The economic burden of the porcine respiratory disease complex and related interventions - A systematic review

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Introduction

The Porcine respiratory disease complex (PRDC) is one of the main causes of death in weaned and finisher pigs and the main reason for antimicrobial usage[123]. Understanding the financial consequences of endemic pathogens within the PRDC and the effects of mitigation measures, would assist on-farm decision-making regarding disease prevention and control.

Aims

To identify:

I. What economic studies have been carried out on the PRDC;
II. What economic methods are being used and what cost components they consider;
III. The economic impacts of specific or co-existing PRDC pathogens and the costs and benefits of interventions.

Materials and Methods

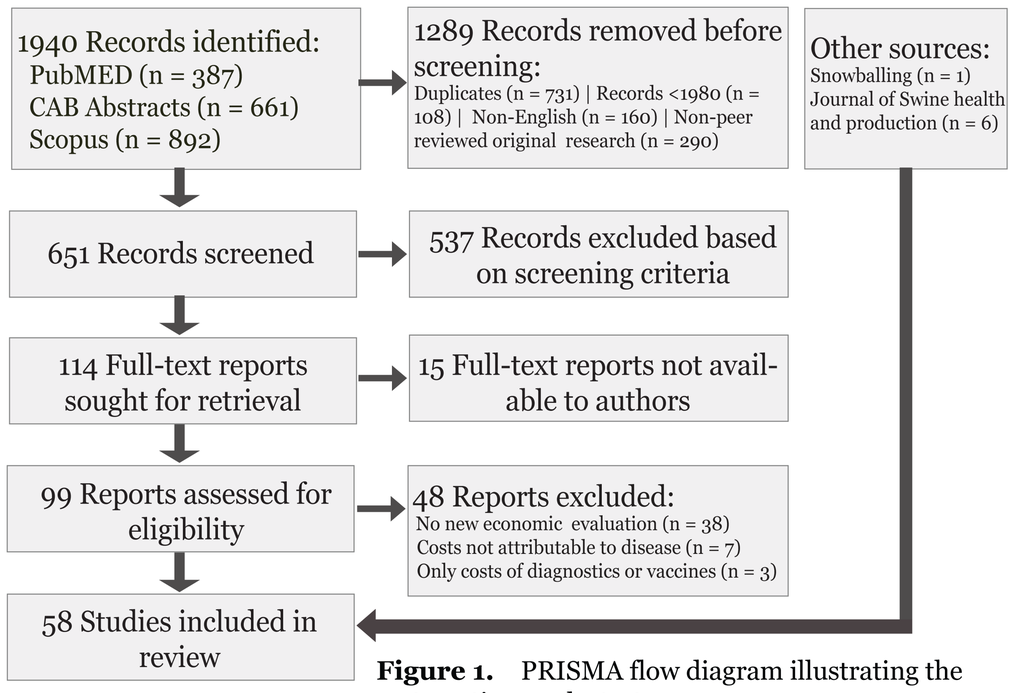

Figure 1. PRISMA flow diagram illustrating the systematic search strategy.

Results

- The studies mainly considered endemic scenarios on commercial fattening farms;
- PRRSV was by far the most studied pathogen, with a reported economic impact ranging from €1 to €11 per fattening pig (figure 2) and €78 to €443 per sow;
- Comparing effects of interventions was not possible due to too large variation in the expression of outcomes;
- Seven different economic methods were applied across studies to calculate the economic impact;
- Numerous cost components were considered in calculations, which varied widely between studies (table 1), even when using the same methodology.

Table 1 Cost components considered in the economic analysis of disease-focused studies on Porcine Reproductive and Respiratory Syndrome Virus (PRRSV).

	Veterinary costs	Prevention and control	Breeding costs	Pig purchases	Feed costs	Bedding and manure	Transport	Disposal costs	Labour	Fixed costs	Growing pigs sold	Piglets weaned/sold	Carcass value	Sow sales	Longer growing period	Other
PRRSV -focused studies																
Brouwer et al. (1994)			■									□			■	
Pejsak & Markowska-Daniel (1997)	■															
Garner et al. (2001)			■					□			■					□
Neumann et al. (2005)	■		■		■	□			■	□		□			■	
Holtkamp et al. (2013)	■		■		■				■	□		□	■			
Nathues et al. (2017)	■		■		■		■	□	■	□	■				■	
Pham et al. (2017)	■	□	■		■		■			□	■		■		■	
Valdes-Donoso et al. (2018)												□				
Trevisan et al. (2020)												□				
Renken et al. (2021)	■	□	■		■		■		■	□	■	□	■	□		
Kim et al. (2022)	■		■		■	□			■	□		□				
Trevisi et al. (2022)	■			□	■											
Zhang et al. (2022b)	■		■	□	■				■	□		□				

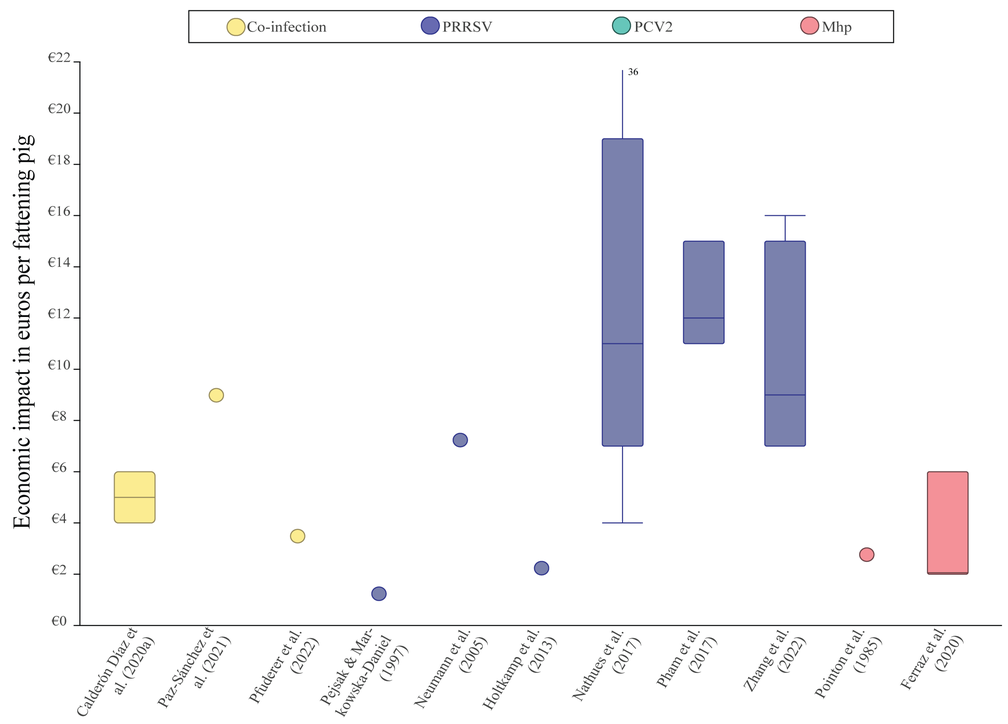

Figure 2. Economic impact of disease caused by endemic respiratory pathogens, expressed in decreased profit (in euros) per fattening pig.

Discussion

The present review provides novel insight in the variation of the economic impact from specific and co-existing respiratory pathogens.

Factors resulting in increased variation in estimated outcomes:
- The multifactorial nature of the PRDC;
- Strain virulence and pathogen prevalence across countries;
- Variation in production systems across countries and over time.

Limitations impacting direct comparability of outcomes:
- Different applied economic methods with a varying level of detail;
- Change of prices over time.

Other limitations in this review include the potential presence of publication bias and outcome reporting bias, especially in intervention-focused research.

Conclusions

- Endemic respiratory diseases form a significant economic burden in pig production;
- Comparability in economic research is key to better understand the disease impact and ultimately improve decision-making;
- The consistency of economic assessments should be improved, by developing standardised protocols and agreeing on common calcalation methods.

References: [1]USDA (2015). Swine 2012. Part I: Baseline Reference of Swine Health and Management in the United States, 2012. Retrieved from The National Animal Health Monitoring System studies. [2]Lekagul, A., Tangcharoensathien, V., & Yeung, S. (2019). Patterns of antibiotic use in global pig production: a systematic review. Veterinary and animal science, 7, 100058.; [3]Sarrazin, S., Joosten, P., Van Gompel, L., Luiken, R. E., Mevius, D. J., Wagenaar, J. A., ... & Dewulf, J. (2019). Quantitative and qualitative analysis of antimicrobial usage patterns in 180 selected farrow-to-finish pig farms from nine European countries based on single batch and purchase data. Journal of Antimicrobial Chemotherapy, 74(3), 807-816.

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