nutritional Products

Unlimited. **DSM**

Introduction

It is acknowledged that vitamin D is important for the development and maintenance of strong, healthy bones in animals as well as humans. However, there are circumstances when skeletal health can be a problem in modern poultry production and vitamin D₃ alone is not enough. Advances in breeding have improved performance in meat and egg producing strains, resulting in fast-maturing birds and better egg production. Often, however, disease and physiological disorders prevent birds from achieving the performance that they are genetically capable of delivering.



Hy•D®

Hy•D® is a metabolite of vitamin D₃, 25-hydroxycholecalciferol [25-OH-D₃]. Hy•D® provides a more bioactive form of vitamin D₃ to the animal, which has proven advantages over vitamin D₃: improvements in weight gain, feed efficiency, shell quality, laying persistence and reductions in bone disorders.

Vitamin D₃ Metabolism

Besides photo-conversion of 7-dehydrocholesterol in the skin, the supplemented diet represents the major source of Vitamin D to most animals.

Vitamin D₃ has first to be absorbed from the intestinal tract, and transported to the liver to be converted to the D₃ metabolite 25-OH-D₃. This is then transported to the kidney for conversion into a number of metabolites, the most important of which is 1,25-dihydroxycholecalciferol [1,25-(OH)₂-D₃] (see Figure 1).

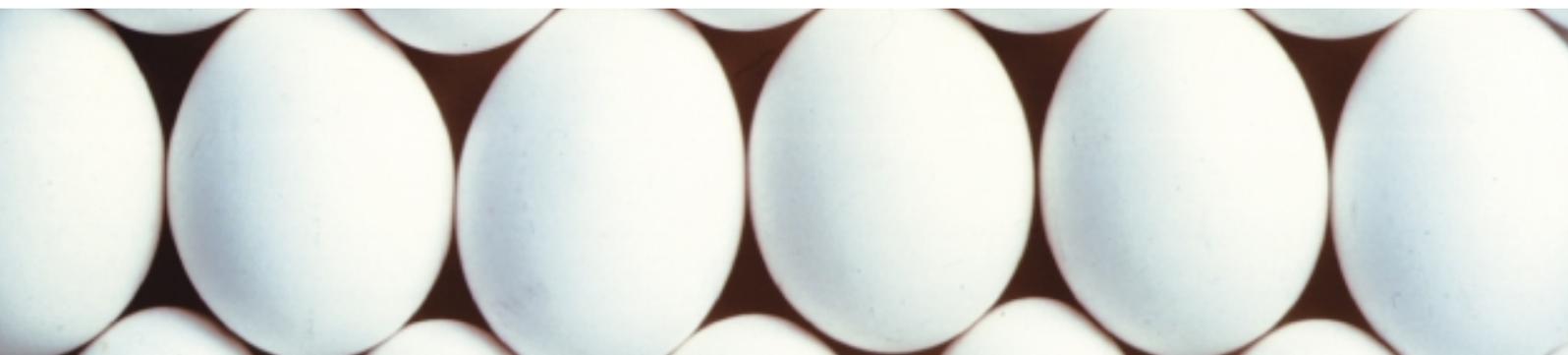
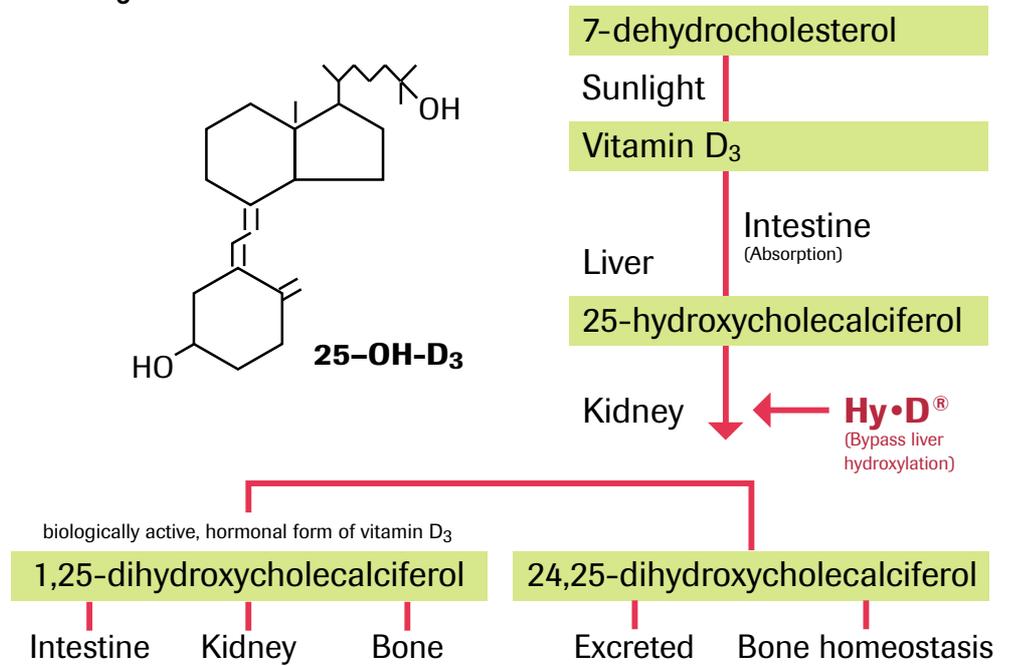


Figure 1: Metabolism of vitamin D₃ and Hy•D®



The metabolism of Hy•D® is different, once absorbed it bypasses the hydroxylation step in the liver. Hence, it is readily available in the active form to be utilised by the animal, yielding a wide range of health benefits (see Table 1).

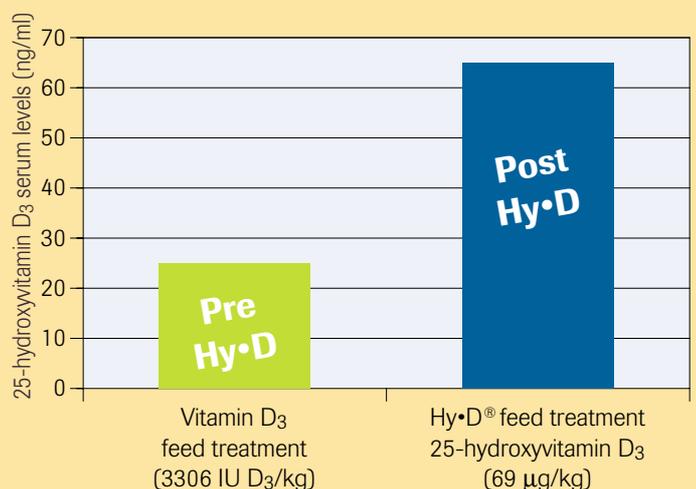
This means that when Hy•D® is supplemented, the active metabolites known to help poultry overcome various health problems are available for the bird very soon after Hy•D® is ingested. Thus providing a more readily available source of this metabolite in the serum (see Figure 2) than vitamin D₃.

Table 1: Vitamin D₃ metabolites associated with Poultry Health Benefits

25-hydroxyvitamin D ₃ (Hy•D®)	Bone mineralisation Calcium and phosphorus homeostasis Immune system modulation
1,25-dihydroxyvitamin D ₃	Aids in absorption of dietary Ca and P Bone mineralisation Immune system modulation
24,25-dihydroxyvitamin D ₃	Bone homeostasis

Figure 2: 25-hydroxyvitamin D₃ blood serum content

Commercial broiler operation (1995).
Samples taken at random from 15 farms pre and post Hy•D® inclusion.

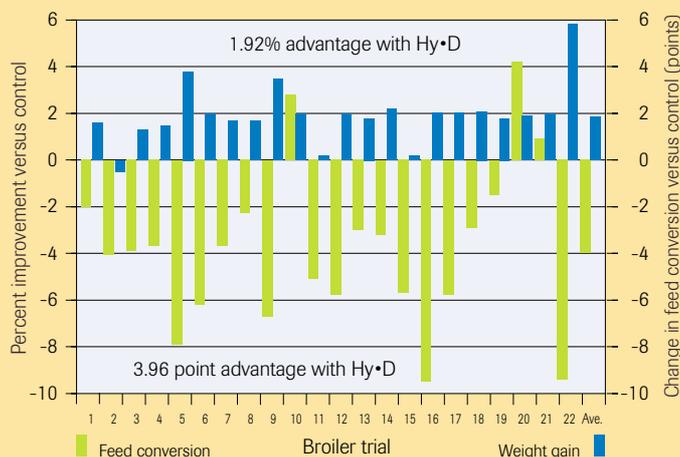


The nutritional benefits of Hy•D®

Broilers, turkeys and laying hens all benefit from Hy•D®. Hy•D® has been shown to enhance the long-recognised nutritional benefits of vitamin D₃, with additional advantages. In various broiler studies (see Figure 3), birds receiving Hy•D® realised an average improvement of almost 2% in weight gain and around four points in feed conversion when compared to birds that received only vitamin D₃. Similar advantages have been achieved in turkey production, in both hens and toms.

Figure 3: Hy•D® effect on broiler performance

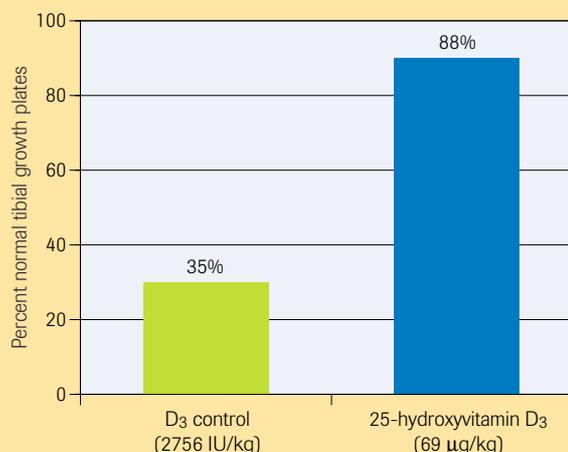
Summary of 22 broiler trials.
DSM research data (1995-2001).



Hy•D® is therefore an integrated part of the OVN concept improving health and welfare, productivity and food quality in the most economical way.

Figure 4: Effects of Hy•D® on development of tibial growth plates in broilers

Roslin Institute (1999)

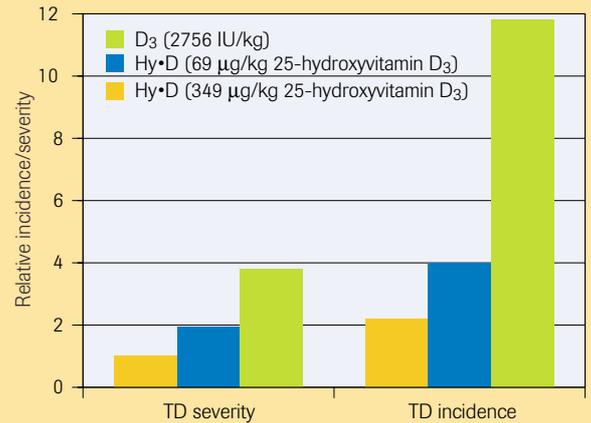


Stronger bones give advantages during growth and processing

Studies have shown that the use of Hy•D® significantly reduces the bone problems known to negatively affect weight gain, feed conversion, end-of-flock liveability and processing plant condemnations. By improving the birds phosphorous and calcium utilisation, Hy•D® reduces the overall incidence of field rickets and results in higher tibia ash percentages in broilers and turkeys. Hy•D® has also been shown to reduce tibial dyschondroplasia (TD) in birds (see Figures 4 and 5).

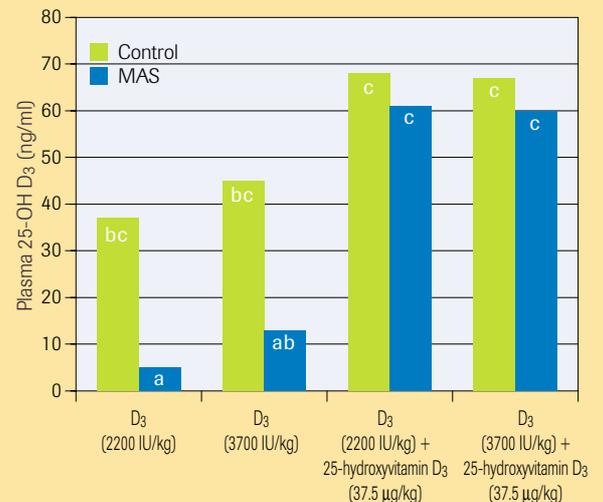
The economic return poultry producers achieve from using Hy•D® extends beyond health and welfare advantages realised in the live production operations.

Figure 5: Effects of Hy•D® on tibial dyschondroplasia in broilers
Auburn University (2000)



The bone health benefits associated with Hy•D® mean fewer condemnations and downgrades during meat grading and fewer broken bones and bone chips during processing. By addressing these bone-related factors, Hy•D® used consistently may result in substantial weight gain, better feed conversion and other live production improvements that equate to more overall meat output.

Figure 6: Influence of Hy•D® on 25-hydroxyvitamin D₃ plasma status of broilers affected by malabsorption syndrome (MAS)
Columns with different letters (a, b, c) indicate differences of P < 0.05)
Private research trials (2001)



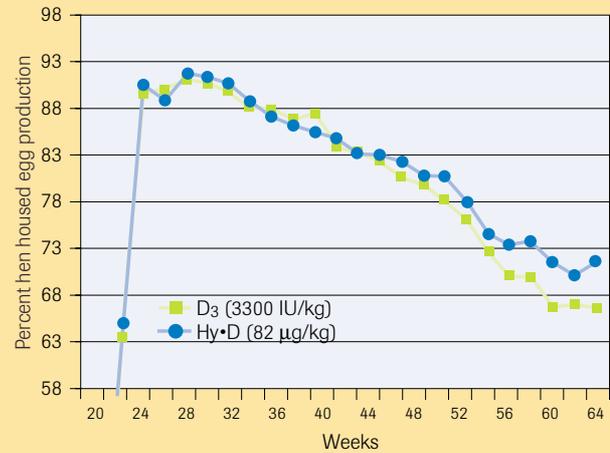
Improved vitamin absorption in the presence of intestinal disease

As Hy•D® has a different mode of absorption, it is not compromised by intestinal disease. Studies (see Figure 6) show that birds receiving Hy•D® during times of malabsorption maintain their plasma 25-OH-D₃ levels, thus helping to maintain their bone integrity.

Hy•D® has been shown to help a bird minimise the effects of a disease challenge. This reduces both mortality and morbidity, enabling the birds to grow even under minor disease stress.

Figure 7: Lay persistence

Jackson and Zhong (1997)



Significant advantages for broiler and turkey breeders and laying stock

For egg producers and breeding operations, Hy•D[®] represents an excellent nutritional tool for addressing the problems of poor shell quality, osteoporosis, cage layer fatigue and hatchability in hens.

Poor shell quality is normally a result of poor metabolism of calcium, phosphorus and vitamin D, feeding Hy•D[®] can help overcome this. Research shows that feeding Hy•D[®] improves shell quality by increasing eggshell thickness. Fed during the early lay cycle, Hy•D[®] results in marked reductions in hen mortality and minimises the loss of skeletal reserves, thus adding five to ten percent more useable eggs per hen housed (see Figure 7).

For the breeder, profitability is measured in chicks or poults per hen housed. Hy•D[®] has been reported to improve hatchability by two to three percent.



How to use Hy•D®

For use in broiler, turkey and layer operations, Hy•D® 1.25% or Hy•D® Premix should be incorporated into the feed. The recommended levels in Europe are the current amalgamation of science and practical experience, to offer the most cost effective solutions and benefits of Hy•D®, the most flexible source of vitamin D, and the safety of vitamin D₃.

Table 2: Supplementation Guidelines for Hy•D® for poultry*

Species	25-OHD3 (µg/kg)	Hy•D® 1.25% (g/t)
Chickens starter, 1-21 days	37.5 - 69	3 - 5.52
Chickens, 22 days-market	37.5 - 69	3 - 5.52
Layer and breeders	37.5 - 69	3 - 5.52
Turkeys starter, 0-6/8 weeks	62.5 - 92	5 - 7.36
Turkey grower, 6/8 weeks-market	37.5 - 92	3 - 7.36
Other poultry	37.5 - 69	3 - 5.52

**In the EU, legal maximum of total dietary supply of vitamin D₃ is 5,000 IU/kg in diets for chickens for fattening and turkeys, and 3,000 IU/kg in diets for other poultry.*



Benefits from using Hy•D® in poultry

Effect on	Benefit
Vitamin D Metabolism	<ul style="list-style-type: none">- Potent and effective source of Vitamin D₃- Improves plasma 25-OH-D₃ when liver immature- Better bone mineralisation in young animals- Optimises calcium and phosphorus homeostasis- Maintains plasma 25-OH-D₃ under intestinal disease conditions like malabsorption
Bone Metabolism	<ul style="list-style-type: none">- Helps prevent field rickets- Improves bone growth and strength- Ameliorates leg disorders like tibial dyschondroplasia- Maintains bone mass longer
Productivity	<ul style="list-style-type: none">- Optimised weight gain and feed conversion- Stronger egg shells – fewer broken eggs- More eggs per hen, extends layer cycle- Better hatchability- Combines with phytase feed enzymes
Enhanced Health and Welfare	<ul style="list-style-type: none">- Reductions in skeletal problems- Less leg problems- Assists in cage layer fatigue- Limits osteoporosis in laying birds
Processing Plant Management	<ul style="list-style-type: none">- Less rejects and downgrades- Fewer broken bones during processing- Lessens bone chips during further processing- Important particularly in heavy bird production

Hy•D® has shown to be a cost effective and flexible source of vitamin D₃ when used in combination with standard vitamin D₃ sources

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