

The Importance of Poultry Gut Health in Achieving Optimum Value Through the Production Chain

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About Danisco Animal Nutrition

- Danisco Animal Nutrition, part of DuPont Industrial Biosciences
- Offers value-driven, science-based solutions for gut health
- Many solutions are industry "firsts"- unparalleled investment in developing of unique technologies (Enzymes, Essential Oils, Betaine and Probiotics)
- Global and local collaboration with customers, leading industry, government and academic partners.



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Today's Presentation: Three Main Topics

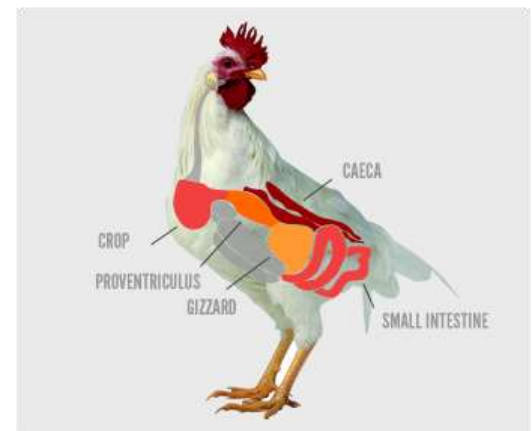
■ 1. Background

- **The Challenge: importance to consumers and producers**
- **Gut Health and Efficient Production**
 - Consequences of Dysbacteriosis
 - Sub-Clinical Diseases
 - Food Safety
- **Antibiotic Growth Promoter (AGP) Withdrawal**

■ 2. Maintaining Efficient Production – Four Alternative Solutions

- Enzymes
- Essential Oils
- Probiotics or Direct Fed Microbials (DFMs)
- Enzyme + DFM Combinations

■ 3. Summary and Conclusion



Importance Of Poultry Market To China

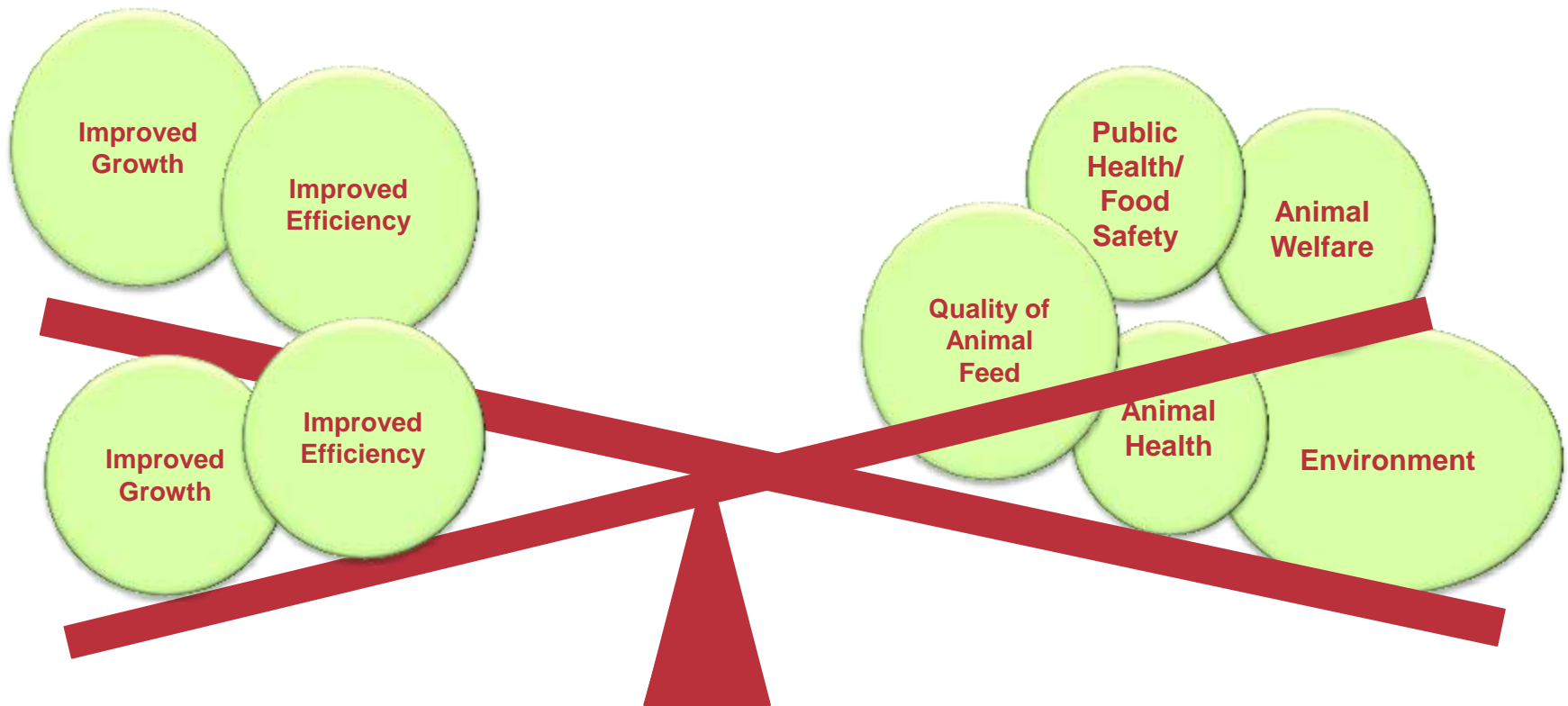
- Leading egg producer
- World's 2nd largest producer of poultry meat

	Poultry meat		Eggs	
1	USA	100	China	100
2	China	72	EU	37
3	Brazil	58	USA	19
4	EU	40	India	12
5	Russia	18	Japan	9

Source: FAO stat 2014



Why Is Feeding The World With Safe, Nutritious Food Still A Challenge?



In the case of poultry:

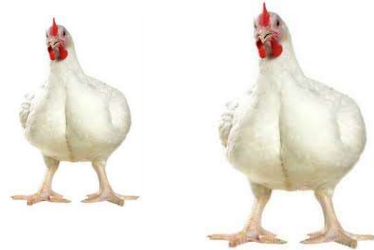
- All these issues relate to gut health.
- Antibiotic Growth Promoters (AGPs) are going away.

Commercial Production Conditions Can Make Birds More Susceptible To Clinical & Sub-clinical Disease



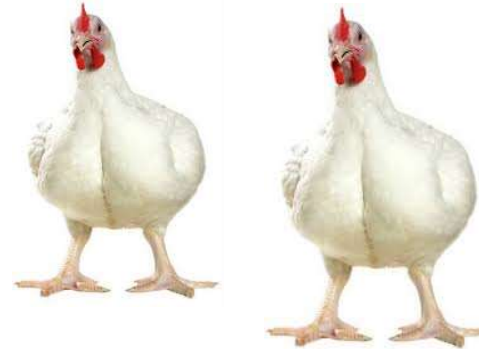
Post hatch/week one

- Mortality
- Colibacillosis



2 weeks onwards

- Necrotic Enteritis(NE)
- Footpad dermatitis (Pododermatitis)
- Coccidiosis



3 weeks

- *Campylobacter*
- Dysbacteriosis



4-6 weeks

- Enterococcal spondylitis
- Endemic colibacillosis

Which Diseases Specifically?

■ Necrotic Enteritis (NE)

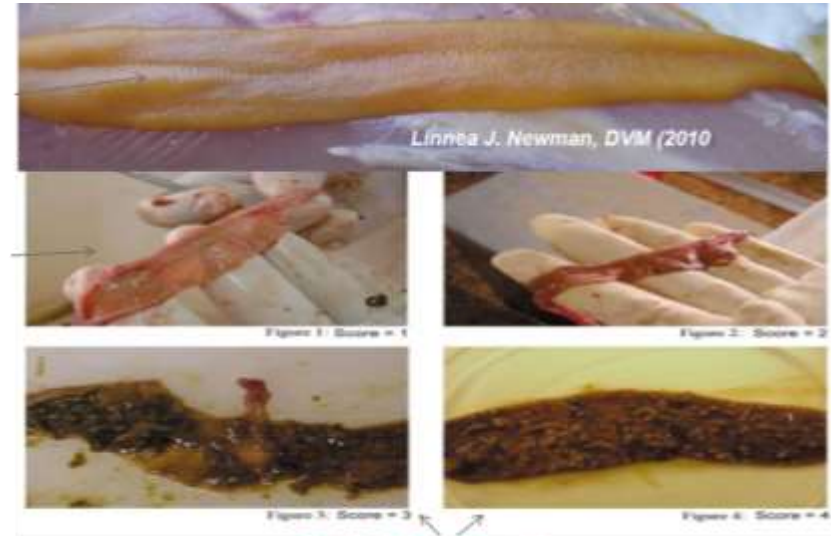
- Overgrowth of *Clostridium perfringens*
- 2-5 week old broiler chickens
- ~40% of broiler flocks worldwide
- Profit reduced by 33%
- Treatment of NE ~5¢ per broiler

■ Podo Dermatitis (Foot Pad Lesions)

- Ammonia burns on foot pads
- Caused by poor litter quality
- High pH, ammonia produced by bacteria in litter
- Ammonia inhalation is bad for bird's health

■ Avian coccidiosis

- Caused by intracellular parasite *Eimeria*
- Predisposes birds to bacterial diseases
- Estimated annual loss of more than \$3 billion worldwide
- Subclinical cases account for 70% of this cost.



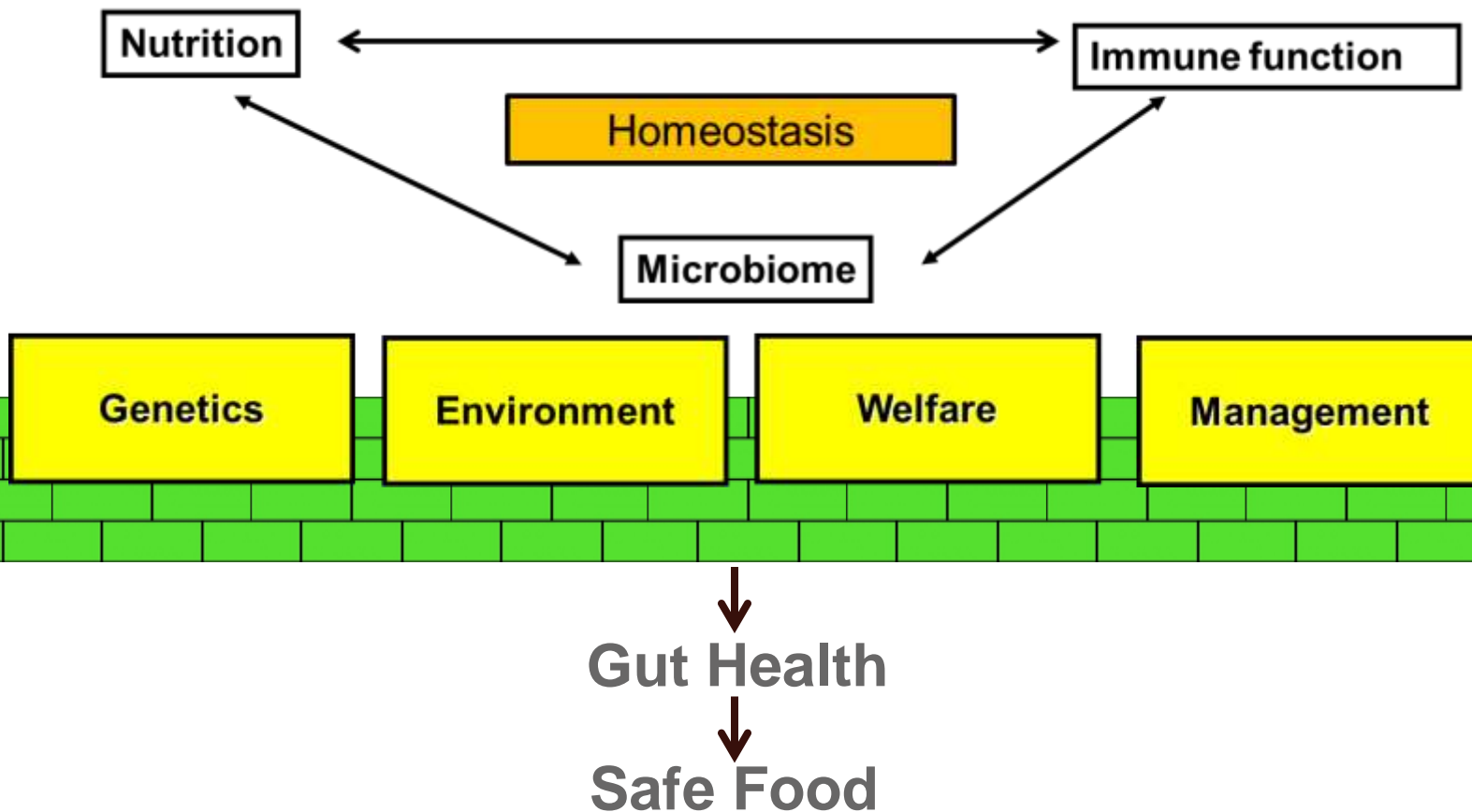
Clinical NE at different stages



Podo Dermatitis

There Is No “Silver Bullet”

Antibiotics do not correct unfavourable microbial conditions caused by poor husbandry, nutrition or genetics



Small Intestine BIG Job

A Delicate Balancing Act of Conflicting Objectives

Pathogen Defense and Nutrient Absorption

☺ VFA (butyrate) provides 70% energy

☺ Produce nutrients, such as vitamin K & B.

☺ Water re-absorption

☺ Improve bone mineralization

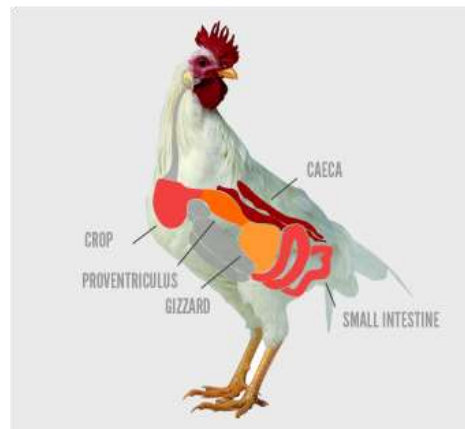
...and much more

☹ Decreased nutrient digestibility

☹ Non-specific

☹ Stimulation of immune response
Increased absorptive cell turnover and mucus production.

☹ Undesirable shifts in the gut microbiota,
negatively affecting Feed Conversion Ratio (FCR) and bird health



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Alternative Solution #1: **Enzymes**

Carbohydrase and protease enzymes could be part of the solution

Small Intestine

- De-polymerisation of soluble NSPs
 - Reduction in viscosity
 - Increase nutrient digestibility
 - Digest transit time is better regulated
 - Lesser microbial overgrowth
 - Better nutrient absorption
-

Large Intestine

- De-polymerisation of soluble NSPs produce smaller oligomers which are utilized by healthy microflora
 - Increased energy availability by higher VFA production
 - Lower pathogen pressure
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Enzymes and Gut Health

Enzymes help maintain gut health by reducing available substrate and improving GIT mucous membrane layers.

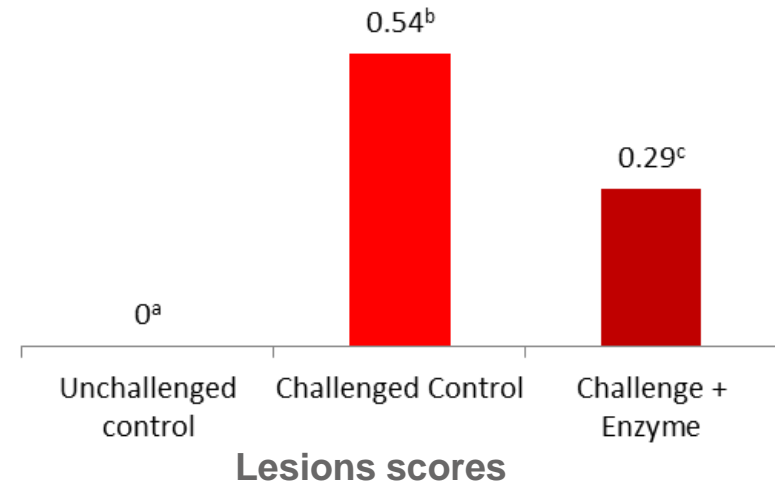
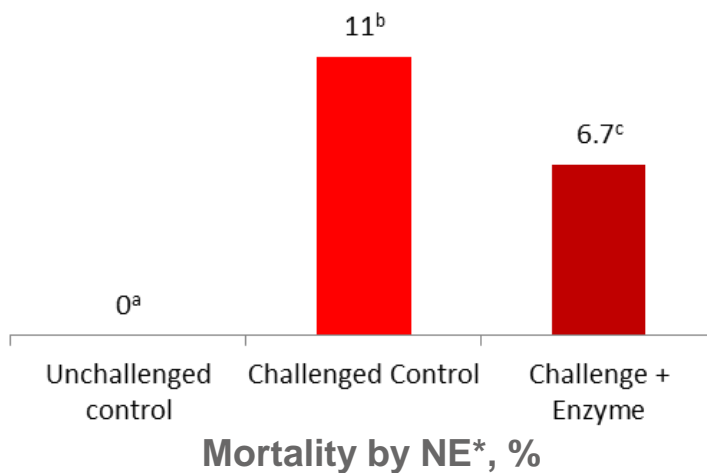
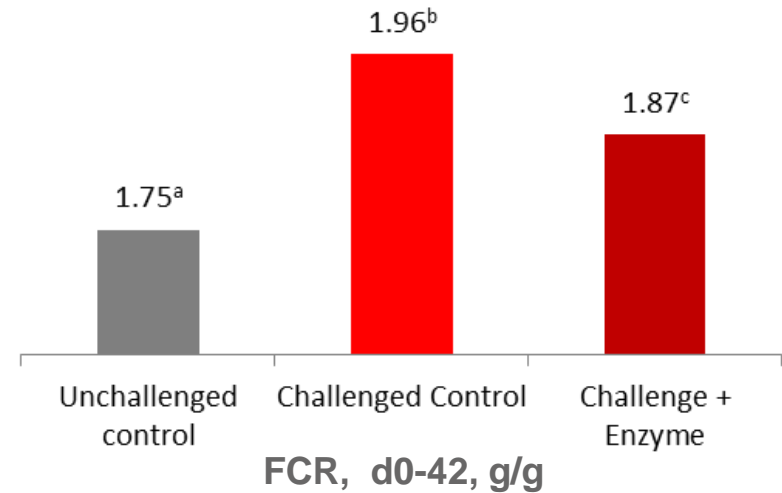
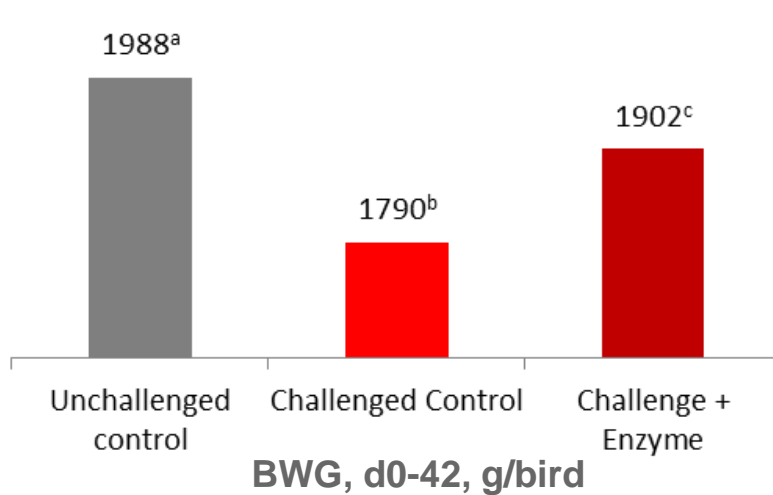
Xylanase, Amylases reduces xylans, NSPs

Proteases breaks down indigested protein

AGPs prevent microbial overgrowth in small intestine by antimicrobial activity

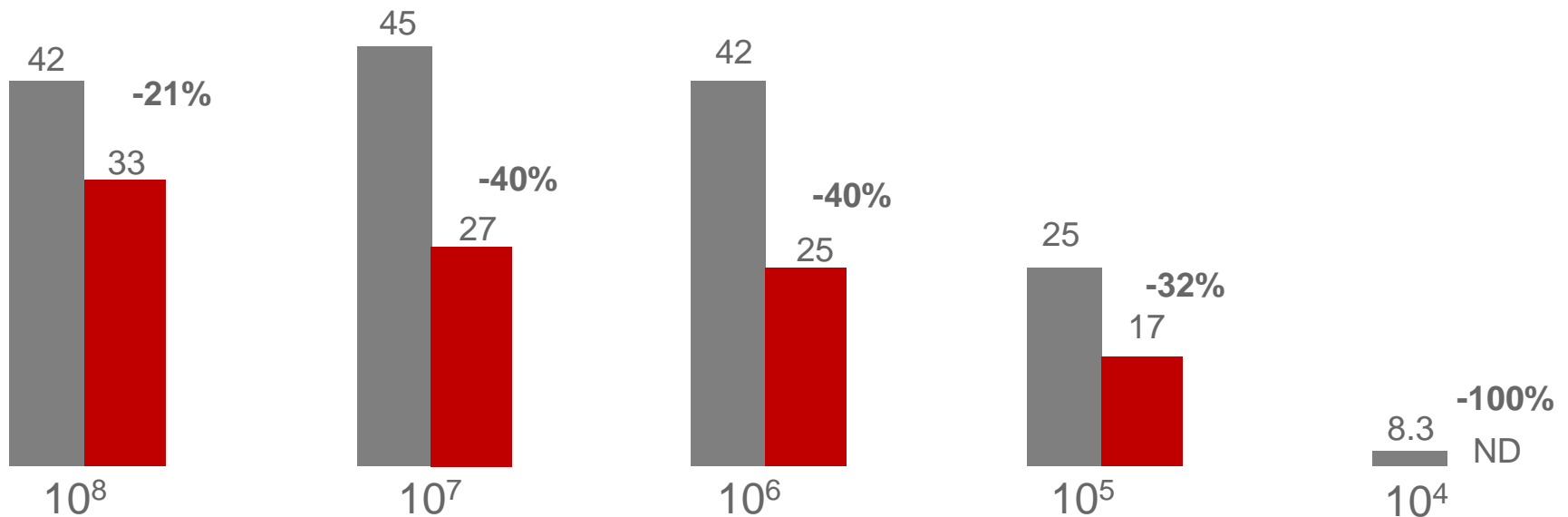
Enzymes prevent microbial overgrowth in small intestine by substrate reduction

Enzymes (XAP combination) And Necrotic Enteritis Challenge



Enzymes (XAP) And *Salmonella* Challenge

S. enteritidis-positive birds (birds with $>10^5$ cfu/g), %

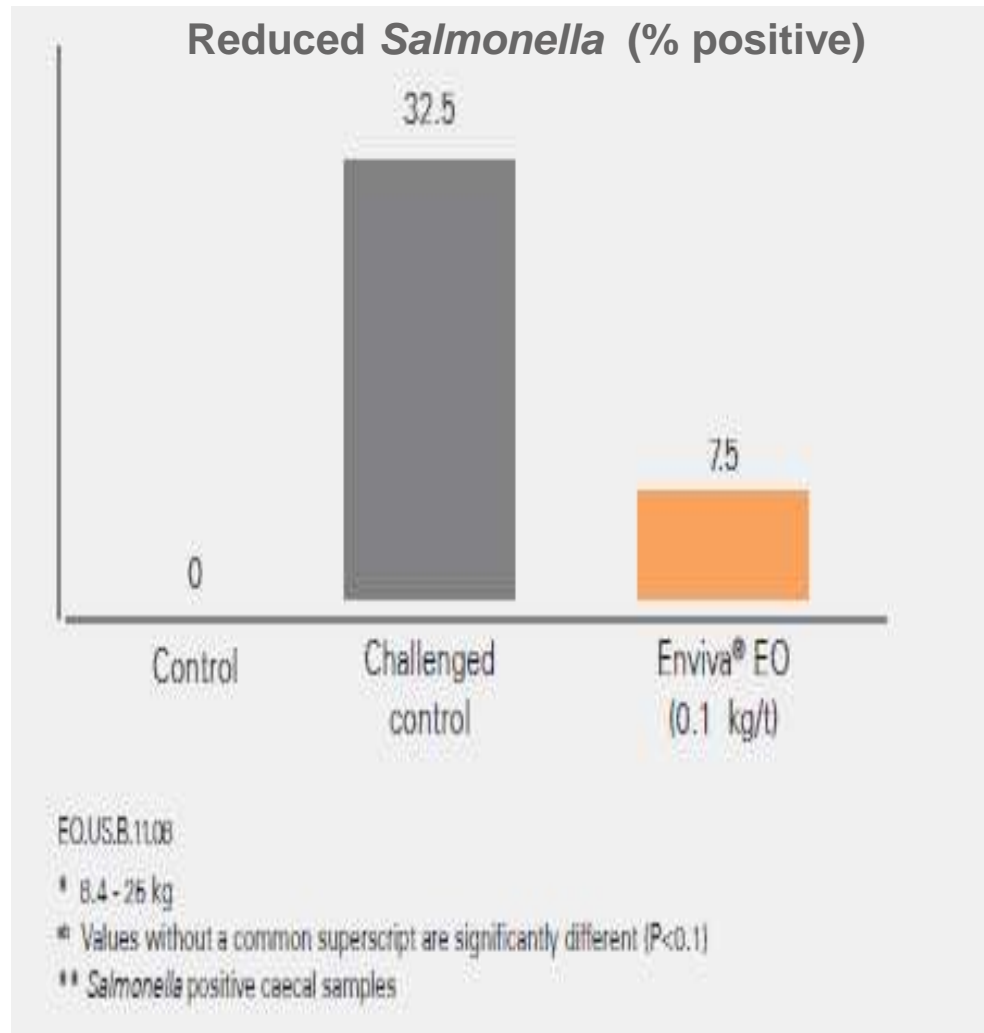


Salmonella enteritidis inoculation, cfu/bird

■ Control ■ + Enzyme

Alternative Solution #2: **Essential Oils**

Success In Use Where AGP Reductions/Bans Are Already In Place



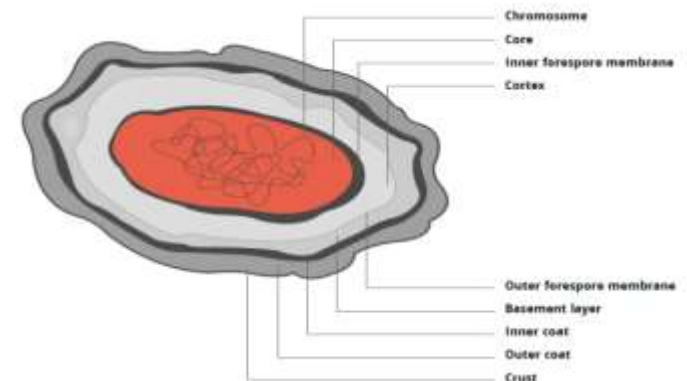
Alternative Solution #3: Probiotics

Benefits of using probiotics:

- Promotes villus (gut cell) formation
- Reduction in meat contamination
- Improved overall performance
- Prevention of inflammatory reactions
- Alternative to AGPs

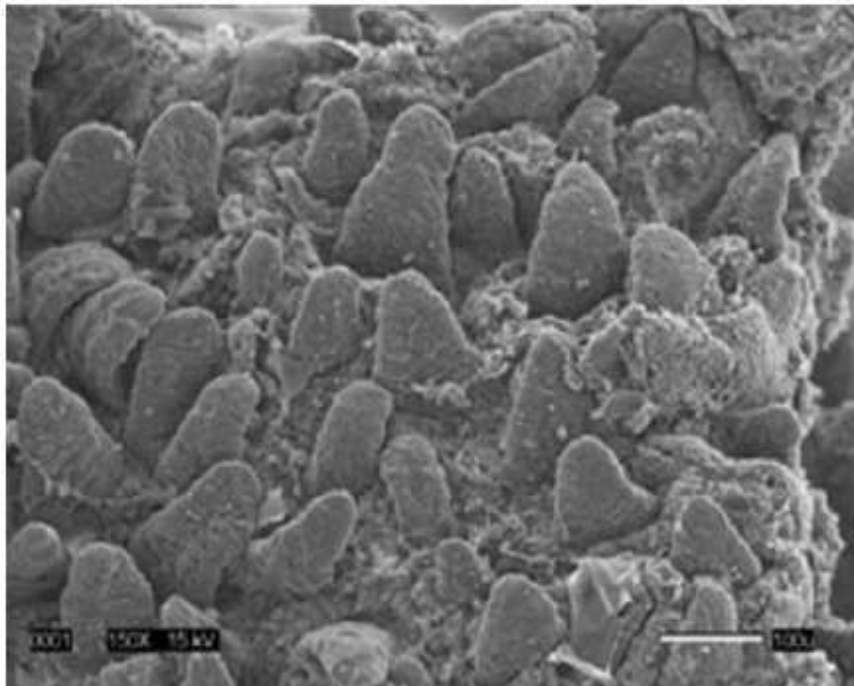
Benefits of using *Bacillus* spores:

- Stable during distribution, feed processing and storage
- Long shelf life
- In the chicken GI tract, germinate rapidly
- Active in the GI tract



Probiotics And Gut Health Restoration

Scanning electron microscopy of ileal villus of 21-day old poults

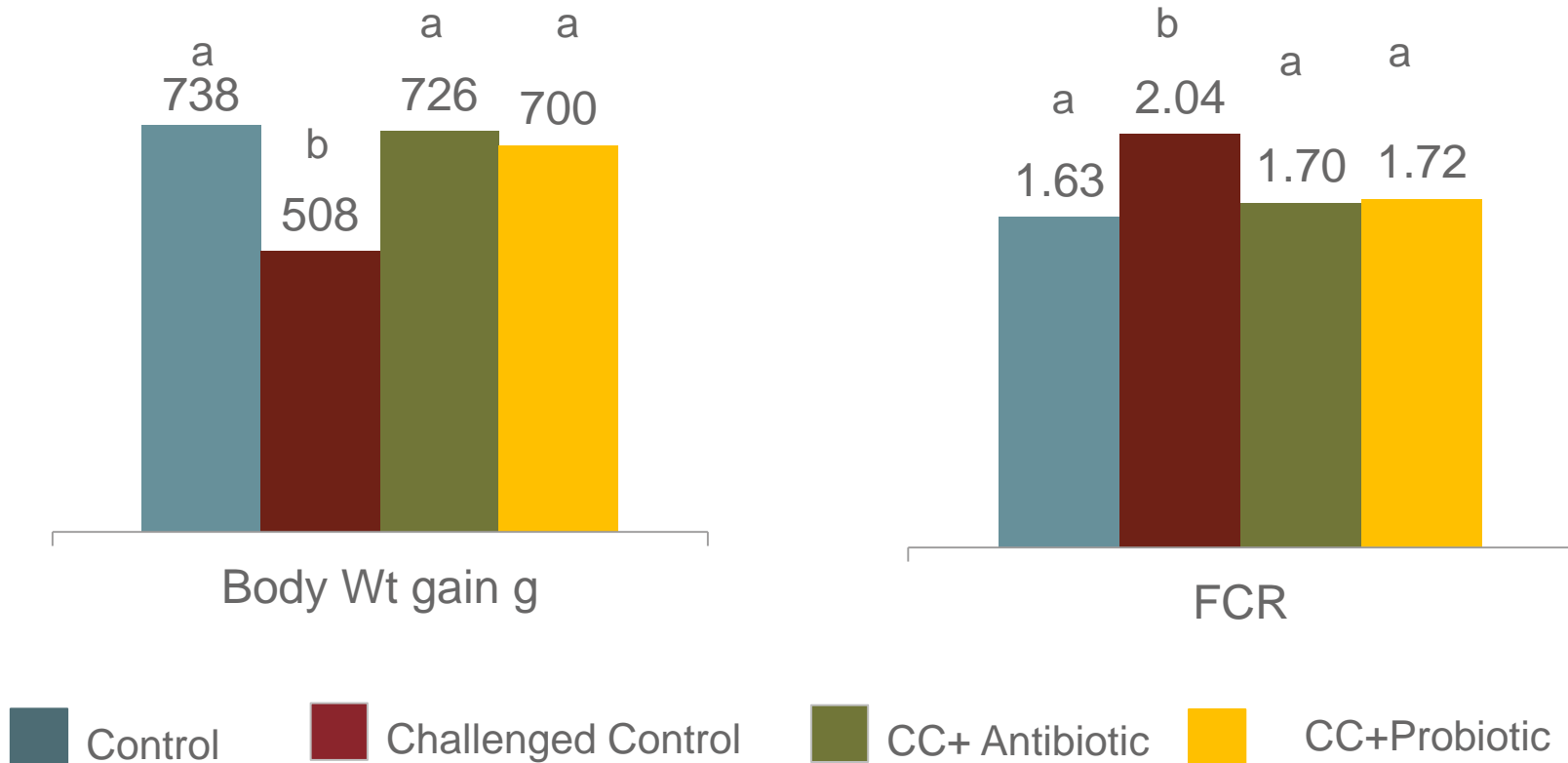


***Salmonella* challenge
without probiotic**

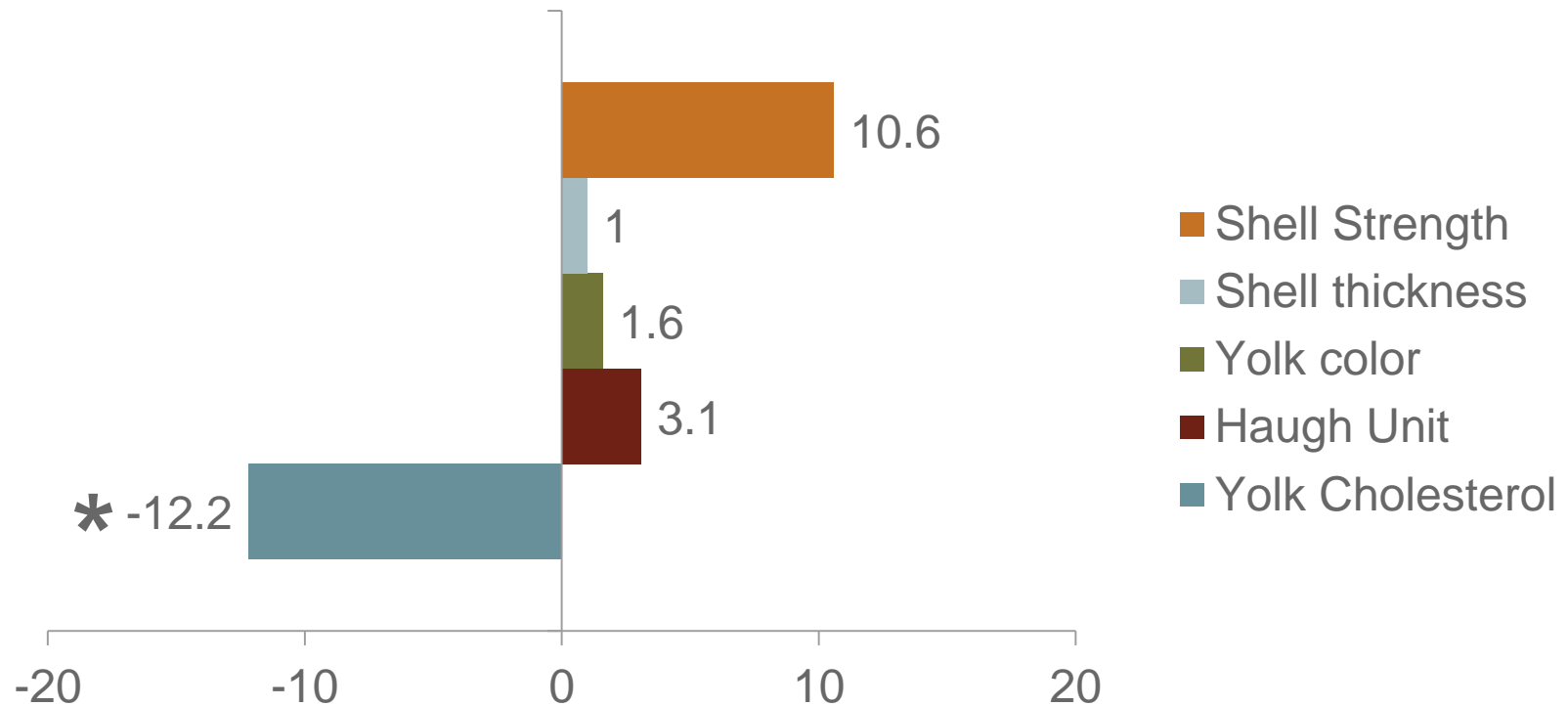


***Salmonella* challenge
with probiotic**

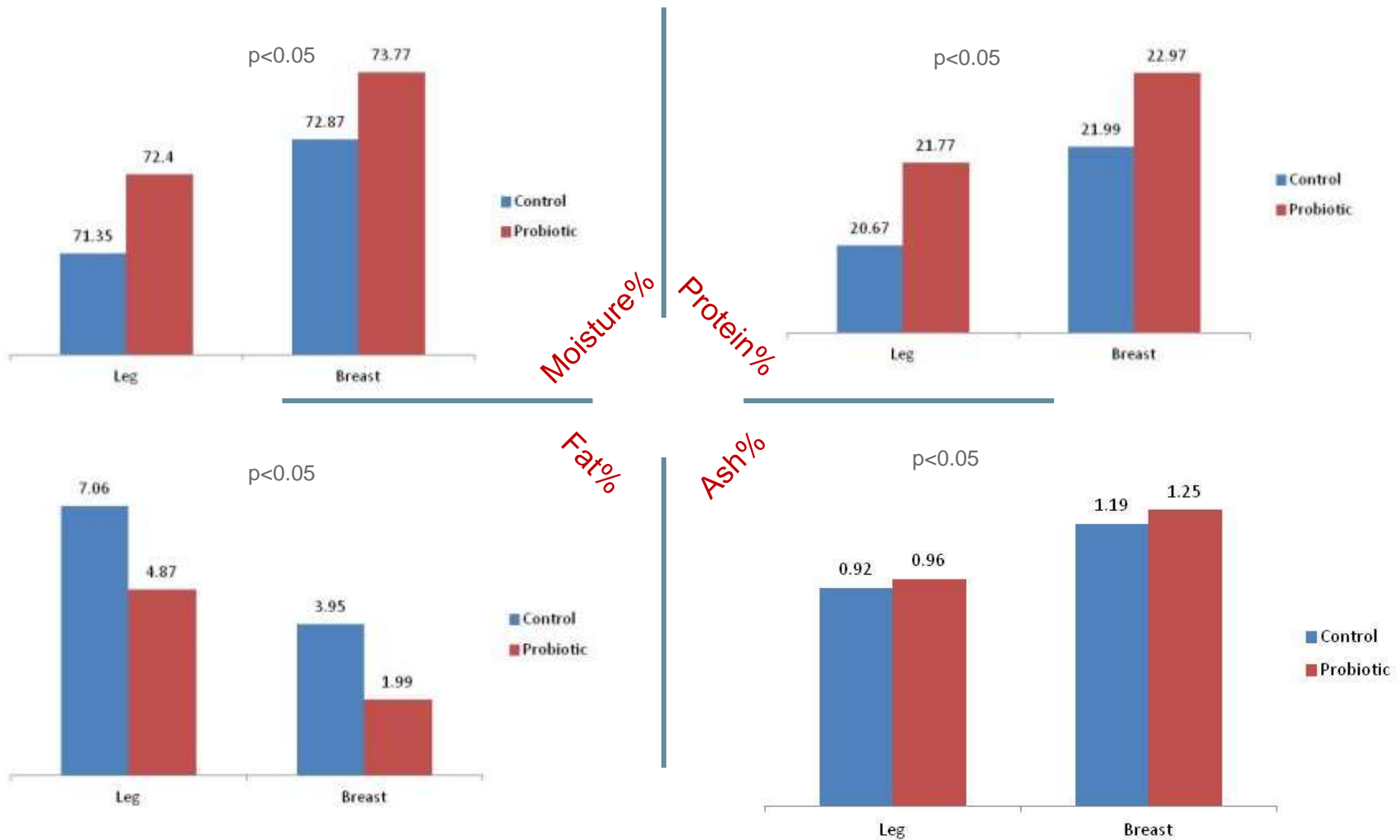
Probiotics And Necrotic Enteritis Challenge (0-28d)



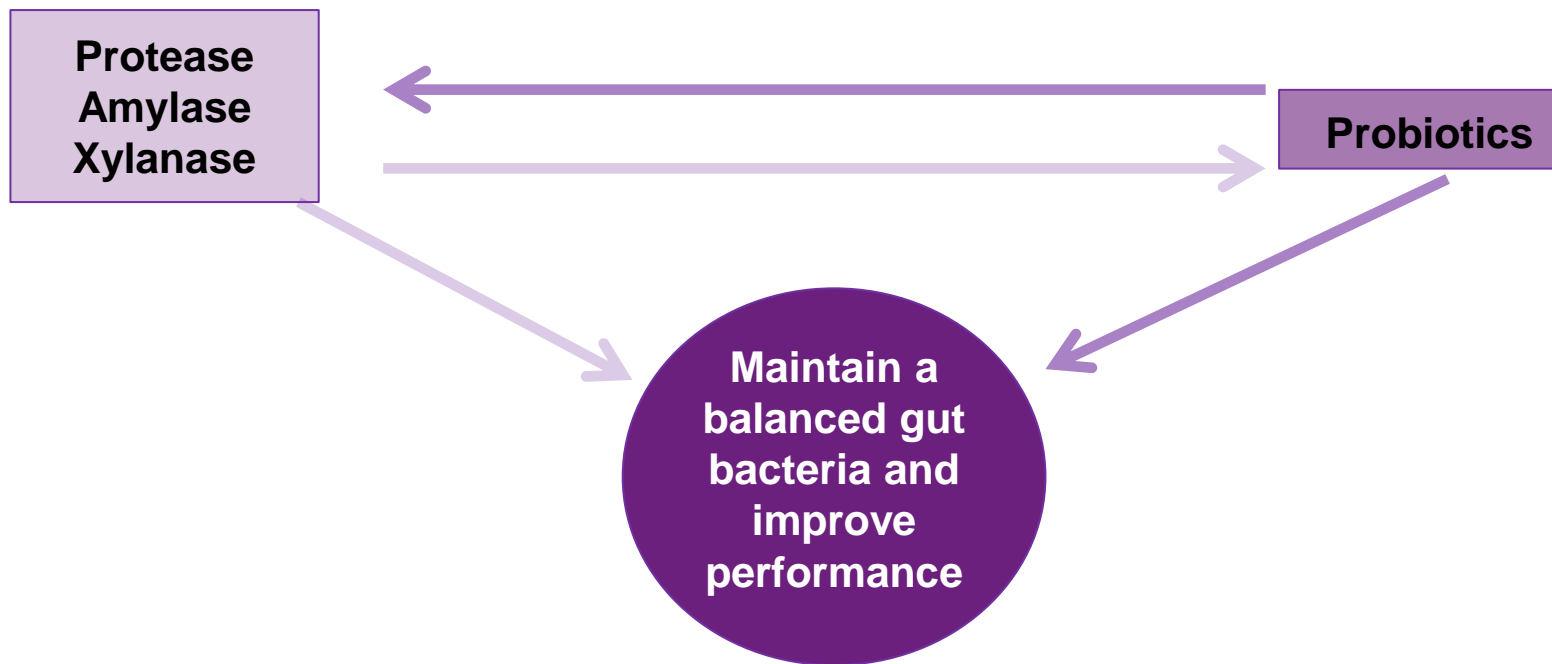
Probiotics: *Bacillus* and Egg Quality



Probiotics And Meat Quality

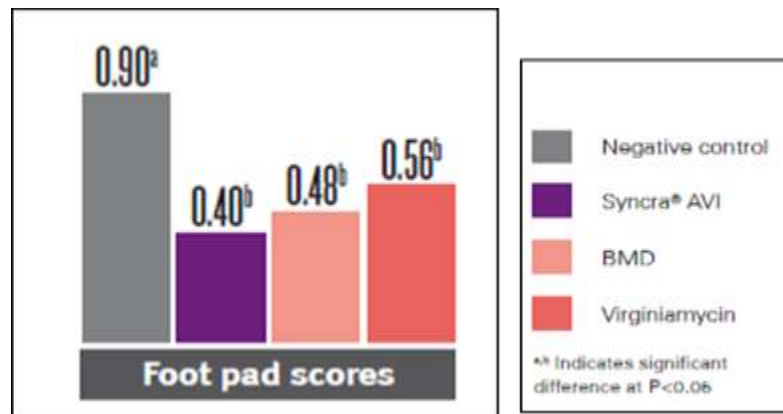
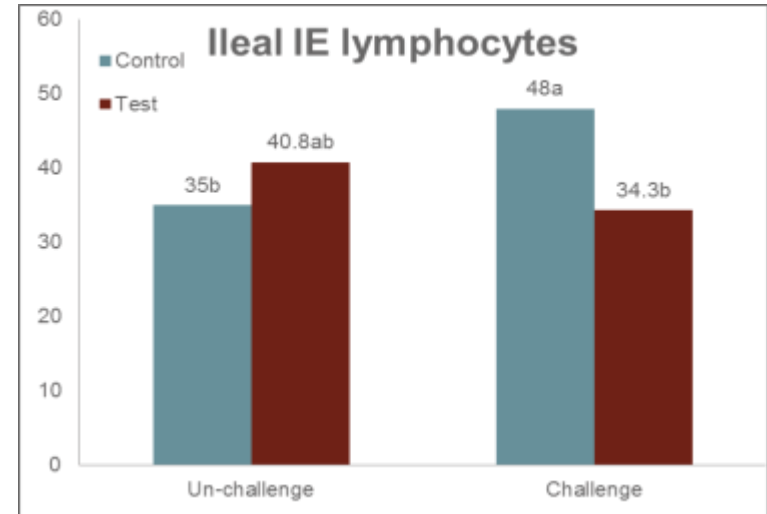
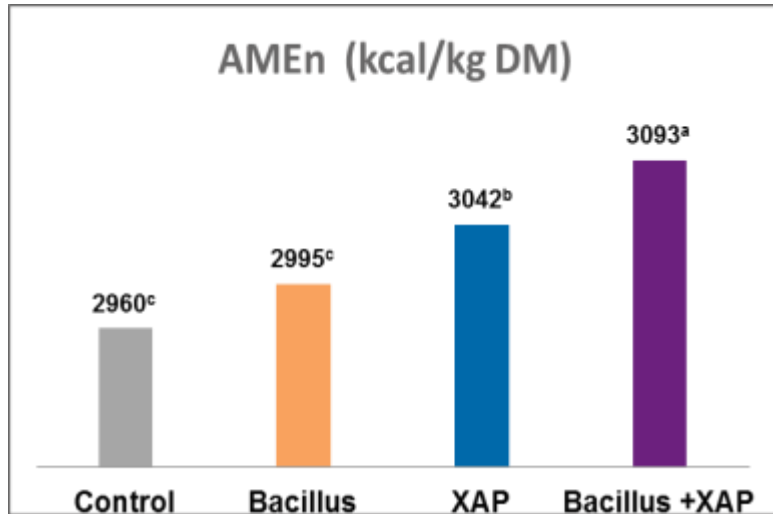


Alternative Solution #4: Probiotics + Enzymes Combined



Combination of 3 strains of *Bacillus* + xylanase, amylase and protease enzymes

Probiotics: Synergy with enzymes



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The Importance of Poultry Gut Health in Achieving Optimum Value Through the Production Chain

- **Optimal Gut Health = Optimal Bird performance.**
- **Healthy Nutrition** large part of solution with genetics, husbandry and environmental control.
- **Alternative solutions of enzymes, EOs, probiotics and combination** are backed by scientific studies



Thank You!

August 2015