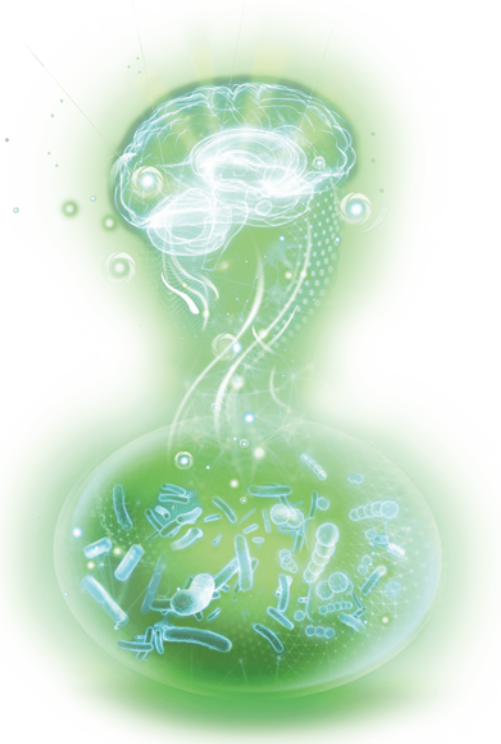
Improving the microbiota-brain relationship



The poultry market, particularly in Europe, is under constant demand for increasingly natural and healthier solutions related to human health on the one hand, and for more environmentally friendly practices on the other. Furthermore, consumers now expect to be able to purchase animal products at prices that are affordable to the masses.

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This contradiction is even more glaring if we consider the fact that consumers continue to willingly purchase products derived from intensive production methods, while at the same time calling into question the processes used to enable this mass production.

Additives are also changing

In this changing context, it is essential to adapt poultry production practices. The use of antibiotics as growth promoters is highly controversial and is banned in many countries (due to the residue in products and the resulting resistance to antibiotics), but paradoxically, antibiotics remain the industry benchmark.

New alternatives are available which make different claims:

- Prebiotics such as organic acids, administered via alternative routes, help promote a healthier intestinal flora.
- Probiotics help establish the dominance of one micro-organism that is recognised to be beneficial (yeast or bacteria).
- Essential oils help modulate the intestinal flora.
- Spices can stimulate digestive secretions.

In most cases, the scientific literature tends to focus on the study of an isolated active principle. This is a rational and reassuring approach. However, it means that certain synergies between plant extracts are neglected.

The intestinal micro-organism hosts are usually targeted. They are studied individually and are categorised as either beneficial or opportunistic pathogens.

A new paradigm: the microbiota reveals even greater complexity

The intestinal microbiota hosted by the organism is treated as a complex whole that is either considered as healthy or in dysbiosis.

The microbiota is no longer regarded as an inextricably linked sum of micro-organisms, but as a coherent unit that is nourished, produces waste and receives information from the animal (in terms of immunity, hormones, etc), and that, in turn, sends information about the animal to the central brain through hormone production and stimulation of the vagus nerve.

The health and performance management of production animals should therefore take into account the animal as a whole and not focus solely on the control of a particular micro-organism.

The concept of the cerebral ecosystem is therefore particularly important: the microbiota hosted by the intestine is connected to the central brain via the vagus nerve and the vascular system.

Holistic approach and synergy of active ingredients

Stimulation of the cerebral ecosystem is particularly complex due to:

- The interactions between the three entities (brain, vagus nerve and intestinal microbiota).
- The specific nature of this intestinal microbiota.

Table 1. Feed additives in the feed program. BMD: Bacitracin Methylene Disalicylate; Oleobiotec Poultry (Phodé, France).

Diets	Starter 0-7 days	Starter 8-14 days	Grower 15-28 days	Finisher 29-42 days
Control	Ø	Ø	Ø	Ø
AGP	Ø	BMD 55ppm	BMD 55ppm	Stafac 22ppm
Synergistic blend of plant extracts	Ø	100ppm	100ppm	100ppm

Table 2. Growth performance at 42 days. LBW: live body weight in g; FCR: mortality adjusted feed conversion ratio. N & P efficacy estimated by the ratio between N or P feed intake and N or P body composition.

Treatment	LBW (g)	FCR	Mortality (%)	N efficacy (%)	P efficacy (%)
Control	1,906[b]	1.949[a]	3.06	0.68[b]	0.56[b]
AGP	2,111[a]	1.798[b]	6.19	0.73[a]	0.59[a]
Synergistic blend of plant extracts	2,061[a]	1.807[b]	5.48	0.72[a]	0.59[a]

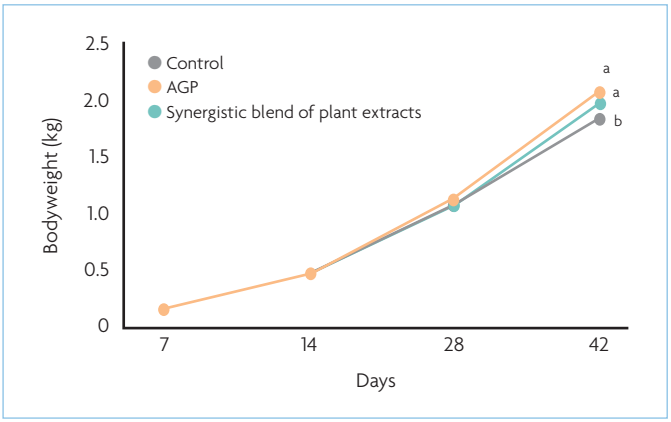

Fig. 1. Body weight (kg) by age and treatment.

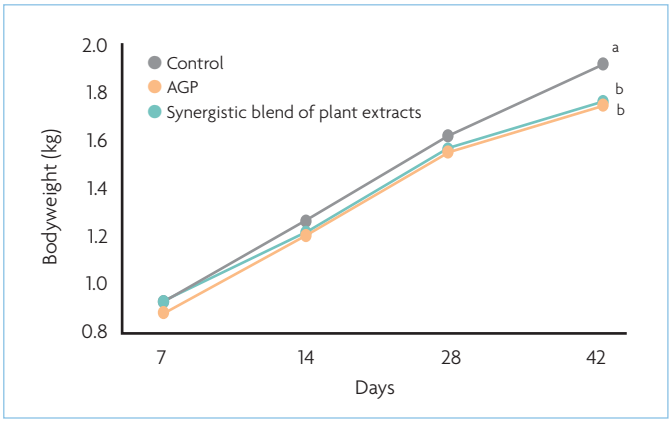

Fig. 2. Mortality adjusted feed conversion (by age and treatment).

Meeting this challenge therefore requires the design of equally complex solutions. Plant extracts appear to provide the answer. But can they all meet this challenge?

Using the synergies between plant extracts to optimise the cerebral ecosystem function offers a promising lead in the search for both naturalness and respect for the environment.

Tests were conducted on a blend of synergistic plant extracts at the Virginia Diversified Research Corp experimental centre (USA).

Some 1,080 four-day-old chicks were divided into 36 runs and subjected to a health test which involved exposure to litter contaminated by the previous group (positive for coli, clostridium and eimeria).

From seven days, one of three programs was applied to each chicken run, chosen at random (Table 1):

- Control (no additives).
- Blend of synergistic plant extracts (100ppm to 42 days).
- Growth promoter (BMD to 28 days then Stafac to 42 days).

Improved growth performance of the animals was observed in this test (Figs. 1 and 2, Table 2).

The environmental impact through the study of the N and P residues, was significantly improved in both cases (see Table 2).

Conclusion

The holistic approach to the cerebral ecosystem combined with specialist knowledge of the synergies between active principles has made it possible to develop a solution with a complex mode of action. Expertise in the selection and the blending of plant extracts which have beneficial properties for the microbiota is also essential.

By targeting the balance of the microbiota, the functioning of the cerebral ecosystem is optimised and, consequently, this promotes the 'Better-being' of the animal and improves production performance while reducing environmental impact. ■