

Broilers – locomotor problems in Brazil

by Isaac Bittar Filho, MV,
DSM Nutritional Products,
São Paulo, Brazil.

Today, Brazil is one of the largest poultry producers and the largest chicken meat exporter in the world. This outstanding position in the global market is certainly the result of efficient and very technical work.

The intensive production, with increased stocking density, restricted use of growth promoters, re-use of litter and reduced downtime, increases production but certainly has a negative impact on productivity per m².

Other factors that have helped this development are genetic selection, the increase in weight gain rate and increased body mass.

One of the problems resulting from these changes is an increase in locomotor problems. Problems triggered by osteochondrosis, osteoporosis, chondrodystrophy, rickets, torsional and angular deformities and fractures.

Studies carried out in the UK have shown that 3.3% of the birds are culled because of evident locomotor problems (LP) and another 27.6% had some walking impairment.

No studies have been carried out in Brazil to determine the occurrence of such problems, but field observations have shown that culling due to LP is between 1 and 3%.

The increase in the incidence of locomotor problems is followed by an increase in partial and total condemnations in the slaughter plant as a result of skin infectious processes, cellulitis and repulsive aspect.

Economic impact

The question that immediately arises is: What is the cost resulting from locomotor problems? Assuming that 1% of the birds are lost and considering only the losses up to the slaughter plant, the direct economic losses caused by the birds that are culled due to locomotor problems can be calculated as follows:

1 Monthly slaughter in Brazil: 450 million birds.

1 1% cull due to LP: 4,500,000 birds.
1 Weight at slaughter: 2.5kg.

1 Price per kg live weight: US\$1.00 (price of raw material for the slaughter plant).

1 Calculation: 1% culls (monthly slaughter in Brazil) x bird weight (kg) x price (US\$).

1 Calculation: 4,500,000 x 2.5 x 1.0.

1 Result: US\$11,250,000.00 per month.

Thus, it can be considered that companies have losses around US\$ 11 million per month due to LP or to any other factor that affects livability by 1%.

On the other hand, if we consider that the discarded meat could have been further processed, resulting in an added value product, this figure could be two or three times higher.

Animal welfare

In general, chickens with locomotor problems are only the birds that are culled because they are very much affected, unable to walk and have a repulsive aspect. The birds that have some lameness but still maintain a good aspect are not included in this category.

A survey by Pfeiffer et al. (2002) in the UK reported that for every 1% of birds with evident locomotor problems there is another 2% with subclinical locomotor problems, and this is not different in Brazilian conditions. The fact that the birds have difficulties walking is an indication that they may have some pain or discomfort. The gait score evaluation, a system developed by Bristol University in the UK, is one of the tools that is used to assess the way they walk and is one of the items used to measure the quality of life of the birds and their welfare.

The economic losses resulting from the difficulty to walk are not measured, but we know that these birds will not have the same performance as those that are walking normally.

They will have a limited access to feed and water due to the difficulty to walk, and will only consume the minimum required for their survival.

We can also assume that animal

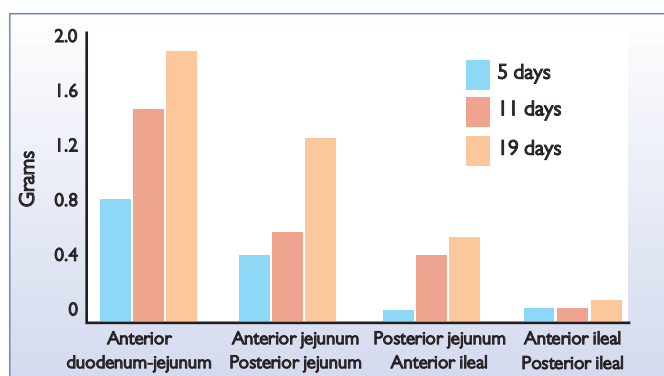


Fig. 1. Total fat absorption at different ages and different intestinal segments of turkeys (Sklan and Noy, 2003).

welfare is not only a requirement to improve the living conditions of poultry to satisfy demanding customers. It also has an economic impact caused by these losses that still have to be quantified.

Management

Management is an important factor in the occurrence of LP. It is very intensive from the time the birds are removed from the hatcher, undergoing selection, vaccination, transportation and housing in the poultry farm. The birds have to be carefully managed, taking into consideration the time and personnel available to perform these tasks.

Genetics

A marked genetic evolution has been achieved, and this can be ascertained by comparing the modern 2004 broiler that is 4.6 and 3.9 times heavier than the 1957 broiler fed the modern and the old diets, respectively. Whitehead (1992) states that there is a genetic correlation between the occurrence of tibial dyschondroplasia and deviated legs (valgus and varus) and the genetic selection for weight gain.

When the bodyweight tables of the broiler lines available in the market are analysed, it becomes clear that the weekly bodyweight gain is becoming increasingly higher. In

Table 1 it can be seen that the weight in the third week of age is almost 21 times higher than the weight at one day of age. It is important to stress that the skeleton has the highest relative growth in the first 21 days of life.

The main factors associated with locomotor problems are directly related to the growth rate.

Nutrition

There are several nutritional factors that are directly related to the increase or decrease in LP incidence, including:

1 The levels of vitamins, minerals and amino acids, protein and energy in the diet can be directly involved in skeletal problems. Calcium, phosphorus and vitamin D₃ (metabolites)

Continued on page 9

Table 1. Bodyweight vs weekly growth rate in relation to day 0 (as hatched flock) (Aviagen 2007).

Age (days)	Weight (g)	Weekly growth rate
0	42	
7	182	4.3
14	455	10.8
21	874	20.8
28	1412	33.6
35	2021	48.1
42	2652	63.1
49	3264	77.7

Continued from page 7

have the largest influence.

1The diet should have the optimal level of vitamin D₃ in each phase.

1Check if the Ca and phosphorus level of diet for each phase are equal.

1The Ca:P relation is more important than their individual levels. This relation, for broilers, should be between 1.8 and 2.2.

1To be aware of quality Ca and P sources.

– Check the limestone granulometry; less than (<1mm) for broilers.

– Do not use limestone with a high magnesium level (> than 0.8%).

1To be aware of feed mixability (CV < 10%). To verify the mixability of the feed mixer at least every six months.

1To verify if the electrolytes of the feed (the electrolytic balance, acid-base) are balanced. (Na⁺, K⁺, Cl⁻, SO₄²⁻).

1Some factors which could change the phytase effectiveness include:

– Water with pH higher than 8.

– Formaldehyde in the feed.

– Feed over processed (high pellet temperature, high time of conditioning and/or high steam pressure).

1Many studies showed better effi-

Phase/treatments	T1	T2	T3	T4
Starter (0-10 days)	D ₃	25(OH)D ₃	25(OH)D ₃	D ₃
Grower (11-28 days)	D ₃	25(OH)D ₃	25(OH)D ₃	D ₃
Final (29-41 days)	D ₃	25(OH)D ₃	D ₃	25(OH)D ₃

Table 2. Evaluation of the 25(OH)D₃ plasma level according to the source of D₃ that was used (Doug Korver and Jennifer Saunders, Blades University of Alberta, 2006).

ciency of the phytase when associated to 25(OH)D₃ (commercial name is HyD) in reducing skeletal problems.

1Many studies showed better absorption of 25(OH)D₃ compared to vitamin D₃, its utilisation reducing skeletal problems.

1Deficiencies caused by intestinal malabsorption due to different reasons.

During the last few years, Vitamin D₃ and its metabolites (1,25-(OH)₂D₃, 25-(OH)D₃) have been widely investigated in the interaction between nutrition:skeletal abnormalities.

Vitamin D₃

Sklan and Noy (2003) recently reiterated that age has a direct relationship with digestion, and referred to a marked difference in fat absorption from the intestinal tract in young turkeys, between five and 19 days of age (Fig. 1). Fat absorption in the distal part of the GI tract was still very low at 19 days of age. The importance of this statement is that this is the segment where a significant absorption of vitamin D₃ can occur due to the longer retention

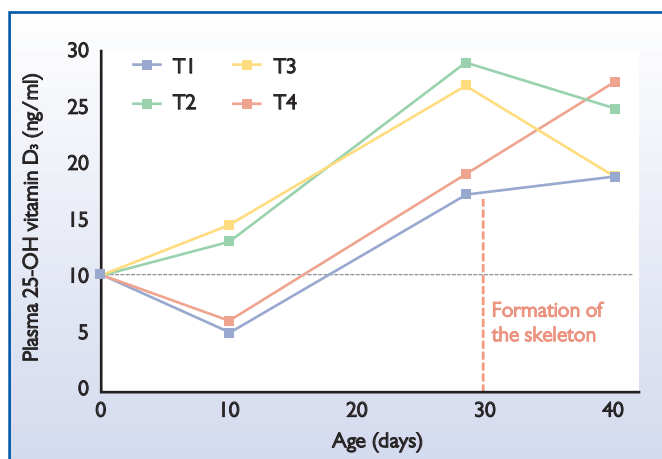


Fig. 2. Levels of 25(OH)D₃ in the plasma of broilers fed either 25(OH)D₃ and D₃ or alternating the two sources (Doug Korver and Jennifer Saunders, Blades University of Alberta, 2006).

time of the digesta. Vitamin D₃ is liposoluble and therefore dependent on fat absorption to be also absorbed.

Korver et al. (2006) evaluated the 25(OH)D₃ plasma levels in broilers fed 25(OH)D₃ and or vitamin D₃ at different stages of their life, as shown in Table 2.

The results of this trial (Fig. 2)

of age. Thus, during most of this period the 25(OH)D₃ levels are below this recommendation.

Mycotoxins

Liver lesions have a direct impact on digestion (bile), metabolism and storage of carbohydrates, fats and vitamins. Vitamin D₃ undergoes hydroxylation in the liver. This process is reduced and 25(OH)D₃ plasma levels are lowered if liver functions are impaired.

Enteric challenges

The small intestine is the longest portion of the digestive system and is responsible for the final food digestion and nutrients absorption. Enteritis leads to lower weight gain, affect the flocks uniformity, and as the birds age and become heavier they can present locomotor problems (rickets, osteoporosis and angular deformities), that can usually be diagnosed.

In a study carried out in the USA, Powell (2007) correlated the level of leg fractures in broilers with the

peak of microscopic lesions in the duodenum and jejunum, between days 16 and 18. The gross lesions peak only became more evident 4-8 days later (Fig. 3).

Use of 25(OH)D₃ as a tool to decrease the incidence and losses caused by locomotor problems with skeletal origin.

When the information on the high weight weekly gain rate of the genetic broiler lines that are presently available (Table 1) is analysed in association with the low fat absorption from 0 to 10 days of age (Fig. 1) (corresponding to the low vitamin D₃ absorption), the findings of Korver, 2006 (Fig. 2) are explained.

It is shown that the 25(OH)D₃ levels are below the 10ng/ml considered as low and related to risk of locomotor problems by Goff, 1990.

This has a very strong impact on the incidence of locomotor problems, as 90% of the skeleton is formed until 30 days of age.

If this situation is associated with enteric challenges as described by Powell (2007, Fig. 3), the levels of 25(OH)D₃ can remain for a longer period below the recommended concentration.

25(OH)D₃ is the first vitamin D₃ metabolite in the body. Birds need this vitamin for growth, health and bone development. It is responsible for calcium and phosphorus homeostasis.

Efficiency of absorption (from the first day of life) ensures adequate bone formation, thus decreasing the culling due to locomotor problems in the field and also partial and total condemnations in the slaughter plant. Korver, 2006, shows that the plasma levels of 25(OH)D₃ are higher when 25(OH)D₃ is given to the poultry, minimising the locomotor problems resulting from poor skeletal formation.

25(OH)D₃ is used from 0-42 days of age at 69mg/ton of feed.

Conclusion

Locomotor problems exist and are more frequent and the percentage figures are higher than what is generally assessed by the market.

As shown, the gait score indicates that a high percentage of birds that have difficulty to walk, and one can consider that there is a decrease in water and feed consumption, thus affecting their performance.

Locomotor problems are common but this does not mean that they should be considered as normal. The first step is to quantify and identify the possible causes, so management, health and nutrition can be adjusted with the objective of decreasing this incidence. ■

References are available on request: isaac.bittar@dsm.com

Fig. 3. Enteric challenges. Timeline of the microscopic and gross lesion scores in 76 broiler flocks, April 2005-June 2006.

