A scoping review of freight rail noise and vibration impacts on domestic animal health and welfare

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Abstract

Multiple benefits of freight rail activity have been shown for commercial agribusiness, yet the effects of freight rail-related noise and vibration on domestic livestock health and welfare has so far received little research attention. This scoping review examines peer-reviewed and grey literature addressing associations between freight rail noise, vibration and impacts on domestic livestock. Six databases (Scopus, Science Direct, SAGE, TRID, SPARK, ARRB) were searched for relevant literature published from 1980–2019. PRISMA search procedures were used to identify 28 publications relevant to domestic livestock, as well as noise or vibration impact of rail applicable to the freight rail context. Included publications addressed a range of livestock and related species, covering descriptive, review, and experimental findings on noise and vibration impacts. Five publications addressed vibration effects, and 23 addressed noise effects. Effects of noise and vibration on different species indicated that adverse effects vary depending on exposure intensity. The literature indicates that specific thresholds for noise and vibration exposure should be considered when managing freight rail impacts on commercial agribusiness involving avian and mammalian species. Freight rail noise and vibration likely exceeds thresholds for discomfort and harm for avian and mammalian species. Future research should consider case studies that specifically focus on integrating freight rail noise and vibration data to derive species-specific guides for animal health and welfare purposes.

Keywords: animal welfare, livestock, noise, rail, transport infrastructure, vibration

Introduction

The health and welfare of domestic livestock is an ongoing social and ethical consideration internationally. Animal welfare issues represent both a social and economic concern to the rail industry, agribusiness and the public (Hampton et al. 2020). The agribusiness sector already focuses on functional benefits of animal welfare (eg in relation to productivity and therefore profitability) (Sinclair et al. 2019). However, there is also the need to address animal health and welfare factors as an ethical concern (Cornish et al. 2016). In the context of this review, the term ‘livestock’ refers to farmed animals raised for agribusiness purposes, and includes, though is not limited to, fowl, as well as cows (Bos taurus), pigs (Sus scrofa) and other mammals. This intersection of industry, animals, and the public requires interdisciplinary perspectives, considered data sharing and dialogue with industry to advance animal health and welfare (Wiseman & Sanderson 2019), particularly regarding transport noise and vibration stressors (eg Edwards-Callaway & Calvo-Lorenzo 2020).

Considerable research has explored surface transport noise and vibration impacts on wildlife (Kajzer-Bonk et al. 2019), and ecological health (Barrientos et al. 2019), as well as on human physical and mental health (Hanemann & Maddock 2018; KPMG 2018). Comparably, little attention has been devoted to the impacts on the health and welfare of domestic livestock in the context of freight rail transport. This is surprising, given the growing international role and expansion of freight rail in commercial, economic, and social activity (International Energy Agency [IEA] 2019). At the same time, demand for agricultural products is estimated to grow, in Latin America, for example, by 15% from 2019 to 2028, impacting both land and animals (OECD/FAO 2019). Livestock industry turnover, in Australia for instance, increased by 42% from 2013–2014 to 2018–2019, representing $AUD72.5 billion in 2018–2019 (Meat and Livestock Australia 2020). Both forms of expansion are connected, and factor into animal welfare considerations.

Harmful noise exposure can be broadly defined as sounds that are disruptive to hearing; and harmful vibrations occur where mechanical oscillation about an equilibrium point produces disruptive effects. For reference, noise from a freight train can reach from 80 to more than 100 A-weighted decibels (dB) at 15 m (Hemsworth 2008; Asaff et al. 2019;