Calibrin®Z Reduces Gut Inflammation and Improves Growth Performance in Necrotic Enteritis-Affected Young Broilers

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Agenda

- Necrotic Enteritis
- Hypothesis
- Experimental Design
- Results
- Conclusion

Necrotic Enteritis

- 2 Billion US dollar is estimated on annual cost of necrotic enteritis (NE) in broiler production worldwide.
- *Clostridium perfringens* pathogen (CPP), a gram positive bacteria, plays key role in NE development.
- CPP toxin, such as α-toxin, NE B-like (NetB) and β2-toxin etc. are shown to cause lesion in the intestine.

Predisposing Factors of NE

- Coccidiosis
- Presence of *Clostridium perfringens*
- Feed (indigestible protein, NSPs)
- Management and biosecurity
- Lack of specific feed additives (AGPs)
- Stress (density, temperature, wet litter etc.)
- Mycotoxins

Some Important Factors for NE Development

Banned AGPs (in EU):

- ↓ 11% feed efficiency
- ↓ 12% body weight
- ↑ mortality
- ↑ carcass condemnations
- Estimated loss $300-$1,500 /flock (20,000 birds)

Timbermont et al., 2013

Presence of Mycotoxins or other anti-nutritional factors:

- ↓ protein digestibility
- ↑ *C. perfringens* populations in the small intestine
- ↑ epithelial cell damage
- ↑ oxidative stress
- ↓ immune response

Previous in vitro studies showed that processed clay can inhibit α-toxin hydrolysis of yolk lipids

Hypothesis

Calibrin-Z can bind the α and NetB toxins and prevent necrotic enteritis negative effects in broiler without antibiotics

Experimental Design

- 100 Ross one-day-old male broilers used and randomly allotted to 5 treatments.

Non-NE Control	NE-Infected Control	NE + 0.25% CAZ	NE + 0.5% CAZ	NE + 22 ppm antibiotic

- Necrotic Enteritis
  - 10,000 oocytes of *Eimeria Maxima* on d-14
  - 10^9 CFU *Clostridium perfringens* on d-18
- CAZ: Calibrin-Z; a thermally processed clay
- Antibiotic: virginiamycin (VM)

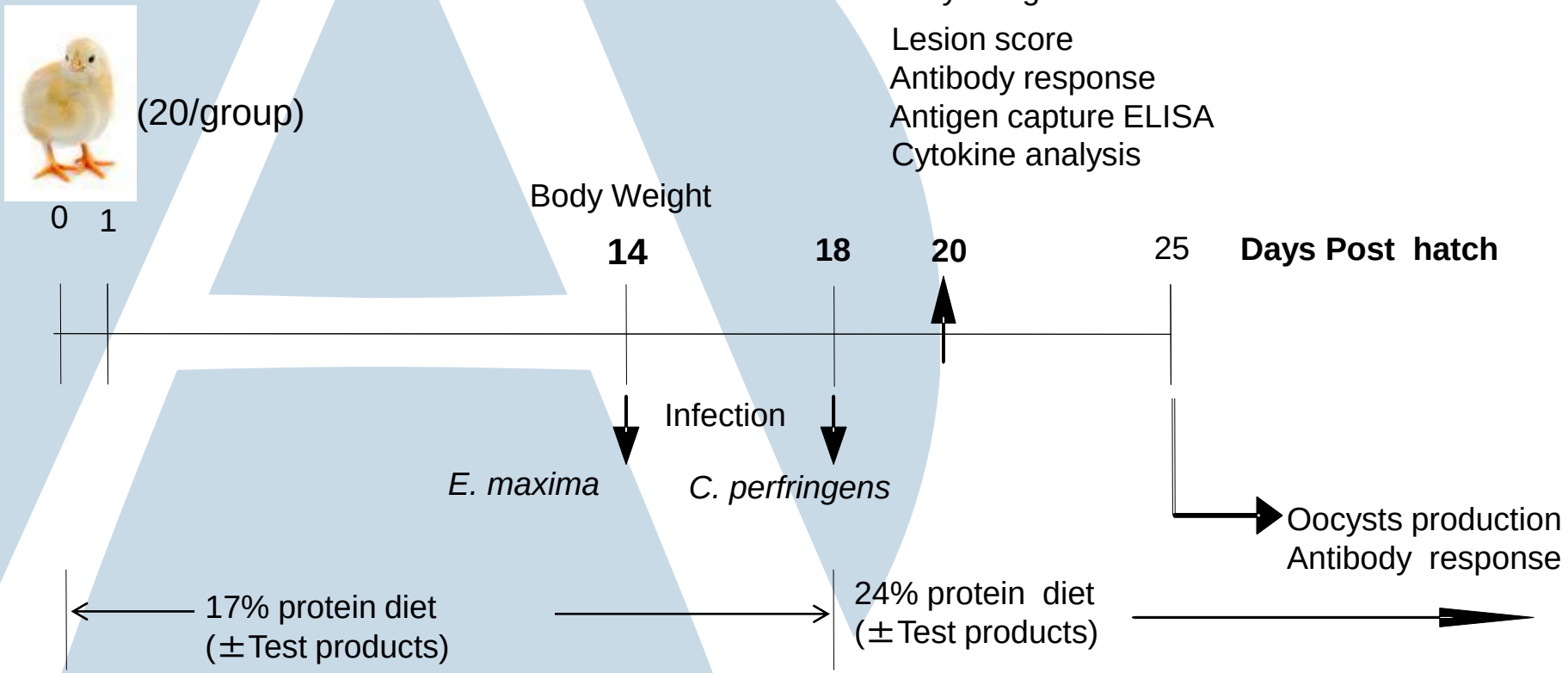
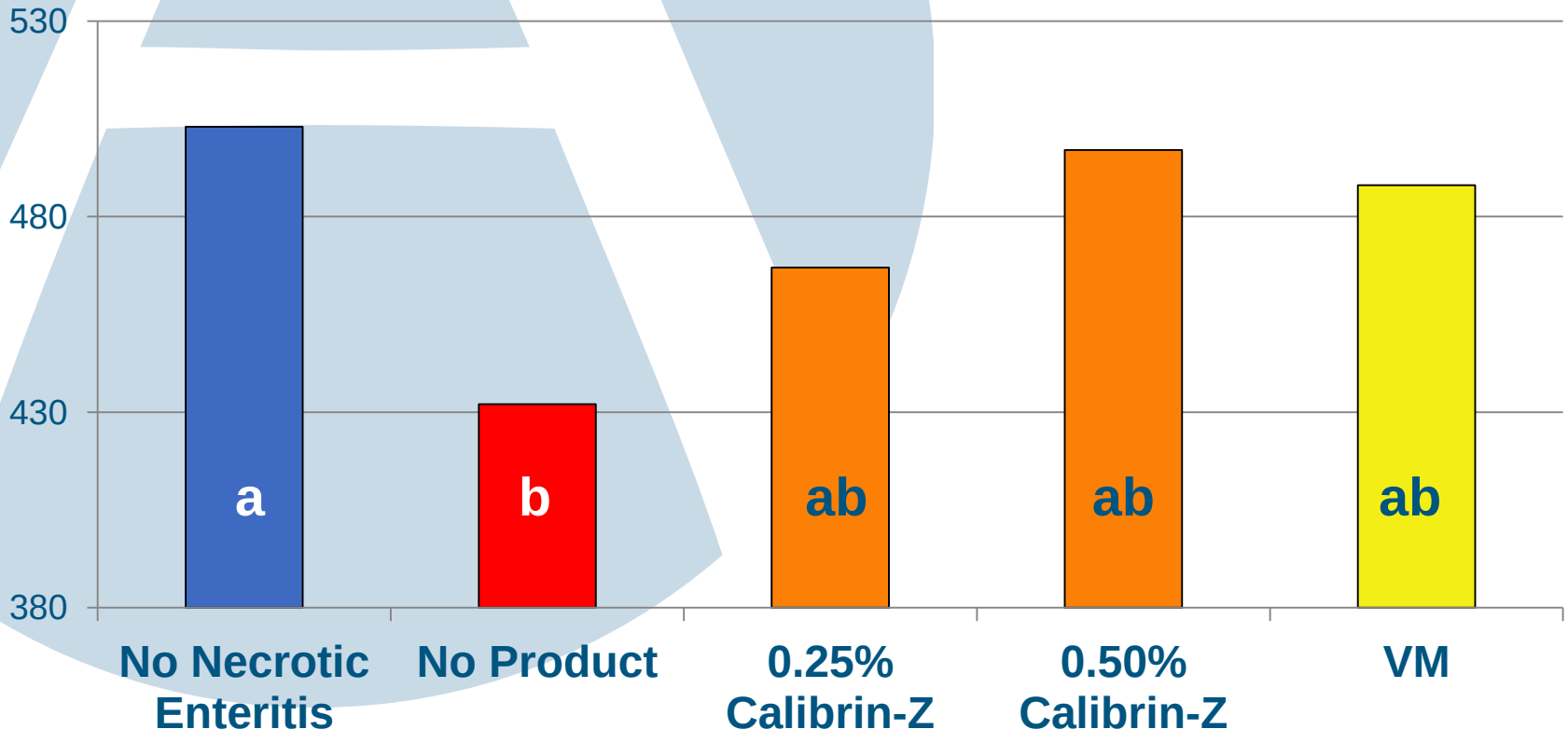


Fig. 1. Schematic illustration of the experimental protocol

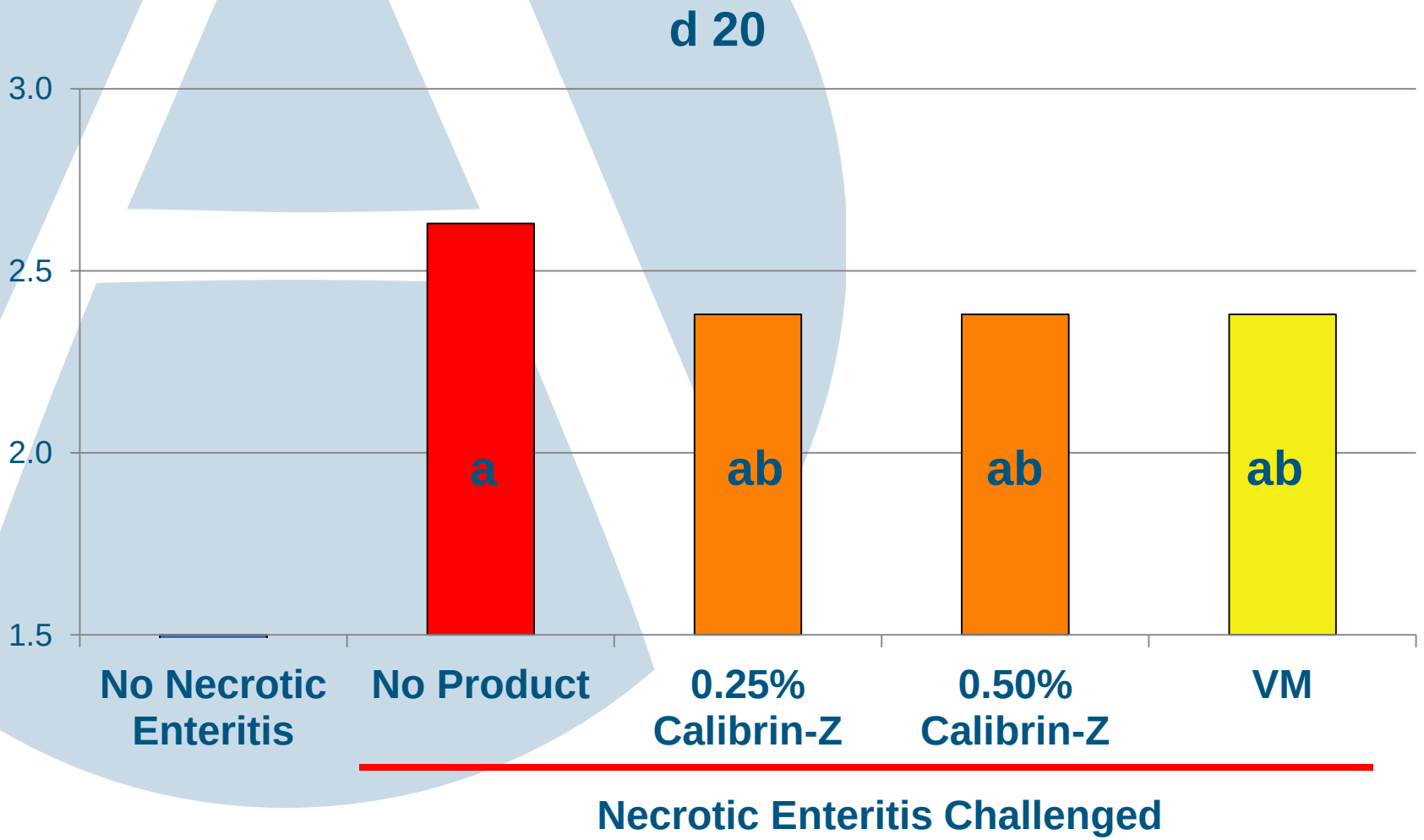
Broiler Body Weight Gain Under Necrotic Enteritis Challenge

Weight Gain (g) d 0 – 7 post *Clostridium perfringens* infection

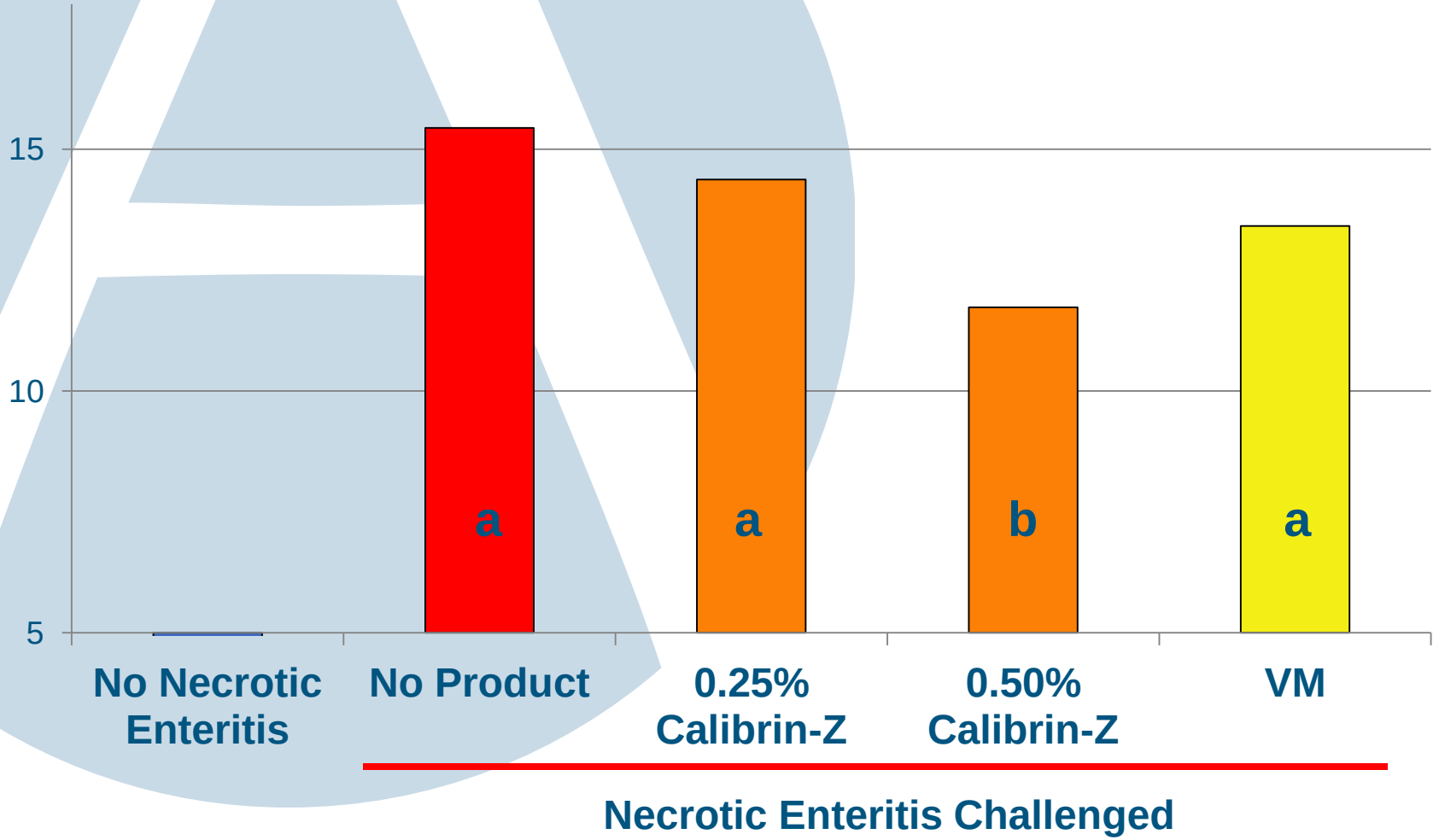


Necrotic Enteritis Challenged

Intestine Lesion Scores



Serum α- Toxin, ng/mL



Effect of Calibrin-Z on Serum Antibodies During A Necrotic Enteritis Challenge

Treatment	Non-Infected Control	NE Infected Control	0.25% Calibrin-Z	0.5% Calibrin-Z	VM
Serum AB to α-toxin	0.489^{b}	0.645^{a}	0.684^{a}	0.714^{a}	0.694^{a}
Serum AB to NetB	0.474^{b}	0.621^{a}	0.650^{a}	0.684^{a}	0.698^{a}

Calibrin-Z Downregulates Spleen Cytokine mRNA During A Necrotic Enteritis Challenge

Cytokines mRNA	0.25% Calibrin-Z	0.5% Calibrin-Z	20g/MT Virginiamycin
IL8	↓↓	↓↓↓	↓
TNFSF15	↓↓↓	↓↓	↑↑↑↑
LITAF	↓↓	↓	↓
iNOS	↓↓↓	↓↓	↓↓

Summaries

Calibrin-Z can ameliorate Necrotic Enteritis negative effects:

- Improves weight gain
- Reduces intestine lesion scores
- Reduces serum α-toxin concentrations
- Increases antiserum to the toxins
- Decreases inflammatory cytokines synthesis

Conclusion

- The trial results suggested that Calibrin-Z can improve broiler performance under NE challenge.