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Geoffrey E. Dahl,
University of Florida, United States

*CORRESPONDENCE
Gianmarco Ferrara
gferrara@unime.it

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Editorial: Economic impact of infections on the farm industry

Gianmarco Ferrara[1]* and Carlos Tejeda[2]

[1]Department of Veterinary Sciences, University of Messina, Messina, Italy, [2]Austral University of Chile, Facultad de Ciencias Veterinarias, Valdivia, Chile

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Editorial on the Research Topic
Economic impact of infections on the farm industry

1 Introduction

Infectious diseases pose a significant threat to the farm industry, leading to substantial economic losses worldwide. The direct costs of infections include reduced productivity, increased veterinary expenses, and higher mortality rates among livestock. Indirect costs, such as trade restrictions and food safety concerns, further impact the profitability and sustainability of agricultural enterprises (Knight-Jones and Rushton, 2013). The economic burden of diseases like abortive, respiratory, enteric, and vector-borne, highlights the urgent need for effective prevention and control strategies. Understanding the financial consequences of infections in the farm industry is crucial for developing policies that enhance biosecurity measures and mitigate economic risks.

2 Economic impact vs. abortive infections

The farm industry faces numerous challenges, including the threat of abortive infections, which can severely impact livestock health and productivity (Vindas-van der Wielen et al., 2025). Abortive infections, such as those caused by pathogens like *Brucella* spp. and *Leptospira* spp., *Coxiella burnetii*, Bovine herpesvirus type 1 (BHV-1), Bovine diarrhea disease (BVD), etc., can lead to reproductive failures in animals, resulting in economic losses due to decreased milk production, reduced fertility, and increased veterinary costs (Iotti et al., 2019; Hernández-Agudelo et al., 2023; Ferrara et al., 2024c). Moreover, there are additional costs based on the implementation of eradication plans. The economic ramifications of these infections extend beyond individual farms, affecting supply chains and market stability. The potential consequences are disastrous for enzootic diseases, which impact a considerable portion of the herd, because production is connected to reproductive parameters independent of production orientation (meat or milk) (Masia et al., 2022). When these diseases are zoonotic, they necessitate continuous surveillance, even in the absence of explicit strategies (Ferrara et al., 2024d). Parraguez et al. have established the average economic loss per abortion owing to neosporosis (US$ 868 range 605-1,162) if the aborting cow stayed in the herd without further abortions throughout its productive life, and US$ 1,866 (range 782-2,825) if the cow was culled after the abortion. The displayed economic losses for the primary sector from abortions in 2018 amounted to about US$ 12 million, which is linked to the loss of calves, delayed birth, lower productive life (fewer days in milk production/days of life), and premature culling.

Hu et al. recently reported on the need for an efficient molecular assay to detect abortive pathogens in pigs, especially PCV-3. Porcine circoviruses are considered one of the most common pathogens in pig farms, with a significant economic effect that highlights the need to continue developing diagnostic tests. Furthermore, the matrix used might have an impact on diagnostic performance; for example, testicular fluids produced a very high viral load for PCV-3.

3 Economic impact vs respiratory infections

Respiratory infections, particularly those caused by pathogens such as herpesviruses, *Mycoplasma* spp., and various strains of influenza, can have a profound economic impact on this sector of the farm industry (Ferrara et al., 2024b). According to recent studies, respiratory diseases in livestock not only lead to increased veterinary costs but also result in decreased productivity and higher mortality rates, ultimately affecting the profitability of farms. Furthermore, the economic burden extends beyond individual farms, influencing supply chains and market prices. Phyu et al. have evaluated the prevalence of porcine parainfluenza virus 1 (PPIV-1) in pig farms from Thailand and Myanmar. The results showed that 3.65% (38/1042) and 7.57% (34/449) were positive for PPIV-1 in Thailand and Myanmar, respectively. The circulating strain was grouped into PPIV-1 lineage II (American lineage) and was closely related to American and Chinese strains. Barroso-Arévalo et al. have provided further evidence regarding farm size and cold season in the spread of Mycoplasma bovis and Trueperella pyogenes. Moreover, through different approaches, the importance of Mycoplasma bovis in cattle respiratory disease has been further demonstrated (26.7% and 16.3% at the individual level by culture and ELISA, respectively). Because they are extremely widespread and have a significant impact on the livestock economy, vaccination for respiratory infections plays a fundamental role. Recently, Harwell et al. have defined the factors affecting respiratory vaccination in Oklahoma cow-calf operations. Herd size and previous vaccination history have the greatest effect on the likelihood of respiratory vaccine acceptance. Vaccination choices for breeding herds are more complicated, impacted not by herd size but by disease knowledge and risk perception, producer education, and cost challenges. Herd health management education initiatives through veterinarians and extension services can use these findings to better focus respiratory vaccine information, therefore reducing some of these obstacles and enhancing national cattle herd health.

4 Economic impact vs enteric infections

The farm industry faces substantial challenges, particularly from enteric infections, which can adversely affect livestock health and productivity. Enteric infections, caused by pathogens such as *Salmonella* and *E. coli*, not only lead to increased morbidity and mortality in animals but also result in economic losses due to reduced growth rates, lower milk production, and increased veterinary costs (Corti et al., 2022). The economic burden of these infections extends beyond the farm, impacting food safety and public health, which can lead to costly outbreaks and regulatory measures (Ferrara et al., 2023a).

5 Economic impact vs. vector-borne infections

Vector-borne infections, which can severely impact crop yields and livestock health. Diseases such as Schmallenberg virus (SBV), Lumpy Skin Diseases Virus (LSDV), Epizootic Hemorrhagic Diseases Virus (EHDV), and Bluetongue virus (BTV), transmitted by mosquitoes, and Rift Valley Fever Virus (RVFV) and Crimea-Congo Hemorrhagic Fever Virus (CCHFV), spread by ticks, not only threaten public health but also impose substantial economic burdens on farmers and the agricultural economy (Chakrabortyid et al., 2023; Ferrara et al., 2023b; Ferrara et al., 2024a; Moje et al., 2024). The interplay between agricultural productivity and vector-borne diseases highlights the need for integrated management strategies that address both economic sustainability and public health concerns (Chakrabortyid et al., 2023). Some of these infections were considered "tropical" but are now endemic (like BTV and SBV), and others are still considered emerging or re-emerging (Ferrara et al., 2024a). When these diseases reach a virgin population, they can reach morbidity of up to 100%, with catastrophic consequences for animal production. Modethed et al. have evaluated the financial losses due to lumpy skin disease outbreaks in dairy farms of northern Thailand. The average overall financial loss on outbreak farms was US$ 727.38 per farm, which was much greater than the US$ 349.19 per farm recorded in non-LSD epidemic farms. Mortality was the most common cause of financial loss on epidemic farms. Reductions in milk sold as a result of decreased milk production, as well as the requirement to discard milk owing to the withdrawal period of antibiotics used to treat secondary infections on afflicted cattle, all contributed significantly to the financial losses. On farms without LSD outbreaks, the largest costs were associated with immunization and disease prevention, totaling US$ 130.66 and US$ 218.53 per farm, respectively.

6 In summary

The economic impact of infections on the farm industry is significant and multifaceted. Infections can lead to reduced productivity, increased veterinary costs, and potential loss of livestock, all of which can strain farmers' finances. Additionally, outbreaks can disrupt supply chains and affect market prices, leading to broader economic consequences for the agricultural sector (Ferrara et al., 2025). Ultimately, addressing these infections through preventive measures and effective management is crucial for sustaining the health of the farm industry and ensuring food security.

Author contributions

GF: Conceptualization, Writing – review & editing, Visualization, Writing – original draft. CT: Writing – original draft, Visualization, Writing – review & editing, Conceptualization.

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