Successfully rearing layer pullets with standardised phytomolecules

Nowadays, modern layers are able to achieve extremely high performances. For instance, they are capable of producing 366 eggs at 80 weeks and 437 eggs at 95 weeks with an average egg size of 63.1g. To reach this level of performance, one key to success is to achieve a successful 18-week pullet rearing period.

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For their first 18 weeks of life, pullets are raised in a facility under environmentally and nutritionally controlled conditions. The objective is to achieve the specific physiological development required to start laying. Amongst the objectives, attaining pullet body weight objectives at 3, 6, 12 and 18 weeks are critical. For instance, it is established that higher performing flocks of layers have higher 18 week body weight relative to lower performing ones.

The young layer's immune system is also maturing during this phase and vaccination plays an important role. In fact, certain diseases are too widespread or difficult to eradicate and require a routine vaccination program. The role of the vaccine is to prevent a specific disease by triggering the immune system to produce antibodies that will then combat the pathogen. An example of a vaccination program is illustrated in Table 1.

From a growth point of view, these numerous and successive vaccinations are an additional challenge. In fact when a pullet undergoes stress, its feed intake is often affected and, in the case of vaccination, it can be depressed by up to 25%.

In addition, a frequently forgotten aspect is the metabolic cost of immunity. When a pullet is vaccinated, both the acquired (antibodies production) and the innate immune systems (inflammatory response) are stimulated and nutrients (energy and amino acids) are required. The inflammation being the costliest in nutritional resources, it is important to limit its over activation following vaccination to avoid drop of performance.

To ensure that a pullet reaches body weight objectives, different strategies are possible:

- Increase nutrient density in the diet at an early stage.
- Improve feed particle size: particles within 1-3mm with a minimum amount of fines.
- Improve pullet vaccination response.

The two first strategies are focused on the nutritional and physical form of the feed. The third strategy is focused on the animal itself. It targets key metabolisms to limit growth impairment, while improving the production of antibodies.

Are phytomolecules suitable tools?

Different published studies concerning various animal species have highlighted the interest of supplementing low dose phytonutrients to modulate animal immune systems. Amongst the identified micro-ingredients, two of them have confirmed their efficiency and a positive synergy has been demonstrated when they are used in combination.

The first, curcuminoids (contained in turmeric oleoresin), has been used for centuries in Indian and Chinese medicine. It improves and speeds up antigens recognition by the host and therefore enhances antibodies production.

The second, capsaicinoids (contained in chilli pepper oleoresin), is known to exert a strong anti-inflammatory activity. This ingredient has repeatedly demonstrated its ability to limit both local and global inflammatory response.

Being irritants and difficult to handle, these two ingredients have to be micro-encapsulated with an adequate matrix in order to create an additive that can be used in animal feeds. The interest of the addition of such additives made of both turmeric and chilli pepper oleoresins (XTRACT Nature) in feed and as a supplement to a vaccination program, was first evaluated by the USDA (United State Department of Agriculture) Animal Parasitic Diseases Laboratory in 2011 for broilers. Results have demonstrated a boosting effect of the cocci-vaccination and an increase in the pool of antibodies produced.

Age (days)	Age (weeks)	Vaccine name
1	1	Marek
14	2	ND, IB and IBD
21	3	ND, IB and IBD
35	5	ND and IB
56	8	ND and IB
70	10	ND, IB, encephalomyelitis, fowlpox, laryngotracheitis and MG
84	12	Encephalomyelitis, fowlpox, laryngotracheitis, ND and IB
98	14	MG, ND and IB
112	16	ND and IB
126	18	ND and IB

ND: Newcastle disease; IB: infectious bronchitis; IBD: infectious bursal disease; MG: Mycoplasma gallisepticum

Table 1. Example of a commercial vaccination program for layer pullets.

Improving vaccine response in layer pullets

In a recent trial performed in South East Asia, the efficacy of XTRACT Nature has been tested in Newcastle disease vaccinated pullets. This trial lasted 12 weeks and the objective was to confirm the efficiency of the additive.

Two buildings were selected in a commercial farm with 5,000 pullets per building. Pullets were from Dekalb white genetic (Hendrix group). From day nine onward, they received the same commercial diet, XTRACT Nature at 100g/ton being the only difference between the two groups. According to the farm vaccination program, all pullets were vaccinated against Newcastle disease (ND) at 19 days of age. At day 32, three pullets per treatment were necropsied and at day 46 (27 days post vaccination), the blood of 20 pullets per treatment was sampled and analysed by ELISA for Newcastle antibody titers. The trial timeframe is illustrated in Fig. 1.

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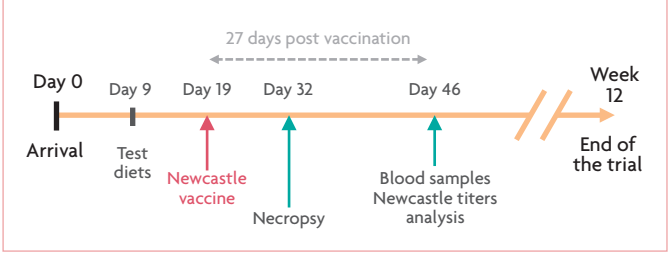
Fig. 1. Trial timeframe.



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Necropsy results

At the necropsy (day 32), signs of inflammation were identified in the trachea of the pullet from the control group This inflammation was most probably due to a response of the innate immune system to the vaccine. Pullets receiving XTRACT Nature revealed lower inflammation status.

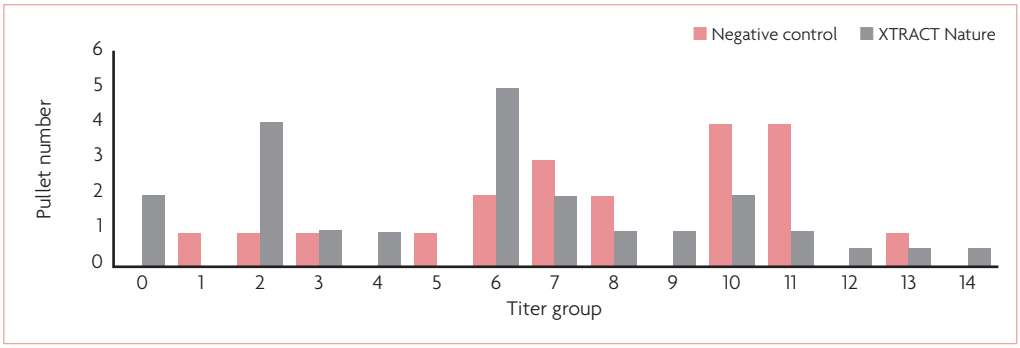

Fig. 2. ELISA tests in serum of pullets fed different diets. [1]Both groups were within the 'titer range of reference' provided by the laboratory. Negative control CV% = 71%, XTRACT CV% = 55%

Response following vaccination

Serum ELISA analysis for Newcastle antibody titers revealed that pullets supplemented with XTRACT Nature had a marked increase of Newcastle titers (11,712 vs. 7,282) together with a lower coefficient of variation (55% vs. 71%) compared to the control.

In other words, pullets receiving XTRACT Nature had higher protective levels and a more uniform flock protection against Newcastle disease (Fig. 2 and Table 2).

Final growth performance

Last, but not least, pullet body weight was measured at the end of the trial (12 weeks of age). Pullets having taken XTRACT Nature had higher body weight (945.4g/pullet) than pullets of the negative control (914.4g/pullet). When fed with XTRACT Nature, pullets achieved 98.8% of their growth potential in comparison to the application of the control diet, with 95.5%.

Conclusion

During pullet rearing, two main objectives have to be achieved:

- Reaching the target body weight at 3, 6, 12 and 18 weeks.
- Preparing the future layer immune system.

Stressful events may occur during these 18 week phases. The intense vaccination program is one example.

In this context, a standardised phytomolecule additive (XTRACT Nature) has demonstrated its ability to modulate the animal immune system.

It enables the pullet to better cope with the vaccination with effects such as reduction of inflammation and improvement of antibody response. Overall it leads to better pullet flock protection and better growth performance. ■

Table 2. Newcastle antibody titers in serum of pullets fed different diets.

	Negative control	XTRACT Nature	Variation (%)
Mean titer	7,282	11,712	+60.8%
Coefficient of Variation (CV%)	71%	55%	-16%
Titer range of reference		7,000-13,000	

References are available from the author on request

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