Animal welfare as preventative medicine

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Abstract

Antimicrobial resistance is a major threat to both human and animal health, but reduction of use raises issues of how standards of animal health and welfare can be maintained without them. This turns the spotlight onto the role of good management and higher standards of animal welfare as drug-free ways of improving immune function and increasing resistance to infection. Research is urgently needed into the relationship between animal welfare, immunity, gut microbiota and disease and we are not yet in a position to claim that improving welfare will improve resistance to disease. ‘Boosting’ the immune system is not straightforward and an interdisciplinary approach is needed.

Keywords: animal health, animal welfare, antimicrobial resistance, immunity, positive emotions, stress

Introduction

Reduced immune function and greater susceptibility to disease are widely recognised as results of poor welfare (Gross & Siegel 1981; Moberg 1985; Broom & Johnson 1993; Cockram & Hughes 2011) and routinely used as welfare ‘indicators’ (Gross & Siegel 1983; Shapiro 2002; Bartomolomucci 2007; Vermette et al. 2017). My aim here is to ask whether there is a case for viewing the relationship the other way around and seeing good welfare not just as a consequence but as a potentially major contributor to improved immune function and disease resistance.

Antimicrobial resistance is now recognised as a major threat to human health across the planet (Hudson et al. 2017; Aidara-Kane et al. 2018) and extensive use of antimicrobials given to farm animals has been a major contributor to this problem (Teuber 2001; McEwen & Fedorka-Cray 2002; Kemper 2008; Silbergeld et al. 2008). Consequently, there are international calls for reduced antibiotic use on farm animals (European Centre for Disease Prevention and Control [ECDC], European Food Safety Authority [EFSA] and European Medicines Agency [EMA] 2017; DEFRA 2017; Ying et al. 2017) but because of concerns about how standards of animal health can be maintained without antimicrobials (Gimeno et al. 2016) their veterinary use for livestock continues to rise across the world (Van Boeckel et al. 2015). A major step forward would be to avoid the use of antimicrobials as growth promoters or routine prophylactics altogether (Aidara-Kane et al. 2018) and to reserve certain types for agricultural use when they are really needed to treat actual infection. An even further step would be to find ways of reducing the risk of infection in the first place. In the context of reducing the need for antimicrobials, several different alternatives have been proposed (McEwen & Fedorka-Cray 2002), including improved management practices, wider use of vaccines, use of probiotics (Bailey & Cryan 2017; Gao et al. 2017) and drugs that boost the ability of the immune system to kill bacteria (eg Christiansen et al. 2017). Of these possibilities, vaccines may often not be available or are expensive, it is often not clear how probiotics and antibiotics differ in the impact they have on immune function or gut flora (Angelakis 2017; Gao et al. 2017), and immune-boosting drugs are largely untested and may have unforeseen consequences. This means that emphasis switches onto the potential for improved management and, in particular, good welfare as a drug-free route to improved immune function. However, although the pressure for reduction in antibiotic use provides an unprecedented stimulus for research in this area, the relationship between welfare, immunity and disease resistance is more complex than often realised (Berghman 2016). Animal welfare as preventative medicine is an attractive hypothesis with worldwide implications for both human and animal health, but that hypothesis now needs to be rigorously tested.

Immunity: the biggest arms race of all time

For at least one billion years, an evolutionary battle has been raging between disease organisms and their hosts. The odds are heavily stacked against us and other animals by virtue of our large size and long generation times. For every