Untreated poultry litter as a source of antibiotic resistance
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The New Zealand poultry industry remains dependent on the use of antibiotics, despite the New Zealand Veterinary Association setting an aspirational goal of being antibiotic-free by 2030. The 2010–2011 MPI report on the sale of antibiotics found that around 25,000kg of zinc bacitracin was used in feed in the poultry industry, which represented around an 8% decline on the five-year average. Bacitracin is the largest antibiotic used by weight in New Zealand. Rates of resistance to bacitracin have been reported as high as 60% in *Enterococcus faecium* and *Enterococcus faecalis* in poultry. *E. faecalis* resistance to bacitracin in Belgium poultry was reported as 16% and 41% for *E. faecium*. Zinc bacitracin was withdrawn from use in EU in 1999 as an antibiotic growth promoter.

The use of antibiotics in food-producing animals has significantly increased animal health by lowering mortality and the incidence of diseases. While antibiotics are thought to have improved the productivity of farming, there is no conclusive evidence from Europe that the banning of agricultural antibiotics has led to a sustained decrease in productivity. Moreover, antibiotic usage in general and the relevance of non-therapeutic antibiotics (growth promoters) in feed need to be re-evaluated, especially because bacterial pathogens of humans and animals have developed and share a variety of antibiotic resistance mechanisms that can easily be spread within microbial communities.

Poultry litter, a mixture of materials including bedding, faeces and feathers, is a valuable soil fertiliser that is rich in nutrients and can improve soil physical, chemical, and biological properties for agricultural crops. Most of the antimicrobial agents such as bacitracin and ionophores for coccidiosis administrated through feed or water are not fully absorbed in the chicken gut and up to 90% of the administered dose of these antimicrobials can be excreted in the faeces.

From one Canadian study, the *Escherichia coli* contaminating poultry litter obtained from commercial farms were all multidrug resistant to at least 7 antibiotics.

Antibiotic resistance genes in the ubiquitous but numerically minor group of *Enterobacteriaceae* intestinal bacteria are the major agents of gene transfer which include the conjugative plasmids where the greatest variety of resistance integrons occur. Integrons are effectively transposable cassettes of resistance DNA and have been found in abundance in Gram-positive bacteria that comprise >85% of the poultry litter microbiome. It is important that poultry litter is pre-treated before release as a fertiliser. Any pre-treatment will need to ensure that it has negated the presence of any residual antibiotics and integrons. Moreover, efforts to replace antibiotics are paramount. Public pressure and concerns about food and environmental safety (antibiotic residues, antibiotic-resistant pathogens) have driven researchers to actively look for alternatives to antibiotics. Some of the alternatives include pre-and probiotics, organic acids and essential oils, particularly *oreganum vulgare* oil in concentrations of 0.01% of drinking water.
Competing interests:
Nil.

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