**Modelling the effects of livestock antibiotic usage on human foodborne disease**

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**LAY SUMMARY**

Antibiotics are commonly used in food animals to both prevent and treat disease. However, the (over) use of antibiotics in livestock could drive the spread and evolution of bacterial pathogens that are no longer treatable by antibiotics. As these bacterial pathogens may potentially spread from livestock to human populations, this may have a direct impact on human health. To slow the spread of so-called antibiotic-resistant bacteria policies have been implemented to restrict the usage of antibiotics in livestock. However, the indirect consequences of these policies are poorly understood. In particular, the restriction of antibiotics, which are commonly used to prevent disease in livestock, may have negative consequences for both livestock and human health. One such negative consequence includes the potential for an increase in the in the carriage of foodborne pathogens in livestock and subsequent increase in foodborne disease in humans.

In this study, we use a mathematical model, to explore the effects of completely removing livestock antibiotic usage on human foodborne disease. To ensure that the model was realistic and grounded in reality, we used real-life data on antibiotic usage and antibiotic resistance from agricultural settings in the European Union. We identified that restricting livestock antibiotic usage would decrease antibiotic resistance in both livestock and humans. However, we also identified negative side-effects of withdrawal of livestock antibiotics. Specifically, an increase in the level of foodborne disease in humans. However, these increases were found to be mild and were controllable by introducing separate measures to ensure that food products are kept free of pathogens throughout food processing steps.

This work explores one of the potential scenarios following a restriction of livestock antibiotic usage. By ensuring good hygiene practices during food processing and maintaining good livestock health, negative human health consequences after livestock antibiotic restriction can possibly be avoided.