

# Challenge studies to assess protection of IBDV vaccine against field strains: The role of SPF controls

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## Summary

Chick challenge studies are usually performed to assess the protection afforded by IBDV vaccines against challenge with field isolates in young broilers using the Bursa: Body Weight ratio (B: BW) as a measurement parameter. This system gives good indication of whether a vaccination program is appropriate for a particular challenge strain. However, in these studies the standardization of the challenge model is difficult because of the presence of variable maternally derived antibodies. The uniformity of the challenge dose in chick challenge studies using broilers was assessed by introducing groups of SPF birds as challenged and non-challenged controls. The comparison of B: BW ratios from these SPF controls groups with previously obtained base line information on B: BW ratios of normal SPF birds and SPF birds challenged with different strains of IBDV was a good indicator of the accuracy of the challenge dose. This helped to determine if the differences in B: BW ratios observed amongst the different commercial sources of broilers were due to factors other than the uniformity of the challenge dose between experiments.

## Objectives

To establish the base line data on B: BW of normal SPF birds and SPF birds challenged with different strains of IBDV.

To perform chick challenge studies with commercial broilers and groups of SPF birds as challenged and non-challenged controls to determine their usefulness as a tool for monitoring the uniformity of the challenge dose between experiments.

## Results

### I. Base line data in SPF chickens

B:BW Group Mean (SD)			
	Experiment 1	Experiment 2	Experiment 3
Control	5.5 <sup>A</sup> † (2.1)	4.8 <sup>A</sup> (1.5)	5.3 <sup>A</sup> (1.4)
Variant	1.2 <sup>B</sup> (0.4)	1.7 <sup>B</sup> (0.3)	1.6 <sup>B</sup> (0.3)
AI-2	1.3 <sup>B</sup> (0.3)	1.4 <sup>B</sup> (0.2)	1.5 <sup>B</sup> (0.2)
Standard	1.4 <sup>B</sup> (0.3)	1.6 <sup>B</sup> (0.4)	1.6 <sup>B</sup> (0.3)

In three different experiments groups of 20 2 week-old birds were challenge via ocular-nasal with 10<sup>3</sup>EID<sub>50</sub>/bird of Standard, Var-E, or AI-2 strains of IBDV. At 7 days after challenge birds were killed and bursa and body weights were recorded.

Values represent B: BW ratios

B: BW = Bursa wt. ÷ Body wt. x 1000

† B: BW values denoted by different capital letters (A-C) are statistically significant from each other (P<0.050) as determined by Tukey test All Pairwise Multiple comparison procedure

### II. Chick Challenge studies in Broilers

Table 2. Bursa:Body Weight Ratio analysis in chickens of different sources challenged with different strains of IBDV

Birds Source	Non-infected Controls	Var-E	AI-2
	AVG B:BW (SD)	AVG B:BW (SD)	AVG B:BW (SD)
SPF	4.77 <sup>*A</sup> (0.67)**	1.22 <sup>B</sup> (0.21)	1.09 <sup>B</sup> (0.23)
1	2.04 <sup>A</sup> (0.51)	1.10 <sup>B</sup> (0.42)	0.60 <sup>B</sup> (0.11)
2	1.86 <sup>A</sup> (0.43)	1.38 <sup>A</sup> (0.55)	0.65 <sup>B</sup> (0.12)
3	2.00 <sup>A</sup> (0.53)	1.11 <sup>B</sup> (0.48)	0.59 <sup>C</sup> (0.11)
4	2.23 <sup>A</sup> (0.57)	1.41 <sup>B</sup> (0.56)	0.67 <sup>C</sup> (0.14)
5	2.51 <sup>A</sup> (0.47)	1.88 <sup>A</sup> (0.75)	0.93 <sup>B</sup> (0.32)
6	2.19 <sup>A</sup> (0.44)	1.57 <sup>A</sup> (0.52)	0.81 <sup>B</sup> (0.16)
7	2.20 <sup>A</sup> (0.27)	1.18 <sup>B</sup> (0.54)	0.67 <sup>C</sup> (0.18)
8	2.07 <sup>A</sup> (0.52)	1.21 <sup>B</sup> (0.56)	0.66 <sup>C</sup> (0.17)
9	1.95 <sup>A</sup> (0.37)	1.00 <sup>B</sup> (0.41)	0.66 <sup>B</sup> (0.13)

Two-week-old broilers from different commercial sources were challenged with 10<sup>3</sup>EID<sub>50</sub> IBDV via ocular - nasal of Var-E or AI-2 strains. Negative controls were not infected. Groups of SPF birds were included in all the different treatment groups including negative controls and treated accordingly.

† B: BW values denoted by different capital letters (A-C) are statistically significant from each other (P<0.050) as determined by Tukey test All Pairwise Multiple comparison procedure.

## Discussion

The base line data (Table 1) obtained in the present experiment served as background to determine whether challenge experiments performed in broilers had the appropriate challenge dose level. The B: BW ratios obtained for the SPF groups in the chick challenge experiments (Table 2) were 4.77 for the non-infected control, 1.22 for the group infected with Variant E, and 1.09 for the group infected with AI-2. When these values were compared with the base line data (Table 1) they showed to be within the range with the exception of the AI-2 which was slightly lower than the range of 1.3 to 1.5 obtained in the SPF studies indicating that the challenge dose for the chick challenge in broilers had been higher for this particular strain.

Interestingly the differences in B: BW ratios of the broilers challenged with Var-E when compared with the respective broiler controls showed a large variation in significance (Table 2) due possibly to different levels of maternal antibodies, immune response to the vaccine, or genetic make up of the different sources among other reasons. But because the B: BW ratios of the Var-E challenged SPF birds were within the expected values, confident conclusion could be made about the protection afforded for the used vaccines in the face of this challenge strain.

These results suggest that the inclusion of SPF controls in chick challenge experiments in broilers allow determination of whether the challenge dose had been uniform between experiments, offering a tool to monitor challenge models for the evaluation of the efficacy of IBDV vaccination programs.

## References

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