Feed-borne *Fusarium* mycotoxins induce morphologic changes in the intestine of broiler breeder pullets

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Fusarium Mycotoxins

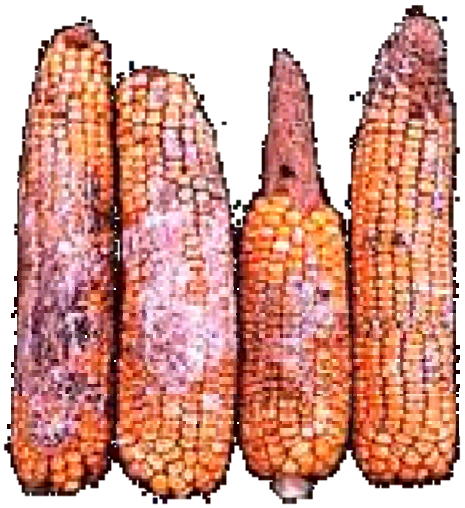
Trichothecenes

Type A: e.g. T-2 toxin, HT-2 toxin, DAS

Type B: e.g. DON (vomitoxin)

3- and 15-acetyl-DON

NIV



Fumonisins

Zearalenone

Fusaric acid

swine, horses, poultry, ruminants

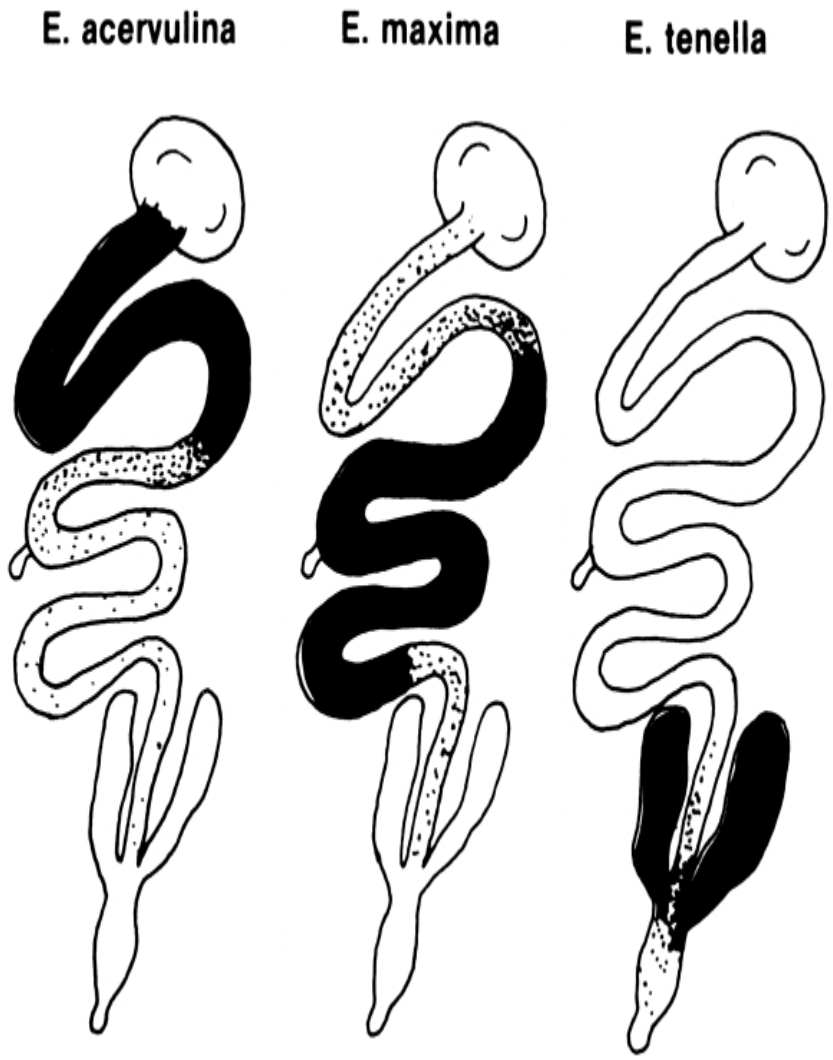
resistance

Rationale

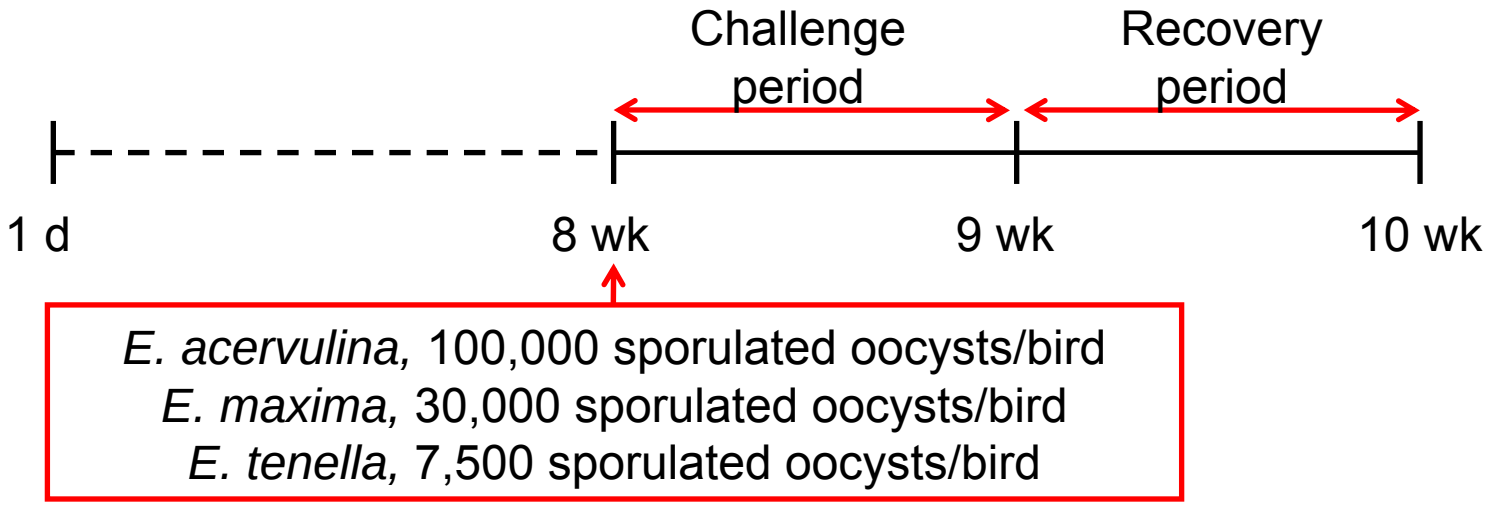
- *Fusarium* mycotoxins are commonly encountered contaminants in Canadian-grown grains.
- Broiler breeders are subject to chronic exposure to feed-borne *Fusarium* mycotoxins.
- Coccidosis is a field problem and the use of live coccidia vaccines is a common field practice.
- The intestine represents a primary site of interaction between ingested mycotoxins and pathogens.

Coccidia (*Eimeria sp.*)

- Optimized mixture (lesions without mortality)
- No interspecies crowding effect
- Mixed infection is common in the field



Experimental Design



Diets

Contaminated (3.8 µg/g DON, 0.3 µg/g 15-acetyl DON)

Contaminated + GMA (0.2%)

Control (inevitable 0.9 µg/g DON)

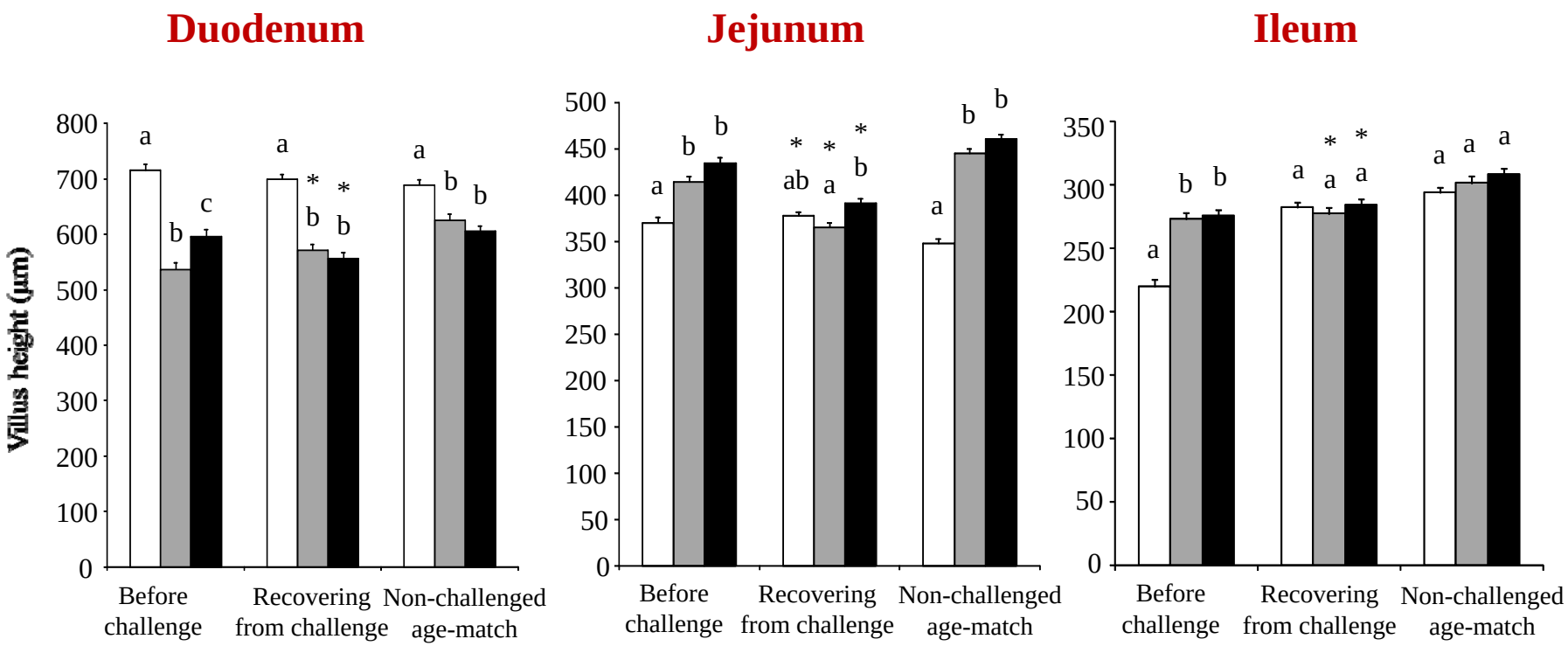
Effect of Diets and Coccidial Challenge on Body Weight Gain

Diet	Body weight gain‡	
	Non-challenged	Challenged
Control	16.86 ± 0.86	8.81 ± 1.11
Contaminated	15.84 ± 2.34	8.45 ± 2.43
Contaminated + GMA	14.94 ± 1.75	8.43 ± 0.56

‡g/bird/day; calculated over the challenge period from day 0 to day 7 PI.

Values are means ± standard error of means (SEM).

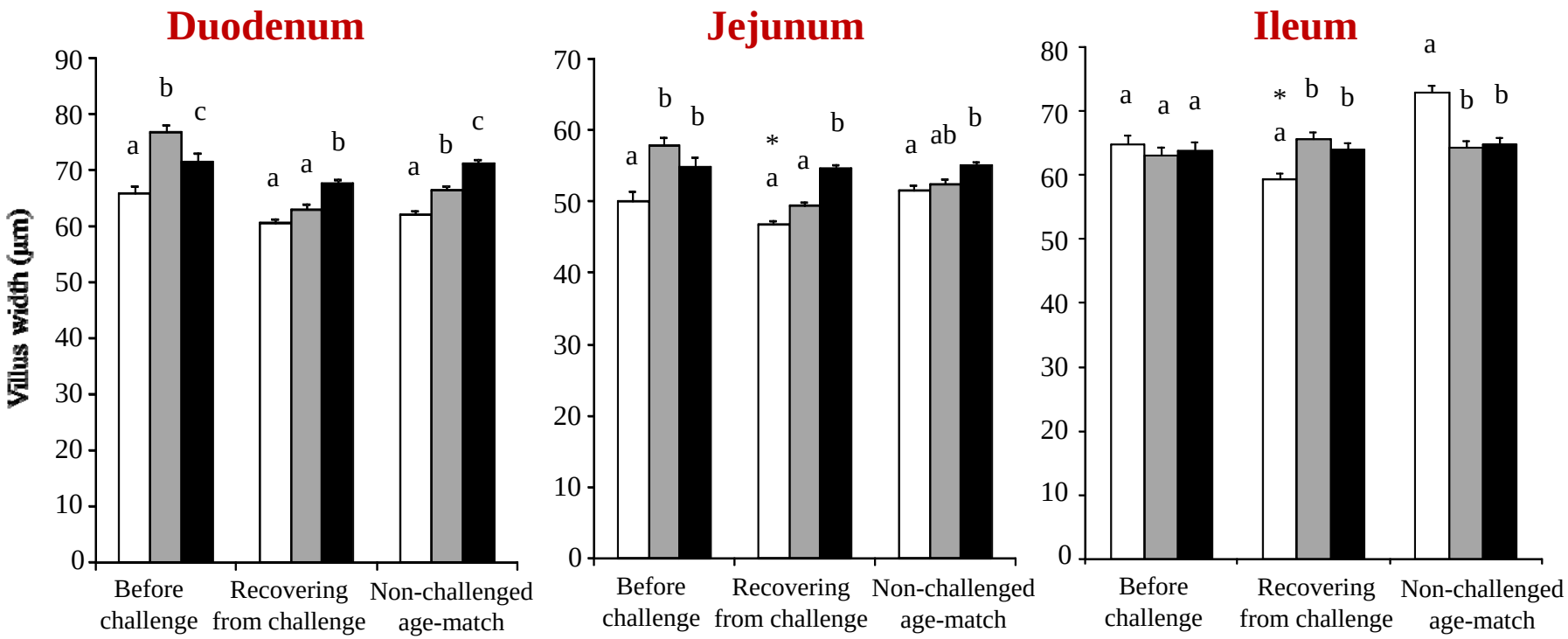
Effects of Diet and Coccidial Challenge on Villus Height



Different letters in each group of bars indicate significant differences.

Asterisk indicates significant difference relative to non-challenged age-match birds fed the same diet ($P \leq 0.05$)

Effects of Diet and Coccidial Challenge on Villus Width



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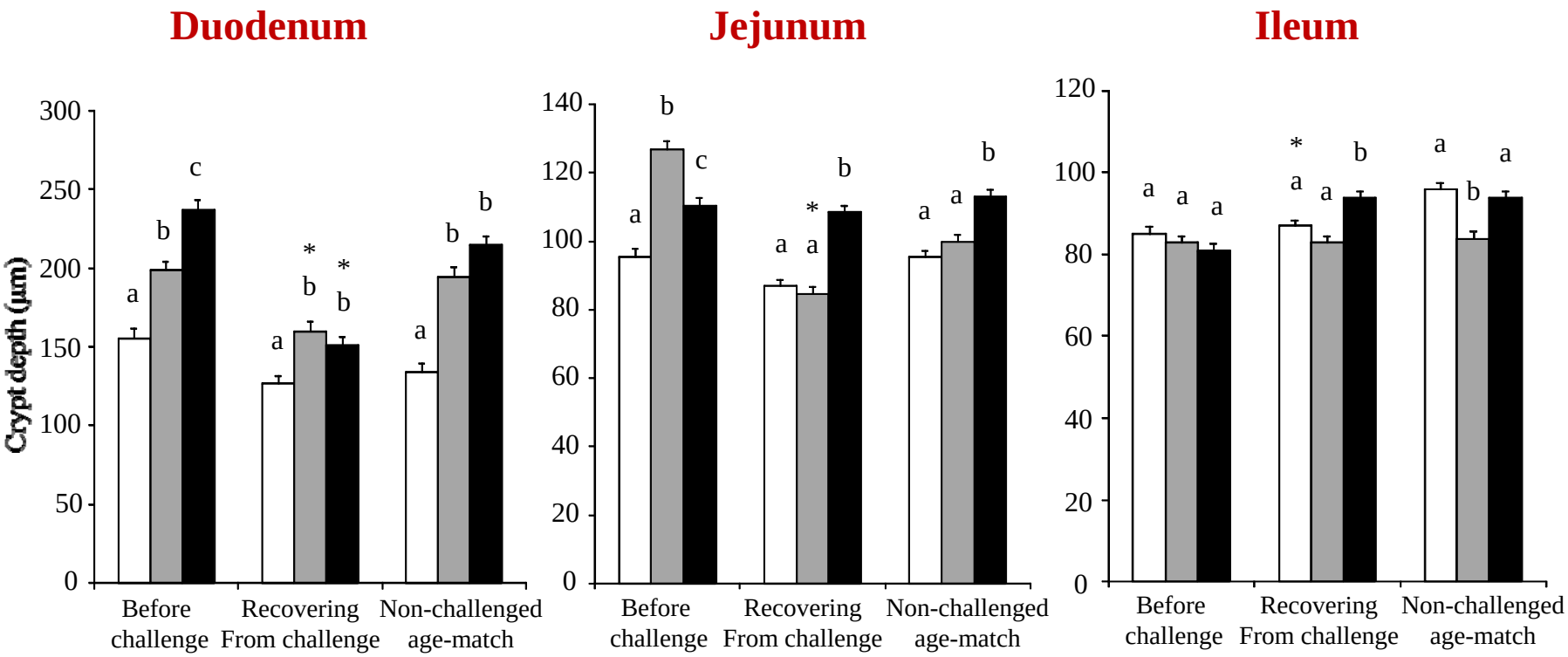
Effects of Diet and Coccidial Challenge on Crypt Depth



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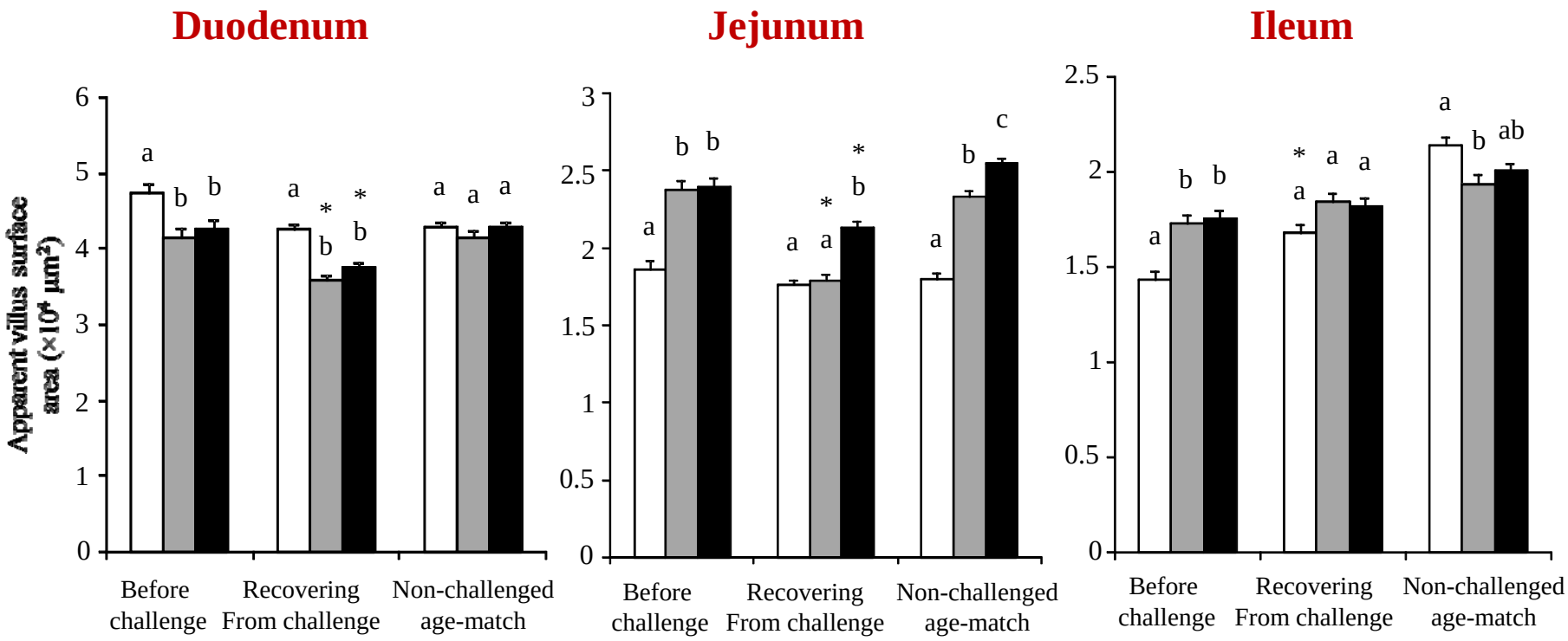
Effects of Diet and Coccidial Challenge on Apparent Villus Area



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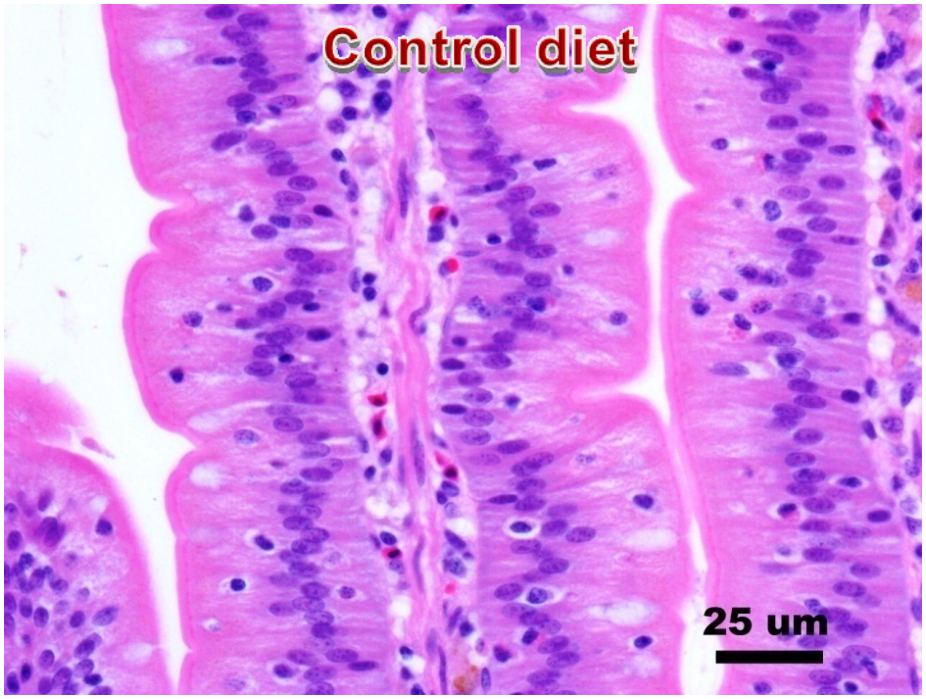
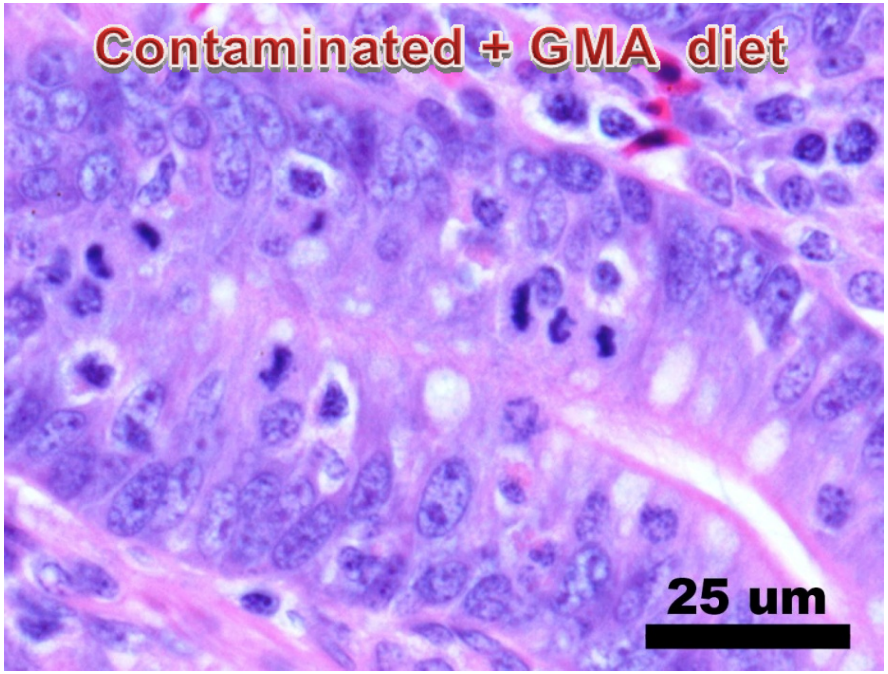

Control diet
25 um


Contaminated diet
25 um


Contaminated + GMA diet
25 um

Conclusions

- *Fusarium* mycotoxins, below levels that affect performance:
  - Alter the morphometry of the intestine.
  - Alter the cellularity of the intestine.
  - Impair the recovery of damaged intestinal mucosa.
- Feeding *Fusarium* mycotoxin-contaminated diets to poultry should be minimized.