Dietary polyphenol extracts improve the performance of broilers challenged with necrotic enteritis

S.A. Salami[1], L. Chew[2], B.S. Lumpkins[3] and B.M. Tas[1]

[1]*Mootral Ltd, UK*
[2]*Mootral SA, Malaysia*
[3]*Southern Poultry Feed & Research Inc., USA*

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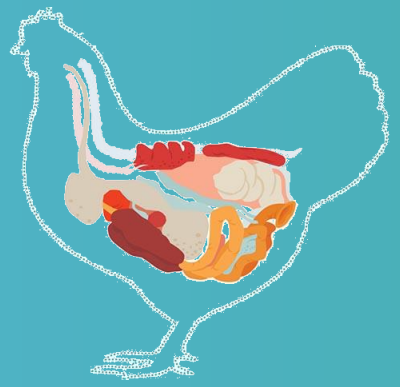
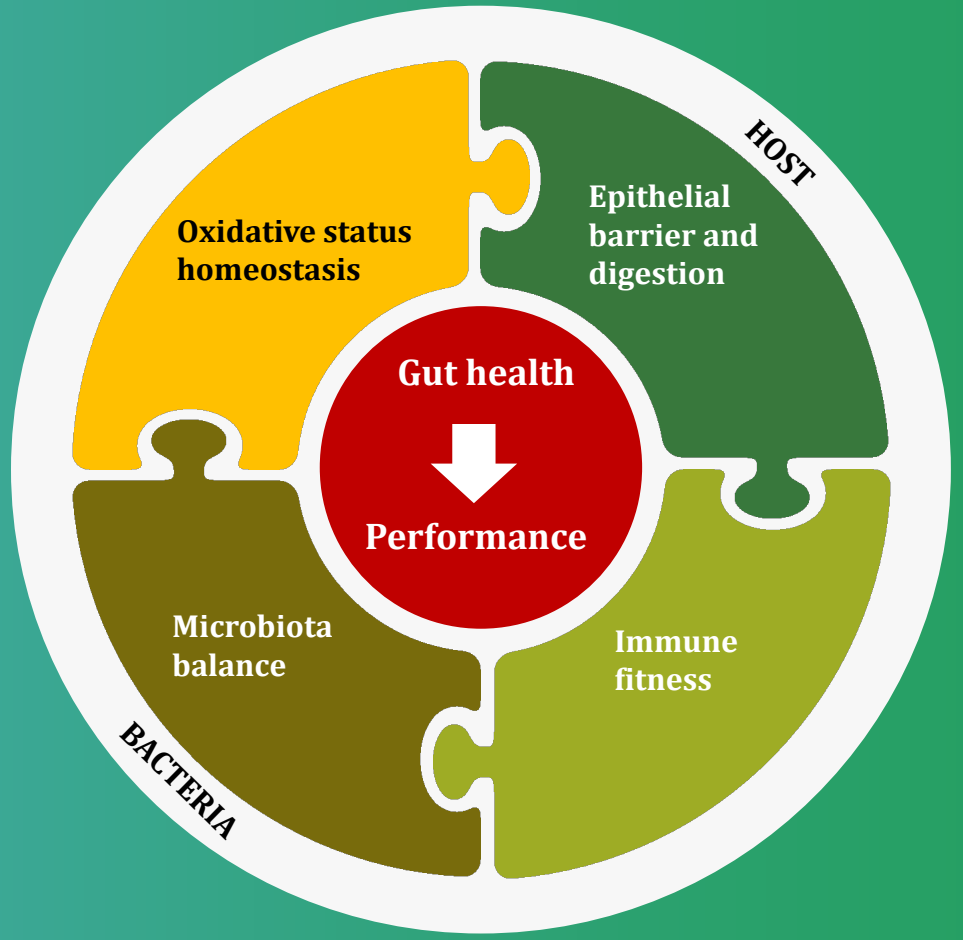
Gut health plays a central role in poultry performance

Healthy Gut =
Healthy Animal =
Optimal Performance



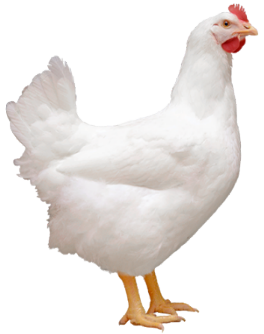


"The four pillars of **gut health**"

Chalvon-Demersay et al. 2021

Necrotic enteritis (NE) compromises poultry gut health

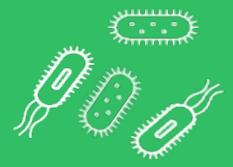
1. Non-pathogenic *C. perfringens* strains normally present in gut microbiome
2. Predisposing factors(e.g. coccidiosis) cause the proliferation of *C. perfringens* within the large intestine
3. *C. perfringens* migrates to the small intestine
4. *C. perfringens* produces toxins in the small intestine
5. The toxins destroy the intestinal epithelial cells
6. Blood-stained diarrhea



Pathogenesis of NE *(Riva and Monjo 2021)*

Impact on gut health

- Impaired intestinal integrity & barrier function
- Bacterial translocation
- Dysbiosis
- Increased immune & inflammatory responses
- Reduced nutrient digestibility & absorption



Impact on productivity & food safety

- Poor growth rate & increased FCR
- Higher mortality
- Significant economic loss ($5 cents/bird globally)
- Increased contamination risk of foodborne pathogens
- Lower sustainability metrics

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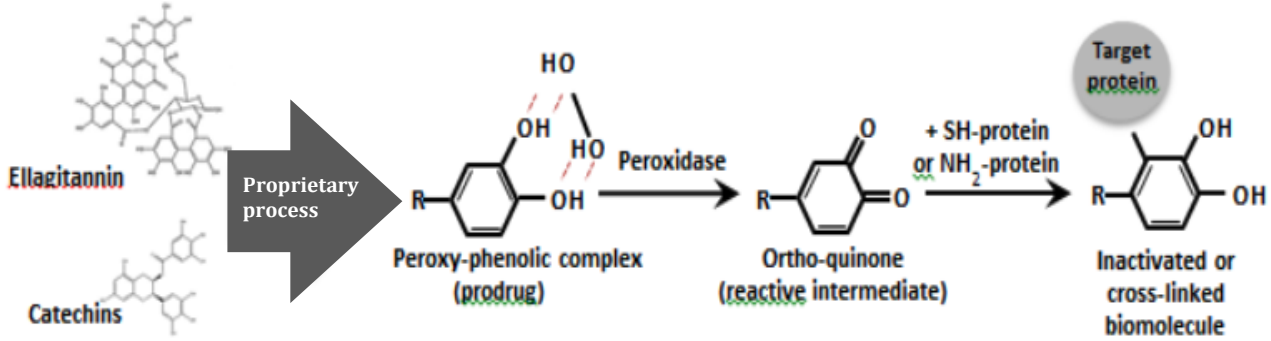
Novel polyphenol extracts (IQV10-3) as a natural nutritional solution for improving gut health

- Polyphenols are potential natural alternative to in-feed antibiotics due to their functional effects; however, they are **unstable and highly prone to degradation**

- **IQV10-3:** a unique blend of polyphenol-rich extracts from pomegranate bark and green tea; uniquely stabilized and pre-activated in a proprietary process; water-based formulation

- Stable during transportation and storage until their deliver to the animals' guts

- Mimic plants' evolutionary defense mechanism



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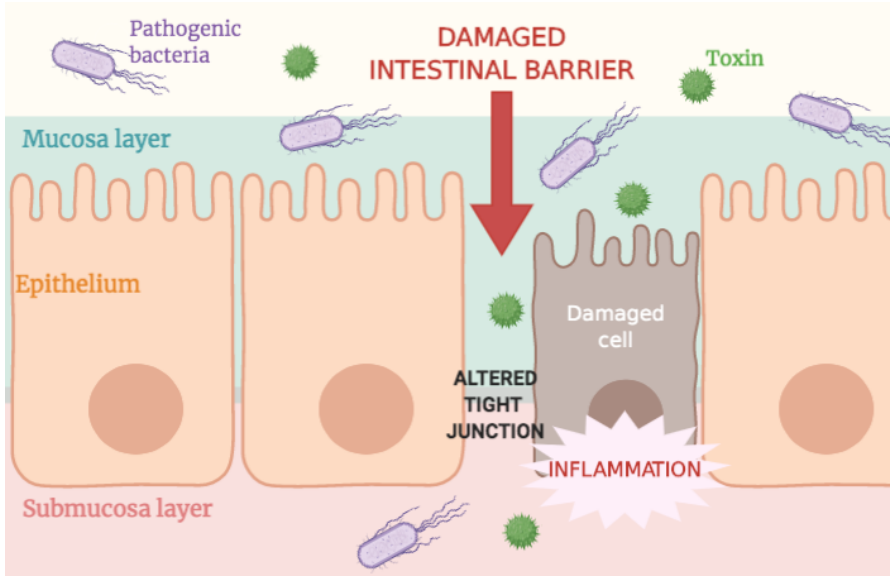
Mode of action of IQV10-3 in improving gut health

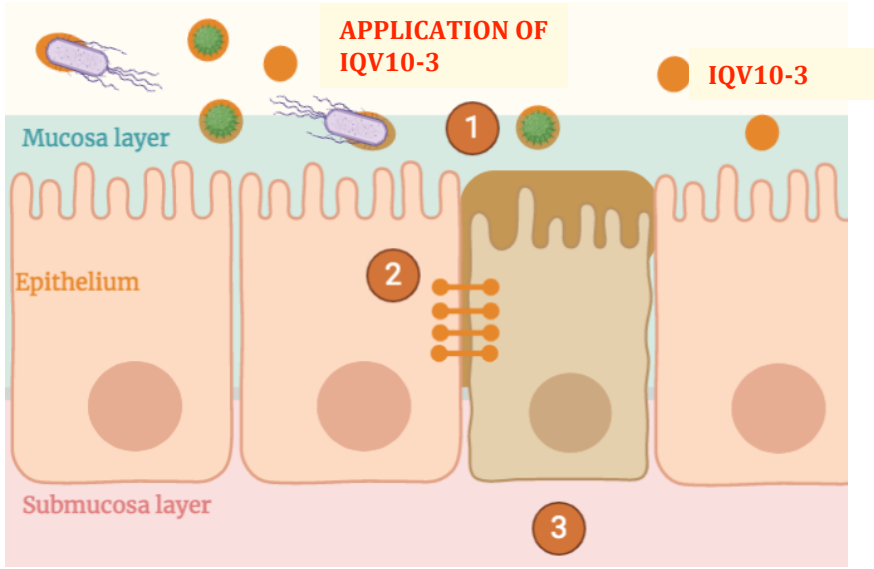
Binds bacterial toxins and prevents adhesion to receptors in intestinal cells

Crosslinks proteins across the tight junctions of damaged cells

Reduces expression of pro-inflammatory cytokines

Disrupts cell walls of bacterial pathogens





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HYPOTHESIS

Supplementary **IQV10-3** would exert positive effects on gut health and attenuate the negative impacts of **NE** on broiler performance

OBJECTIVE

To evaluate the effects of supplementing proprietary **IQV10-3** without or with a coccidiostat on the performance of broilers challenged with **NE**

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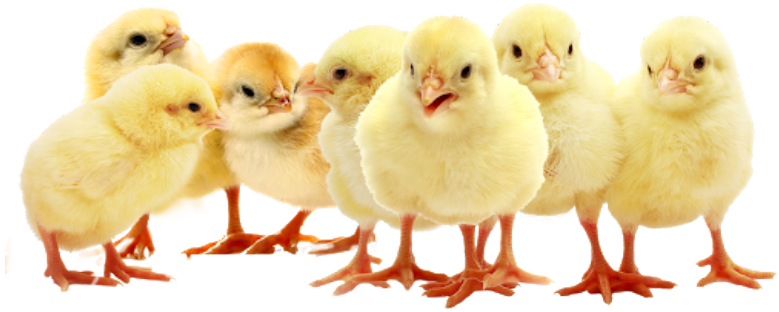
MATERIALS AND METHODS

EXPERIMENTAL DESIGN

Birds: 400-day-old male broiler (Cobb 500)

Treatments: 5 groups (10 cages/group; 8 birds/cage)

Duration: 28 days



Feed: Starter feed (d 0 – 13), grower feed (d 14 – 28).

NE model: Chickens were challenged with coccidiosis and *C. perfringens* to induce NE

No.	Code	Treatment	Coccidial challenge[1]	*C. perfringens* challenge[2]
1	PC	None	D14	D19 – D21
2	IQVA	IQV10-3 Dose A (0.8% on d 0 - 2, 0.2% on d 3 - 28)	D14	D19 – D21
3	IQVA+Co	IQV10-3 Dose A + 125 ppm amprolium[3] in feed d 13 – 21	D14	D19 – D21
4	IQVB	IQV10-3 Dose B (0.8% on d 0 - 2, 0.4% on d 3 - 10, 0.2% on d 11 – 28)	D14	D19 – D21
5	IQVB+Co	IQV10-3 Dose B + 125 ppm amprolium in feed d 13 – 21	D14	D19 – D21

[1] 5000 oocysts of *Eimeria maxima* per bird

[2] 10^8 CFU/ml; [3] Coccidiostat

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PARAMETERS MEASURED & STATISTICAL ANALYSIS

Starter feed			Grower feed							
d 0			d 13	d 14		d 19	d 20	d 21		d 28
START				**Cocci**		***C. perfringens***				END
			Challenge phase							
			Challenge + recovery phase							

- Feed intake, body weight gain and FCR during the challenge phase (d 13- 21) and challenge+recovery phase (d 13 – 28)
- % NE Mortality on d 0 – 28
- NE Lesion Scores on d 21 (3 birds/cage)
- Intestinal permeability: serum fluorescein isothiocyanate-dextran (FITC-d) on d 21

- **Contrast analysis**

Contrast 1: effects of IQV10-3 doses without coccidiostat = **PC vs IQV** (IQVA+IQVB)

Contrast 2: effects of IQV10-3 doses with coccidiostat = **PC vs IQV+Co** (IQVA+Co + IQVB+Co)

- Significance at $P < 0.05$ and tendency at $0.05 < P \leq 0.10$

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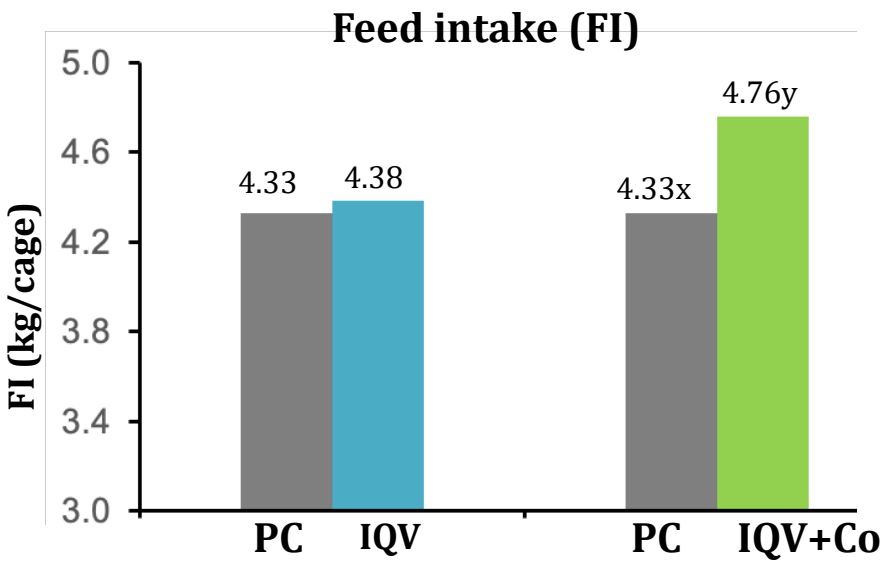
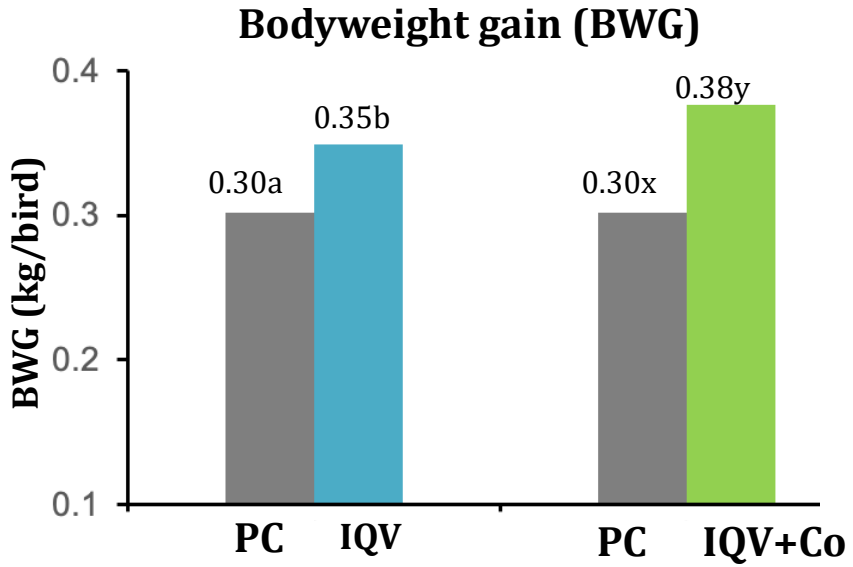
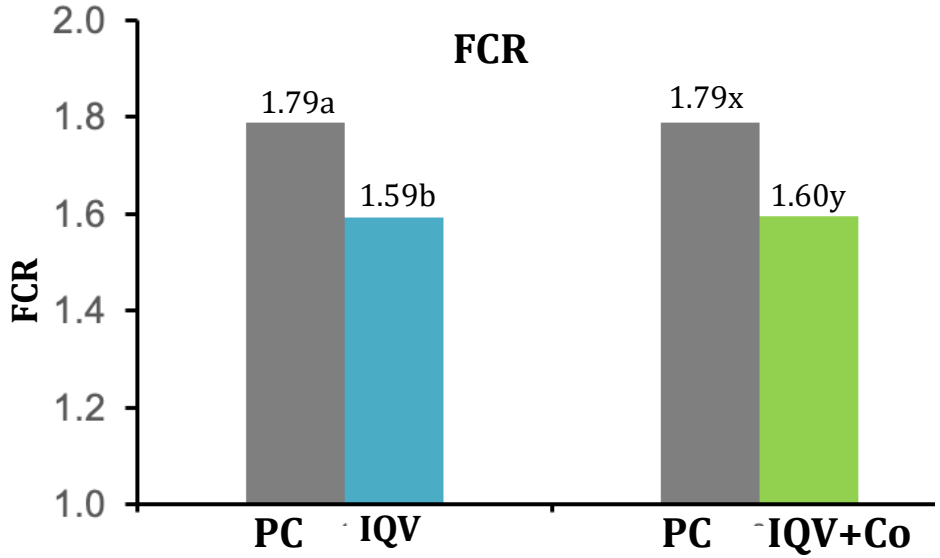
RESULTS

BROILER PERFORMANCE: CHALLENGE PHASE (d 13 – 21)







Contrast 1: PC vs IQV

Contrast 2: PC vs IQV+Co

IQV without or with coccidiostat improve BWG and FCR compared to PC

%relative change compared to PC		
	PC vs IQV	**PC vs IQV+Co**
FI	1.2% ($P = 0.74$)	9.9% ($P < 0.05$)
BWG	15.6% ($P < 0.05$)	24.5% ($P < 0.05$)
FCR	-10.9% ($P < 0.05$)	-10.8% ($P < 0.05$)

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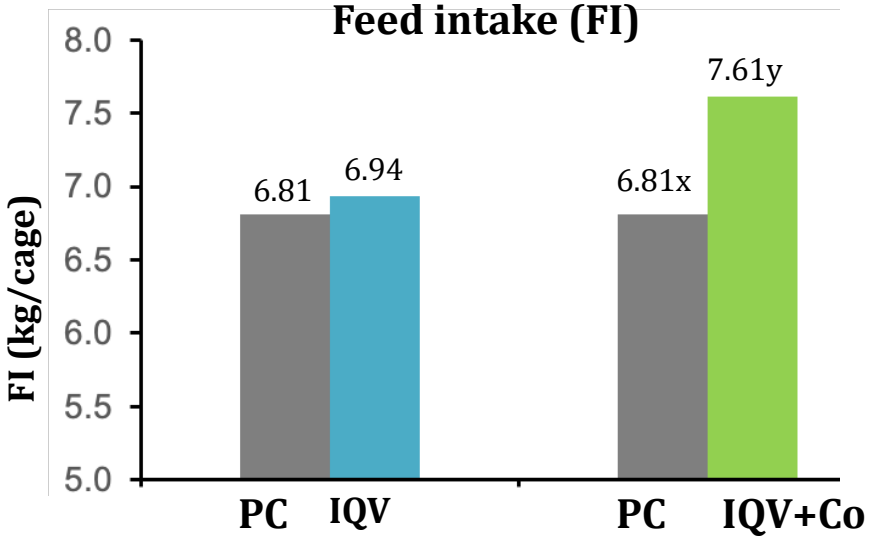
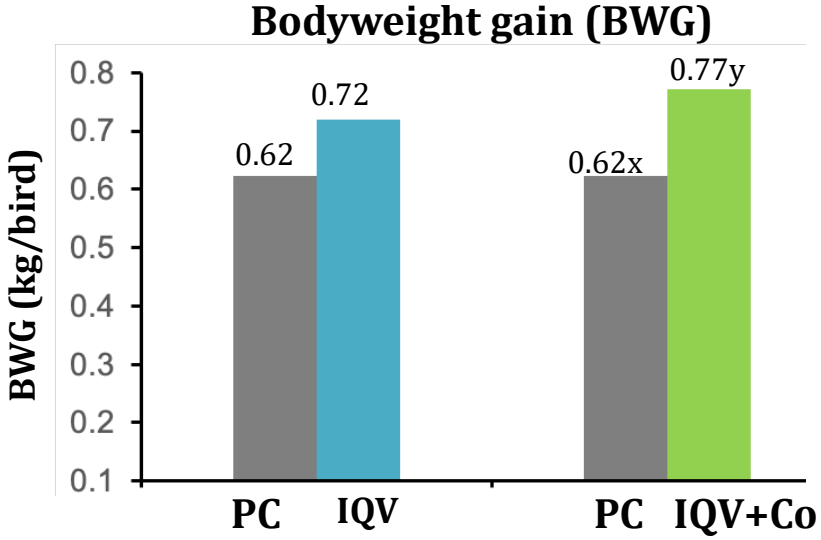
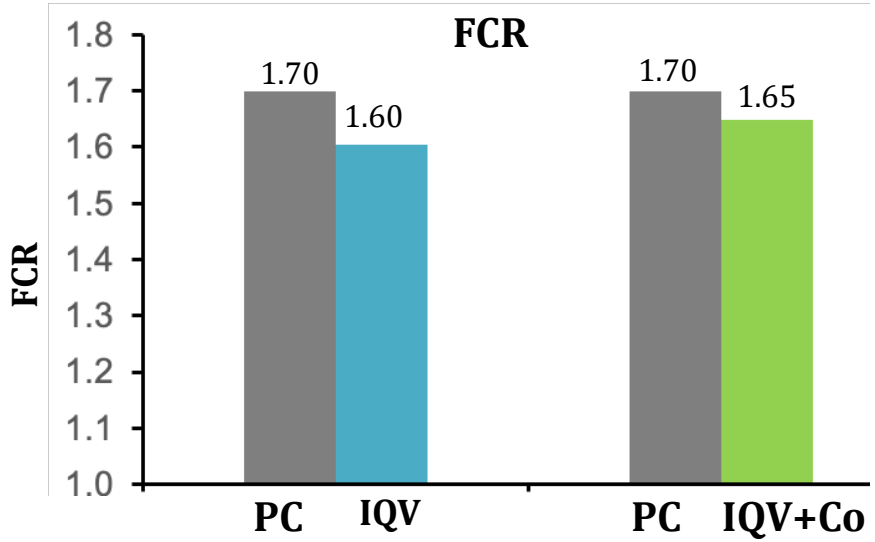
BROILER PERFORMANCE: CHALLENGE+RECOVERY PHASE (d 13 – 28)







Contrast 1: PC vs IQV

Contrast 2: PC vs IQV+Co

IQV tended to improve BWG and FCR

IQV with coccidiostat increased FI & BWG

%relative change compared to PC		
	PC vs IQV	**PC vs IQV+Co**
FI	1.9% ($P = 0.64$)	11.8% ($P < 0.05$)
BWG	15.6% ($P = 0.08$)	24.0% ($P < 0.05$)
FCR	-5.6% ($P = 0.06$)	-3.0% ($P = 0.31$)

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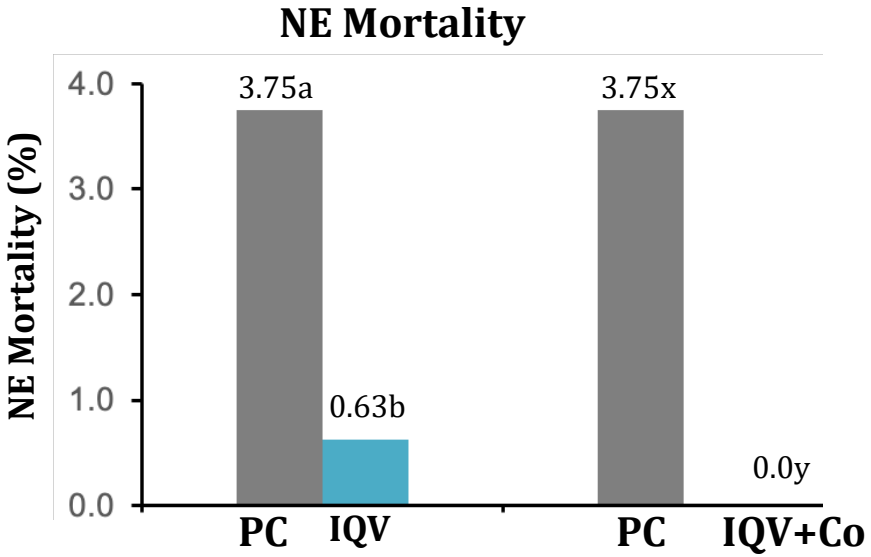
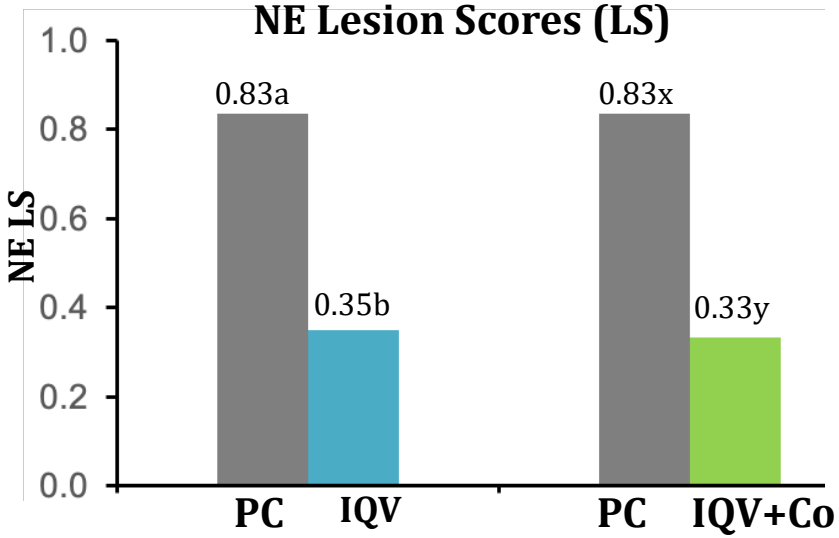
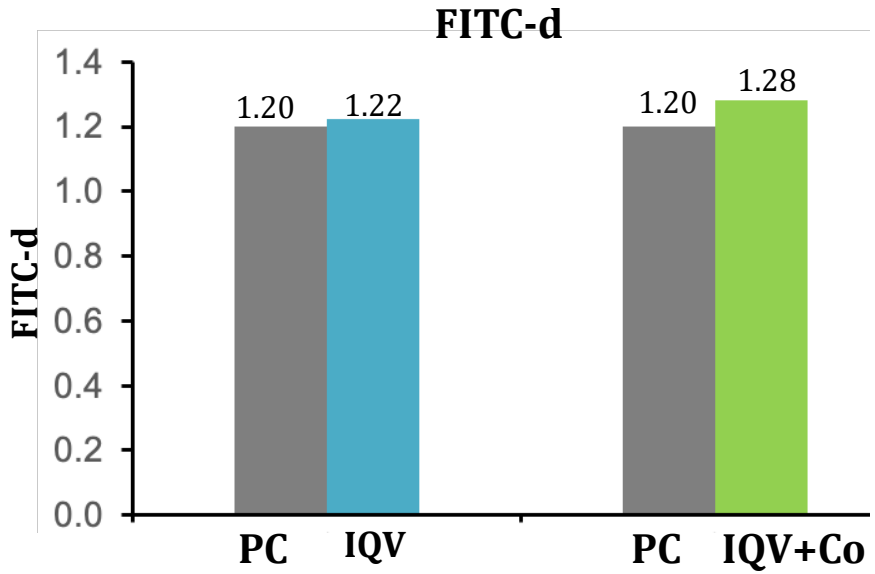
MORTALITY AND INTESTINAL HEALTH







Contrast 1: PC vs IQV

Contrast 2: PC vs IQV+Co

IQV without or with coccidiostat reduced NE mortality and lesion scores

%relative change compared to PC		
	PC vs IQV	**PC vs IQV+Co**
NE Mortality	-83.3% ($P < 0.05$)	-100% ($P < 0.05$)
NE LS	-58.2% ($P < 0.05$)	-60.1% ($P < 0.05$)
FITC-d	1.7% ($P = 0.78$)	6.5% ($P = 0.29$)

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TAKE-HOME MESSAGE

- Supplementing **IQV10-3** without or with coccidiostat **attenuates** the negative impacts of **NE** on broiler performance

- The use of **IQV10-3** can support antibiotic-free programs for NE control in broiler production

NATURAL - ALTERNATIVE TO ANTIBIOTICS - EFFECTIVE SOLUTION

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Thanks for your attention!

Question?