

Effects of a Phytogenic Blend (PHY) composed of Technologically Processed Brassica Seeds, Aromatic Essential Oils, and Capsaicin on Performance and Intestinal Lesion Scores in Growing Broilers with experimentally induced Necrotic Enteritis

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Introduction

- Globally chemicals and ionophores are used conventionally for preventive Necrotic Enteritis (NE) treatment
- Phytogenic feed additives (PHY) turned out as promising alternatives
- Brassica Isothiocyanates powerfully reduce *C. perfringens* counts and are even used in food preservation (1)
- Phenolic Essential Oils (e.g. Cinnamaldehyde, Carvacrol, Eugenol) act as antioxidant and anti-inflammatory compounds and beneficially influence the intestinal flora in *C. perfringens*-infected broilers (2)
- Through induction of the antioxidant Nrf2-pathway they up-regulate simultaneously the expression of major intestinal nutrient transporters (3, Figure 1)
- Capsaicin stimulates the secretion of pancreatic digestive enzymes via activation of the intestinal heat- and pungent receptor TRPA1 (4, Figure 2)

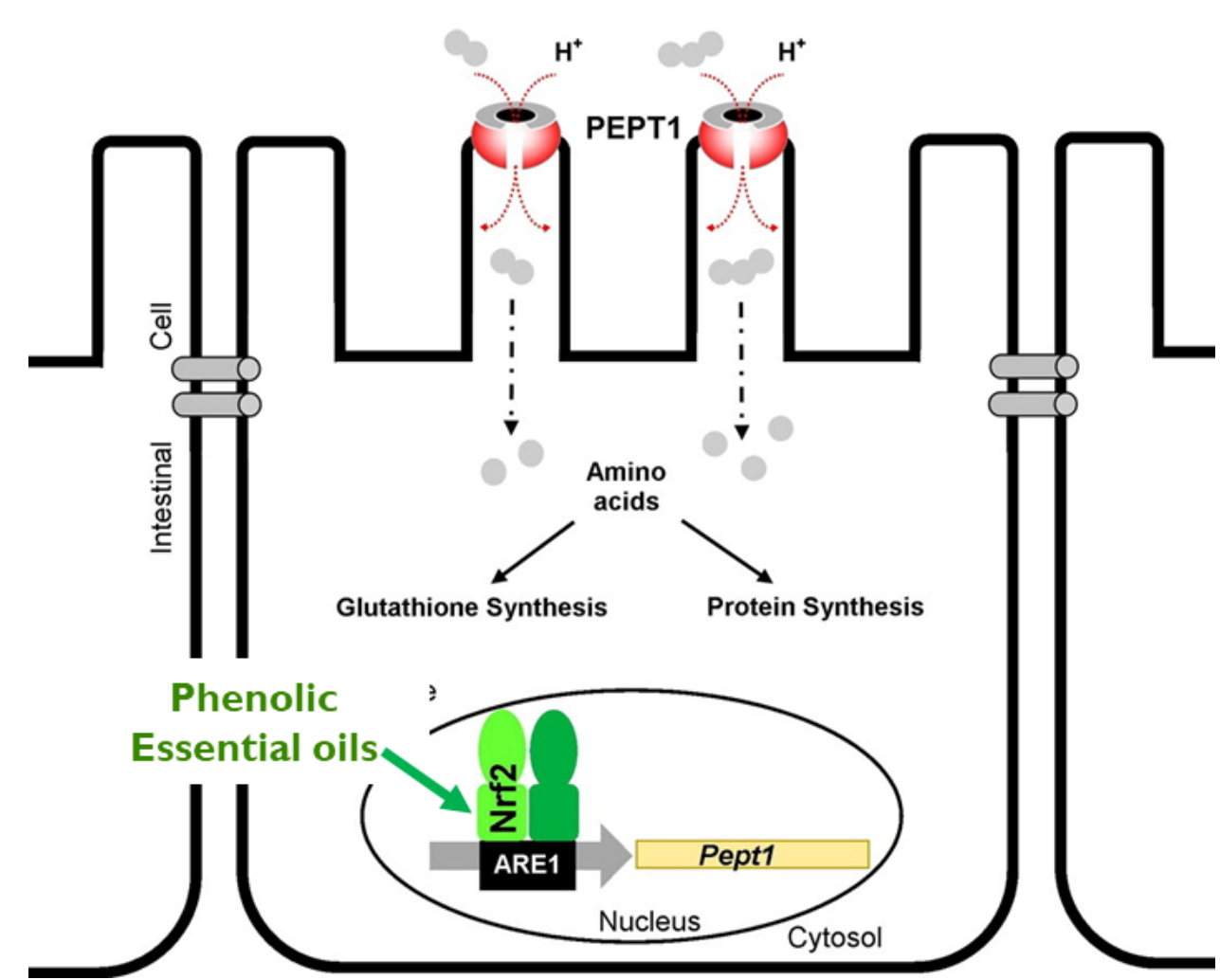


Figure 1: Phenolic Essential Oils stimulate PEPT1 Expression via the Nrf2-Pathway [1]

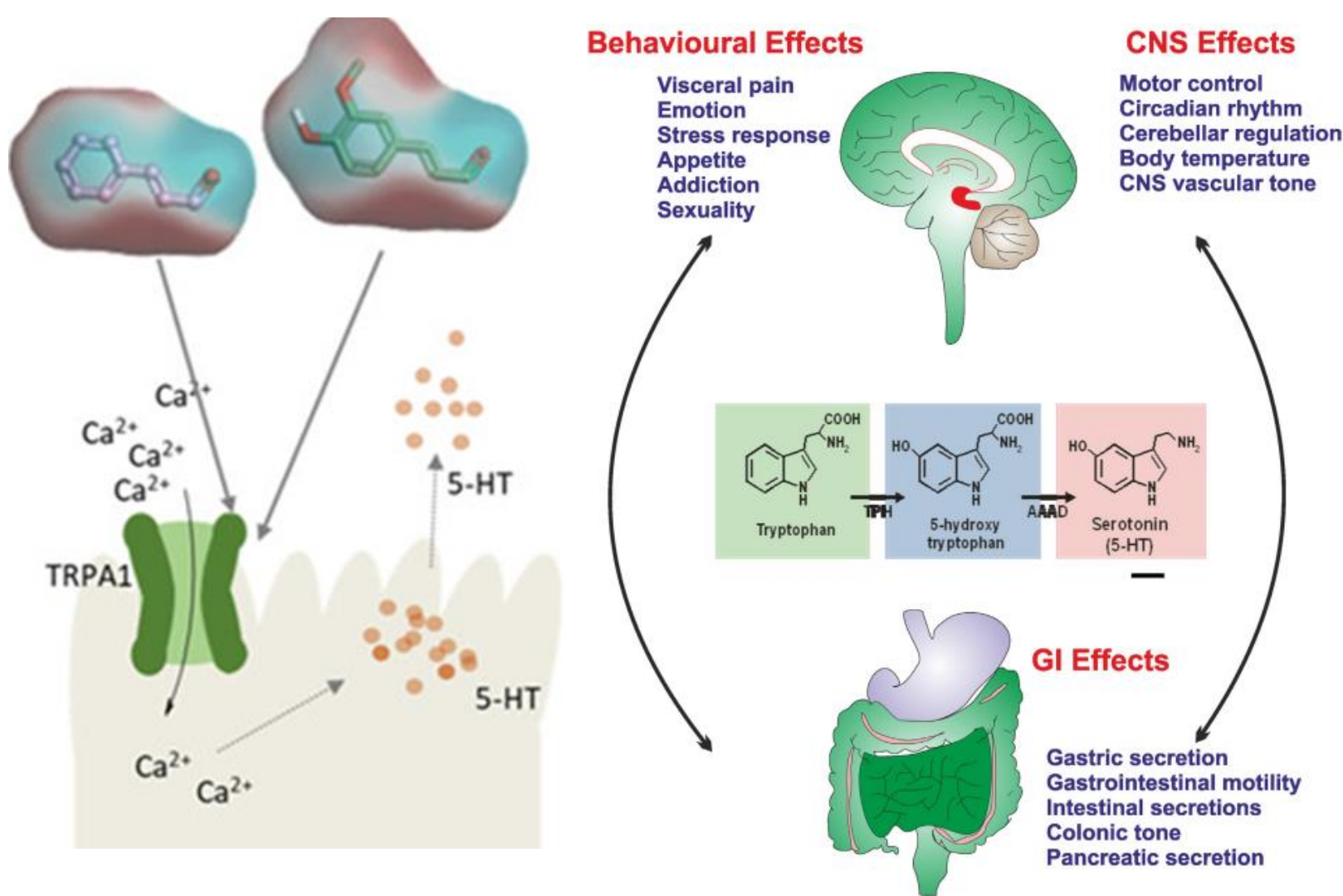


Figure 2: TRPA1 Stimulation by Capsaicin activates Serotonin release in intestinal cells, followed by pancreatic digestive enzyme release [3]

- The aim of the current study was to investigate the efficacy of a phytogenic blend (PHY) [Figure 4] composed of 20% technologically modified brassica seeds, each 0,67 % matrix encapsulated Cinnamaldehyde, Carvacrol and Eugenol, and 0,4% Capsicum Oleoresin, compared to MAXIBAN®, on performance, mortality and intestinal lesions in growing broilers with experimentally induced Necrotic Enteritis (NE). The single compounds of the PHY have been selected based on their Mode of Action (1, 2, 3, 4).

Material and Methods

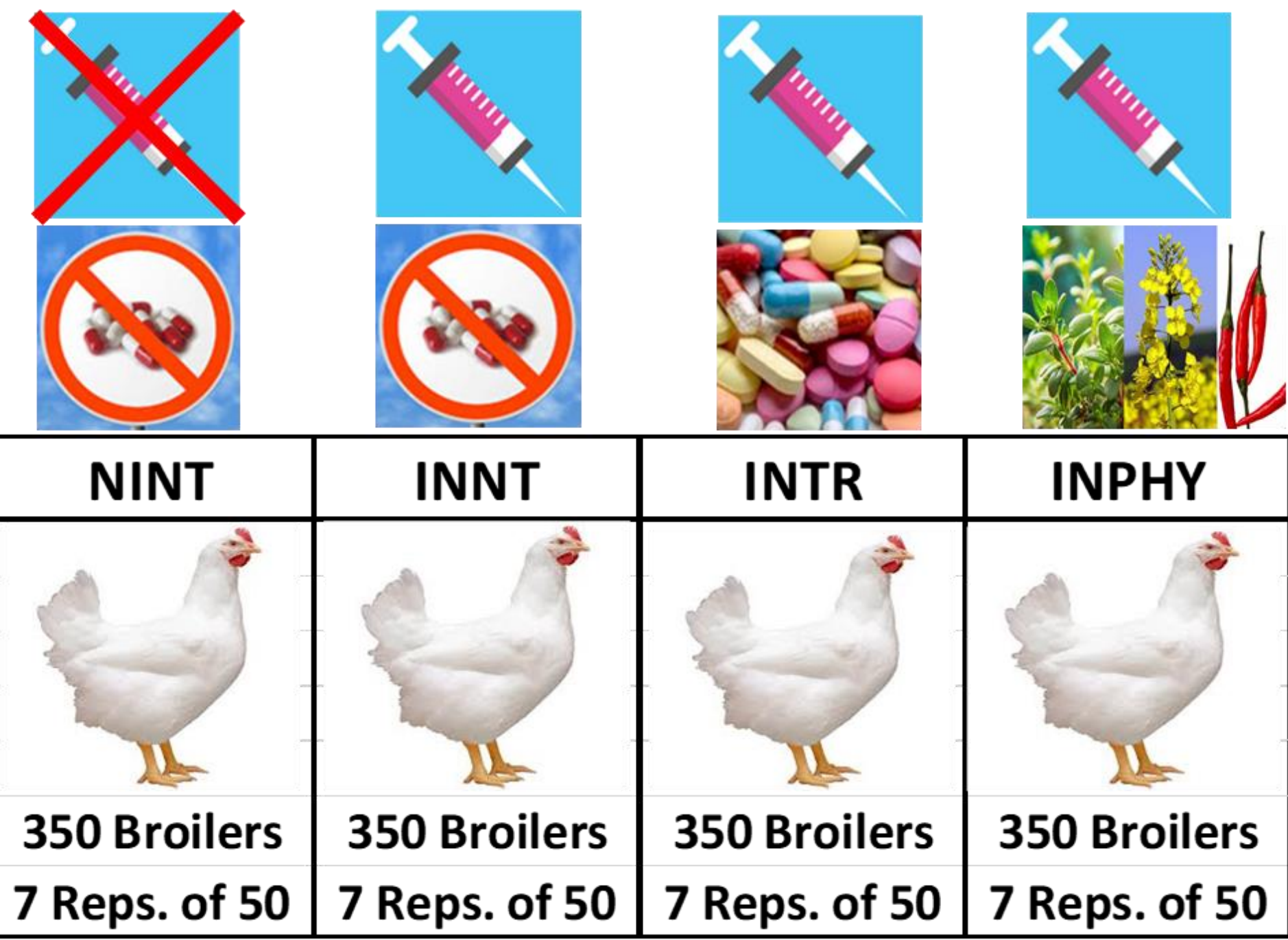


Figure 3: Design of the *C. perfringens* Infection Study with growing broilers

Study of

- Growth Performance • Mortality • Intestinal Lesion Score for 5 weeks (Starter: Days 1 – 14; Grower: Days 15 – 28; Finisher: Days 29 - 35)
- At the start all birds were spray-vaccinated with Coccivac B-52. On days 19, 20 and 21, birds of groups 2 (INNT), 3 (INTR) and 4 (INPHY) were infected with a CPF inoculum (1×10^9 CFU) via feed. Group 1 (NINT) was not infected.

Statistics

All performance and health parameters were analyzed by a one-way ANOVA using the software package SPSS (IBM SPSS Version 21)

Results

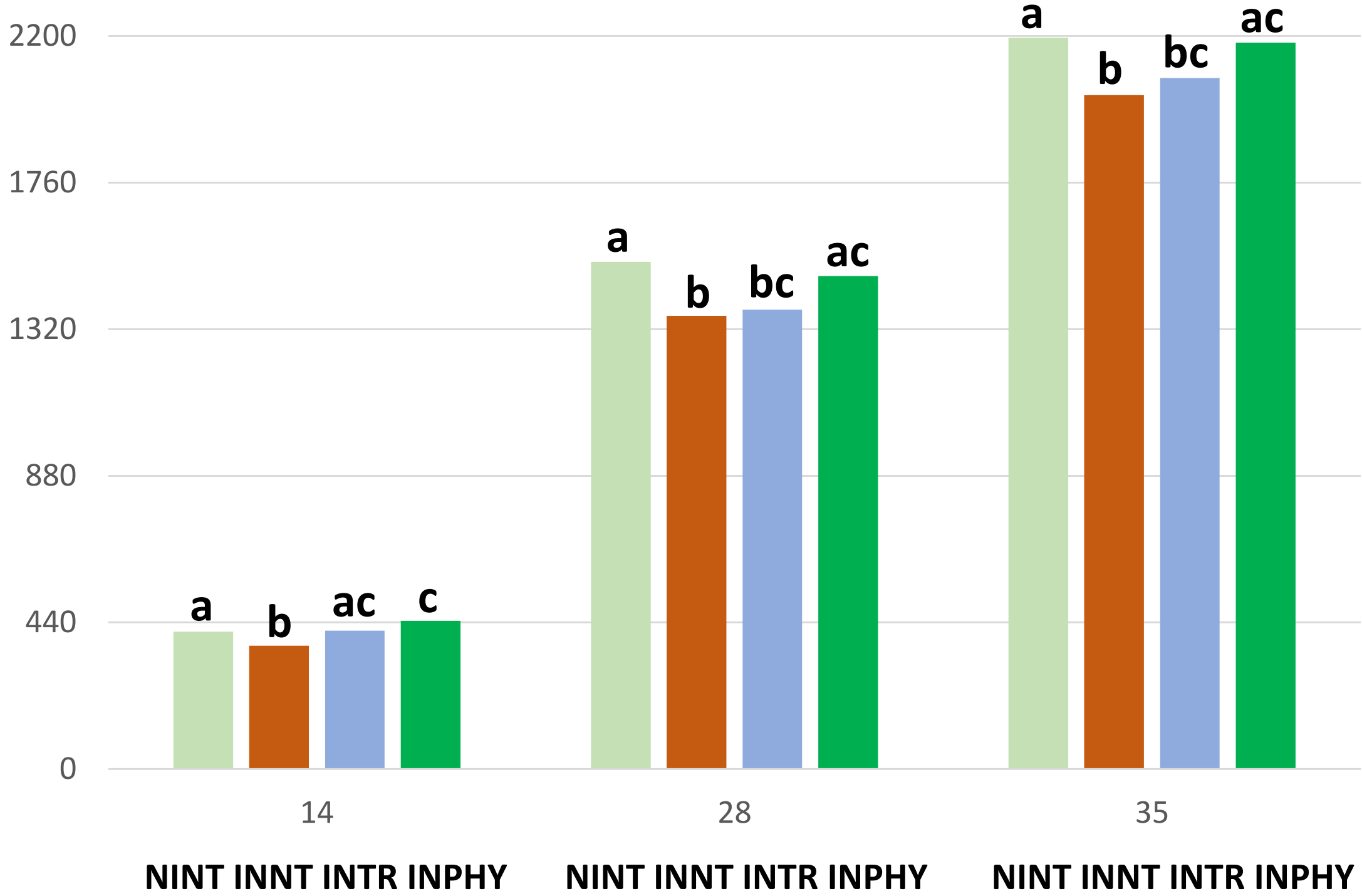


Figure 5: Body weight (g) of *C. perfringens* infected broilers treated with MAXIBAN® or PHY compared to non-infected (NINT) or non-treated (INNT) littermates on days 14, 28 and 35 on experiment

Table 1:

Feed intake and FCR of *C. perfringens* infected broilers treated with MAXIBAN® or PHY compared to non-infected (NINT) or non-treated (INNT) littermates between days 0 – 14, 15 – 28 and 29 - 35 on experiment

Days /Groups	NINT	INNT	INTR	INPHY
Daily Intake (g)				
0 - 14	34,34±1,72 ^a	34,73±1,74 ^a	32,58±1,63 ^a	36,44±1,82 ^a
15 - 28	100,69±5,03 ^a	90,71±4,54 ^b	98,33±3,75 ^{ab}	104,38±4,92 ^{ac}
29 - 35	158,18±7,91 ^a	143,80±7,19 ^b	153,32±7,67 ^{ab}	159,92±8,00 ^a
FCR (g/g)				
0 - 14	1,133±0,056 ^a	1,197±0,060 ^b	1,136±0,057 ^{ac}	1,116±0,055 ^{ac}
15 - 28	1,476±0,074 ^a	1,689±0,084 ^b	1,459±0,073 ^a	1,532±0,076 ^{ab}
29 - 35	1,899±0,094 ^a	1,916±0,095 ^a	1,753±0,087 ^b	1,811±0,090 ^{ab}

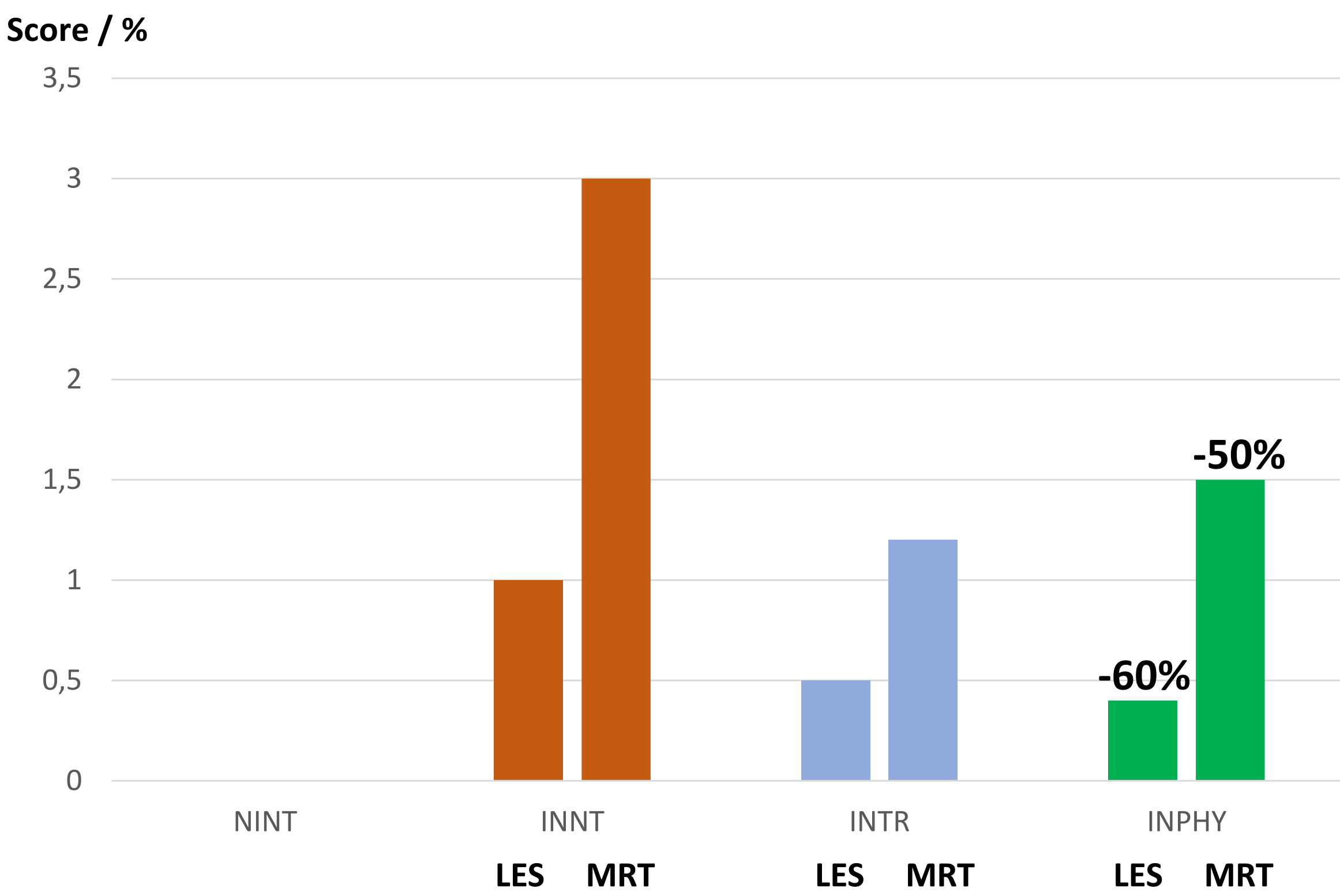


Figure 6: Intestinal lesion scores and Mortality of *C. perfringens* infected broilers treated with MAXIBAN® or PHY compared to non-infected (NINT) or non-treated (INNT) littermates on days 21 or 35, respectively

Discussion and Conclusions

The study has shown that PHY can act as important alternatives for preventive NE treatment in order to compensate negative effects of an artificial *C. perfringens* infection on performance and intestinal lesions. It must be considered that a ionophore served as positive control to show genuine effects of the PHY.

References

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