Comparing the average daily gain from wean to finish in swine associated with three PCVII vaccines: Circumvet® PCV, Ingelvac® CircoFLEX, Suvaxyn® PCV/ Fostera PCV

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Introduction

Three licensed vaccines were available in 2012 for use in pigs three weeks of age and older in the USA, Fostera PCV (Zoetis Animal Health, New York, NY), a reformulated version of the discontinued Suvaxyn PCV (Fort Dodge Animal Health, Fort Dodge, IA), Ingelvac® CircoFLEX (Boehringer Ingelheim Vetmedica, St. Joseph, MO), and Circumvent ®PCV (Merck Animal Health, Omaha, NE).

For all these products, available data suggests improved production and health outcomes, compared to non-vaccinated animals. Consequently, PCV2 vaccines are widely used. Given the efficacy of all the products compared to no vaccination, the comparative efficacy of PCV2 vaccines is of great interest to producers and veterinarians, as the choice to be made is likely among vaccines rather than a choice between vaccination and non-vaccination. Ideally, a large number of randomized controlled trials that compare the vaccines would be available to enable both producers and veterinarians to make a scientifically based comparison of vaccines in the same setting. Few such trials directly comparing all three vaccines are publically available. Given this paucity of direct evidence, it can be useful to include information from other comparisons in the evidence network. Therefore, we conducted a meta-analysis to obtain the comparisons of active to active products.

Review Question

What is the effect of each of the three commercially available PCV2 vaccines on average daily gain from wean to finish in commercial pigs naturally exposed to PCV2 where the porcine reproductive and respiratory syndrome virus (PRRSV) status is known?

Materials and Methods

Review Question Components

- The population of interest was defined as intensively raised pigs in a commercial setting with known PRRSV status
- The intervention was defined as any USDA-licensed, commercial PCV2 vaccine available in the US in 2012 administered as prescribed by the manufacturer, though its use was not geographically restricted to the USA
- The outcome of interest was defined as average daily gain (ADG) from wean to finish
- The study designs were controlled trials in settings with naturally occurring disease

Sources of Information

Electronic citation database searches of AGRICOLA, CAB and PubMed were performed between and May 2012 . A search of the US Department of Agriculture in June 2012. The Annual Meeting of the American Association of Swine Veterinarians (AASV), the Allen D. Leman Swine Conference, the Iowa State University Swine Disease Conference for Swine Practitioners, and the International Pig Veterinary Society (IPVS) Congress in August 2012 within the Swine Information Library from 2006 to 2012. No language limits were placed on the searches; however, for screening we only assessed abstracts published in English and for data extraction we only used articles published in English.

Eligible Studies Criteria

- Reported in English
- Described an assessment of one of the three commercially available PCV2 vaccines within a field trial with a natural exposure to PCV2
- Reported both the vaccine and its administration using the manufacturer specifications
- Reported ADG (wean to finish) and a measure of precision in a manner that can be extracted
- Reported the PRRSV status of the herd

If studies were eligible but the PRRSV status was not clear from the publication, the authors were contacted to request this information. We also contacted authors to request missing outcome data.

Data Extracted

The data extracted were:

- Trial characteristics- the number of animals enrolled, the country of study, and the PRRSV status
- Intervention- the PCV2 vaccine used and control type (saline, no product, adjuvant only)
- Outcome data- ADG (g/day) from weaning (approximately three to six weeks of age) to late finishing prior to slaughter (approximately 23-26 weeks of age) for each trial arm
- Other outcome data were treatment-group level measures of variation (i.e., SD, standard error of the mean (SEM), and p-values)
- Risk of bias- data about randomization and blinding

Intervention	Comparator	Mean	SD	Median	Credible Interval
Circumvet® PCV	Unvaccinated	25.29	5.43	25.02	(15.26, 36.75)
Ingelvac® CircoFLEX	Unvaccinated	25.04	4.12	24.94	(16.99,33.61)
Suvaxyn® PCV/ Fostera PCV	Unvaccinated	16.94	8.94	16.99	(-1.01,34.77)
Circumvet® PCV	Ingelvac® CircoFLEX	-0.24	5.76	0.01	(-12.47,10.49)
Circumvet® PCV	Suvaxyn® PCV/ Fostera PCV	-8.34	9.94	-7.99	(-28.99,10.51)
Ingelvac® CircoFLEX	Suvaxyn® PCV/ Fostera PCV	-8.1	9.67	-8	(-27.76,10.94)

Table 1. The difference in average daily gain for all pairwise comparisons of three PCV2 vaccines Pigs receiving Circumvet® PCV gained 25.29 grams per day more than unvaccinated pigs from wean to finish.

Intervention	1	2	3	4
Unvaccinated	0	0	3%	97%
Circumvet® PCV	42%	44%	14%	0
Ingelvac® CircoFLEX	44%	43%	13%	0
Suvaxyn® PCV/ Fostera PCV	14%	13%	70%	3%

Table 2. The rankings predicted by the MTC model. Circumvent and and Ingelvac had a 42% and 44% probability of being ranked as the product with the highest average daily gain from wean to finish.

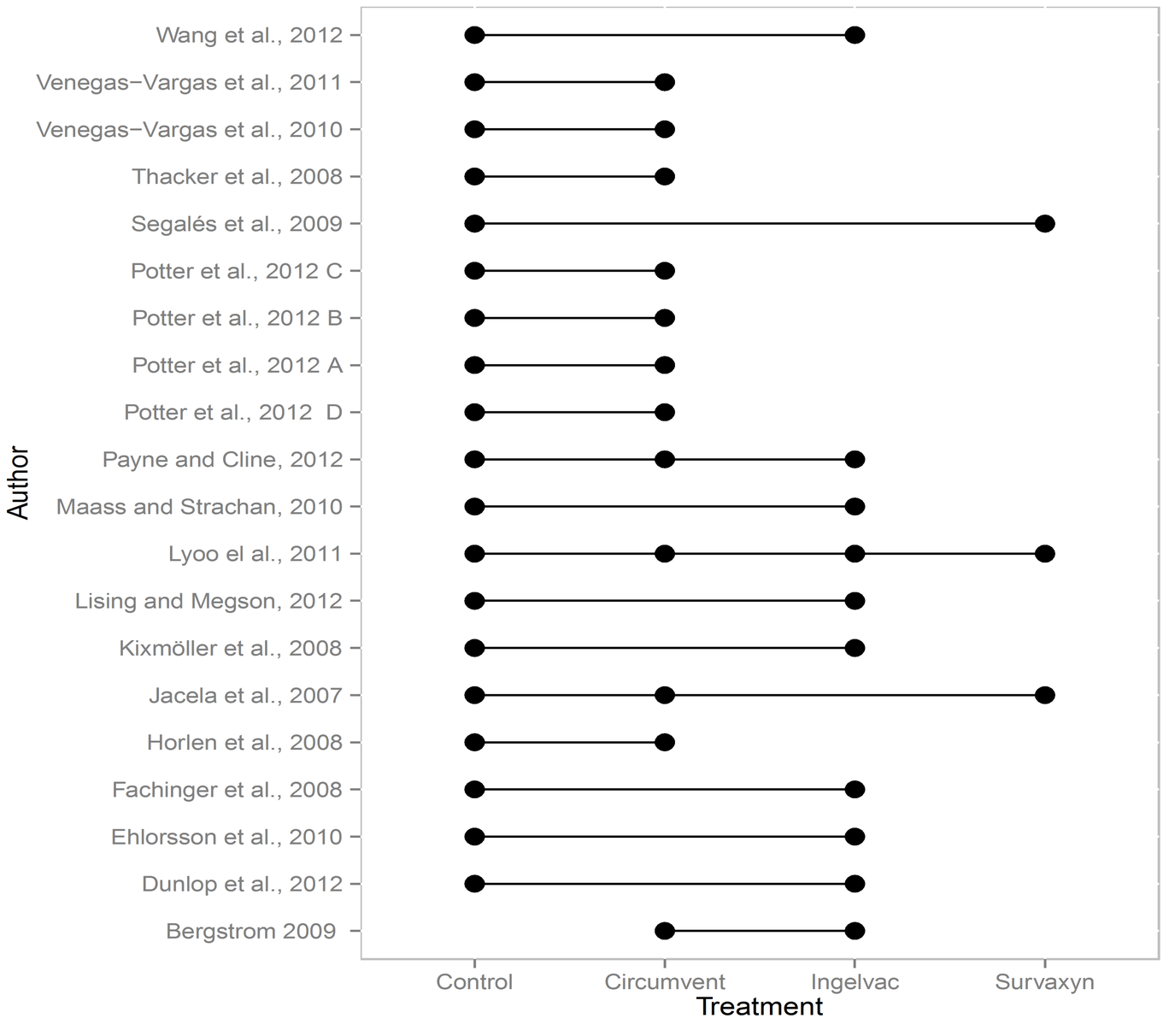

Figure 1. The network of studies used in the analysis

Statistical Methods

We used a statistical approach to obtain comparisons by combining direct and indirect evidence to compare the PCV2 vaccines, commonly referred to as mixed treatment comparison meta-analysis (MTC) or network meta-analysis [Dias et al., 2011].

Results and Discussion

When looking at the comparison of the active vaccines, which was the aim of the analysis, it is necessary to evaluate the credible intervals for Circumvent compared to Ingelvac, Circumvent compared to Suvaxyn/Fostera, and Ingelvac compared to Suvaxyn (d34) (See Table 1). All of these intervals include zero which suggests no evidence to reject the null hypothesis that the ADG is the same for all groups. Note that this is not evidence that the vaccines are equivalent.

If we use ranking as a way to differentiate the vaccines, these data would suggest that the vaccines Circumvent and Ingelvac are probably equivalent. As suggested by the credible intervals, both products were likely to provide the highest or second highest ADGs, Suvaxyn next and last the placebo. In the context of the model, in the 5000 simulations the Circumvent and Ingelvac products consistently had the predicted highest or second highest ADG. The use of ranking information is quite controversial as it requires the assumption of all other things being equal. In particular, the ranking does not reflect other outcomes including mortality or morbidity, and we are unaware of a co-joint analysis that shows that rankings for ADG mirror the rankings for those outcomes.

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References

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