Estimating the treatment failure in ViParc’s chicken farms, Mekong delta, Vietnam

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Background

Antimicrobial resistance (AMR) in animal production has received a great deal of attention in recent years, especially in relation to its negative consequences on human health. In contrast, the potential impact that the choice of ineffective antimicrobials on the treatment of animal diseases has received comparatively little attention. This phenomenon (treatment failure) is likely to result from the use of antimicrobials on the wrong target organism (i.e. a virus/parasite, or an intrinsically resistant bacterial organism), or because antimicrobials having lost their efficacy because of acquired AMR. In most developing countries, animal disease diagnostics are not normally available to farmers, and the choice of antimicrobials to treat animal diseases is not normally based on rational criteria but rather depends on their availability on the market and their costs. We aimed to estimate the fraction of untreated disease in 72 poultry flocks in the Mekong Delta of Vietnam as a result of the inadequate use of antimicrobials.

Materials and methods

Longitudinal weekly data on antimicrobial usage and disease was collected from meat chicken farms restocked with >100 chickens that were visited longitudinally over the production cycle, as part of the “baseline” phase of the ViParc project (www.viparc.org). We used naive Bayes to infer the most likely agents involved in disease episodes in chicken flocks given the observed sets of symptoms, and the prior knowledge of the prevalence of diseases in the area based on expert opinion. Data on AMR of poultry bacterial pathogens were compiled from a recently published review. The relative burden of each of the most common poultry infectious diseases has received comparatively little attention. This phenomenon (treatment failure) is likely to result from the use of antimicrobials on the wrong target organism (i.e. a virus/parasite, or an intrinsically resistant bacterial organism), or because antimicrobials having lost their efficacy because of acquired AMR. In most developing countries, animal disease diagnostics are not normally available to farmers, and the choice of antimicrobials to treat animal diseases is not normally based on rational criteria but rather depends on their availability on the market and their costs. We aimed to estimate the fraction of untreated disease in 72 poultry flocks in the Mekong Delta of Vietnam as a result of the inadequate use of antimicrobials.

Results

Figure 1 shows the surveillance data (disease episodes and antibiotics usage) from the 72 farms over 1 cycle of production, the duration of which is typically between 13 and 26 weeks. The prevalence of disease is very high at the start of the cycle (60%) and decreases with time. Antibiotics usage is extremely high during the very first week of the cycle and does not seem to be associated in any way with disease episodes. Etiologic agents responsible of disease episodes are estimated by naive Bayes and shown on figure 2. 28% of them are viruses. 30 different antibiotics from 9 classes are reported from the surveillance of farms. Colistin and tetracyclines are the most used drug and class respectively (23% and 26%). Combining (i) the estimated etiologic agents (figure 2), (ii) the antibiotics usage (figure 3) and (iii) the levels of resistance of the different etiologic agents against the different drugs (from the literature, not shown), we can estimate the percentage of treatment failure (figure 4). There is treatment failure in about 60% of the cases overall, with half of these treatment failures due to diseases caused by viruses.

Conclusion and perspectives

This study shows an estimated 60% of treatment failure in chicken farms in the Mekong delta. Miss-diagnosis of disease episodes thus potential represents an important economic loss for these farms. Further investigation will look at mortality data and cost of antibiotics in order to quantify this economic loss. We will also look at the relationship between antibiotics usage and disease episodes in order to determine whether antibiotics usage follows some rationale or is used at random.