

## Reviewing coccidiosis control concepts with the use of live attenuated vaccines and increasing profitability with sustainability: Results on farms in Brazil

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### 1 INTRODUCTION

The importance of coccidiosis control in broiler chickens is undeniable due to the great financial losses caused by the disease, either in its clinical or subclinical form. The subclinical disease causes numerous damages that may be imperceptible, given that they are often masked by other factors that occur on the farm. According to Doug Korver, in the 20th South Brazil Poultry Farming Symposium, besides the reduction in feed consumption, the bird experiences muscle degradation to compensate for the low absorption of amino acids due to intestinal injuries.

Historically, the method of coccidiosis control used by most companies is based on the use of anticoccidial agents. However, it can be observed that the degree of resistance of field *Eimeria spp.* to most molecules is increasing, as well as drawbacks such as the use of Nicarbazin, which has a negative effect on the zootechnical results proportional to the dose used, including in some cases accompanied by slight losses, given that it interferes with the circulatory system, increasing cardiac output (Donzele et al. 2001).

In Brazil, the use of vaccines to control coccidiosis is still uncommon, mainly because of a series of false beliefs or “myths” that spread over time. These false beliefs are mostly due to the experience that some companies have had in the past when using non-attenuated type strain oocyst vaccines, extremely virulent, thus severely injuring the intestinal wall, leading to a loss in performance.

There are currently vaccines that contain all precocious attenuated *Eimeria spp.* strains. This allows replication to occur earlier and less

intensely. Consequently, damage to the intestinal wall is minimal and does not result in a loss in performance. We are talking about vaccines like Hipracox<sup>®</sup>, HIPRA’s live coccidiosis vaccine, which contains 5 precocious attenuated species of *Eimeria spp.* (*E. acervulina*, *E. maxima*, *E. mitis*, *E. praecox* and *E. tenella*), developed to be administered by spraying in the hatchery or upon arrival of the birds to the farm on the first day of life of the chicks.

Over the years the resistance of *Eimeria spp.* to the anticoccidial drugs has increased, and coupled with the increasing consumer demand for alternative feeds, the vaccine has had a chance to demonstrate its potential as an effective tool for controlling coccidiosis in intensive breeding systems and not just specific customers and/or niche markets.

A good control method using vaccines should offer companies the options for continuous or rotational use. The rotation strategy is to alternate several consecutive vaccination cycles with anticoccidial cycles, because the vaccine strains are extremely sensitive, and after colonizing the farms with their oocysts, they make subsequent cycles with anticoccidials more effective, with better zootechnical and financial results.

Over the last year some companies in Brazil decided to incorporate the vaccine into their broiler chickens coccidiosis control programmes. These companies are generating a large volume of results under normal field conditions, which therefore represent the reality of Brazilian poultry farming.



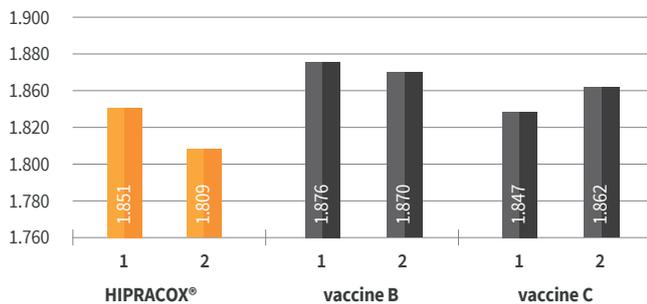
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## 2 COMPANY 1 RESULTS

The first company used the Hipracox® vaccine and two vaccines made up of non-attenuated strains found on the Brazilian market for two consecutive cycles.

Please find below the comparative table of feed conversions:

**Evolution of the Feed Conversion throughout the vaccination cycles**



The adjusted feed conversion graph (3350 g) shows the evolution of each vaccine from cycle 1 to cycle 2, and Hipracox® was the vaccine that obtained the best overall feed conversion ratio (FCR) result and also the best FCR gain from one cycle to another. It is important to note that each company has its own nutritional level, always aiming for maximum performance at the lowest cost, which influences the FCR index.

What is expected from a coccidiosis vaccine is that with each vaccination cycle the zootechnical result improves as a result of the replacement of field resistant oocysts with drug-sensitive vaccine oocysts in the litter.

The table below shows the capability each vaccine showed to improve feed conversion (3350 g adjusted) from cycle 1 to cycle 2.

	1st Cycle	2nd Cycle	Gain/Loss
Hipracox®	1.851	1.809	-0.042
Vaccine B	1.876	1.870	-0.007
Vaccine C	1.847	1.862	0.015

It is important to point out the 42- grams improvement in FCR in the 2nd cycle with Hipracox®, in the same cycle vaccine B showed an improvement of only 7 grams and vaccine C resulted in a 15 grams reduction in FCR.

Still, with regard to Feed Conversion Ratio, the table below compares Hipracox® with vaccines B and C, in cycle 1 and cycle 2.

	Hipracox®	
	1st Cycle	2nd Cycle
Vaccine B	-0.025	-0.061
Vaccine C	0.004	-0.053

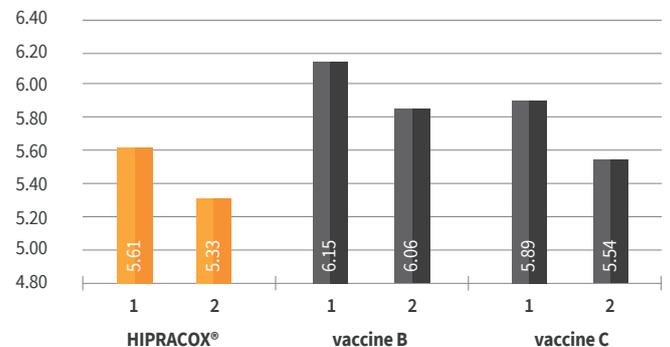
Hipracox® in cycle 2 proved to be 53 grams better than vaccine C. Compared to vaccine B, Hipracox® outperformed it by 25 grams in the 1st cycle and 61 grams in the 2nd vaccination cycle.



Picture: 2nd cycle vaccinated with Hipracox®. Better intestinal quality resulting in better feed conversion.

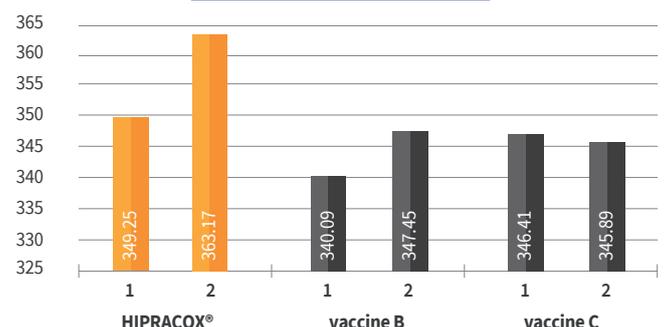
The table below shows the comparison of mortality rates among the three vaccines tested. Hipracox® showed the lowest mortalities and a clear evolution between cycles:

**Evolution of the mortality % throughout the vaccination cycles**



The table below shows the comparison of Production Efficiency Factor (PEF) among the three vaccines. Once again, the data showed that the flocks vaccinated with Hipracox® produced the best results:

**Evolution of the PEF throughout the vaccination cycles**

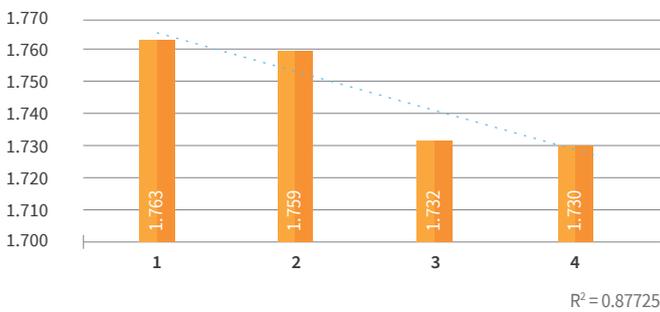


The PEF of the flocks vaccinated with Hipracox® was higher than those vaccinated with the vaccines B and C in both cycles.

### 3 COMPANY 2 RESULTS

In this other company, the initial objective was to control coccidiosis by rotating Hipracox® with anticoccidial agents. However, the results of the second vaccination cycle showed a lower production cost when compared to the anticoccidial programme used, and combined with the significant improvement in clinical cases of coccidiosis, the strategy adopted was to continue vaccinating with Hipracox®. It is important to point out that this company does not use antibiotic growth promoters (it is AGP-free).

Evolution of the Actual Feed Conversion



The graph above shows the improvement in the actual feed conversion throughout the course of the vaccination cycles.

As the field oocysts are replaced by Hipracox® oocysts, precocious attenuated, damage from wild-type strains can be avoided, and consequently, the bird performance is improved.

Vaccination cycle	Actual FCR	Gain*
1	1.763	
2	1.759	-0.004
3	1.732	-0.031
4	1.730	-0.033

\*Calculated values compared to the 1st cycle

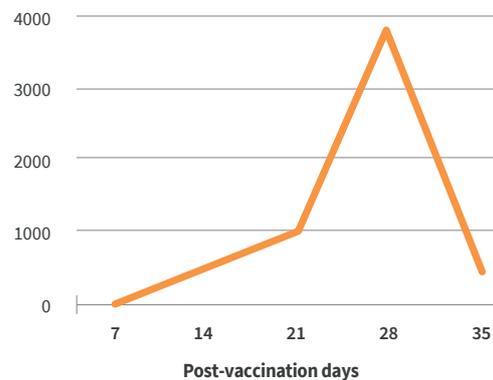
In this company the gain provided by Hipracox® was 33 grams in the FCR in the 4th vaccinated cycle, compared to the FCR in the 1st cycle.

All companies that used Hipracox® achieved a reduction in the number of treatments, mainly for enteritis. This result is the same as the one achieved by field observations in Belgium (Ronsmans et al., 2015).

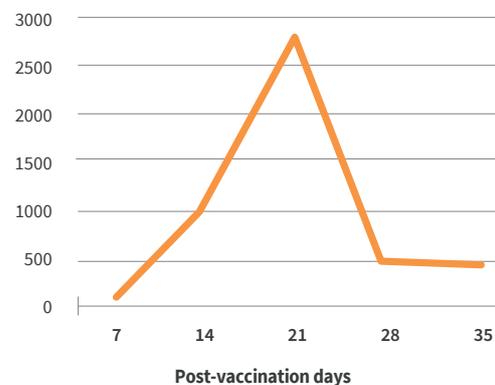
The excellence of the coccidiosis control programme using vaccines is only achieved through the technical monitoring of the vaccinated flocks. To that end, HIPRA provides technical services in all areas essential for success (Hatchery, Feed Manufacturing and Broiler Chicken) and even with Diagnos, its own and exclusive laboratory for its customers, which provides support for the vaccination follow-up protocols, producing results that allow the safe monitoring of bird immunization. And also with the HipraStats services, which through biostatistical tools, offer an overall analysis of the results, which helps measure the efficacy of vaccination.

The graphs below show the results of the oocyst excretion curves on the post-vaccination days with Hipracox® vaccinated flocks, originating from a company with a high degree of resistance to anticoccidial agents.

Oocysts per gram of faeces (OPG) Cycle 1 HIPRACOX®



Oocysts per gram of faeces (OPG) Cycle 2 HIPRACOX®



As it has already been pointed out by Dardi et al. in 2015, in the first vaccination cycle, the peak of excretion occurred at 28 days, but with an oocyst count far below what is deemed to be a challenge (60,000 oocysts/gram of faeces). In the second cycle, the count was also low, but the peak of excretion occurred at 21 days, that is, precocious and with low replication, which in other words means that it caused precocious immunity without prejudging outcomes.



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## 4 CONCLUSIONS

Hipracox®, a live attenuated precocious vaccine against coccidiosis, already used for 12 years in Europe, succeeded in showing its potential in intensive poultry farming in Brazil, dispelling some false beliefs that spread over the years due to ignoring the technical and conceptual differences in vaccines (virulent – non-attenuated strains versus non-virulent – precocious attenuated strains).

The use of coccidiosis vaccines, especially in the case of precocious attenuated vaccines, encourages sustainability in the production of broiler chickens, allowing to balance consumer market demand, animal health and economic viability for companies.

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