Background

- Although antibiotic use in livestock farming is described as a major contributor to the spread of antimicrobial resistance (AMR) genes in humans, studies lack quantitative data on how this contributes to the overall problem of antibiotic resistance.
- We investigated clinically relevant AMR genes before and after the introduction of chicken farming among women in rural Uganda.

Methods

- We tested a subset of women from a randomized controlled trial of small-scale hybrid chicken farming in rural Uganda (ClinicalTrials.gov NCT02619227).
- During brooding, chickens received tetracycline.
- Stool samples before and after chicken introduction were obtained from six women assigned to the control group, five women randomized to the intervention group, and also from hybrid chickens.
- Microbial DNA was extracted from chicken and human stool and screened for 87 AMR genes using validated qPCR arrays (Qiagen).
- Detection of AMR genes was positive if \( \Delta CT (\text{cycle threshold}) > 6 \), negative if \( \Delta CT < 3 \) and inconclusive if \( \Delta CT \geq 3 \) and \( \Delta CT \leq 6 \), per assay instructions.

Results

- At baseline, 18 AMR genes were detected in human stool.
- Chicken stool harbored 24 AMR genes.

Identification of AMR genes in human stool and chickens.

Figure 1. Significant fold change increase in AMR genes observed in women after one year of exposure to chickens. Only intervention participants are shown; each is represented by a unique color. Three individuals showed an increase in mefA genes after one year of exposure to chickens.

Figure 2. Heat map depicting the AMR genes present in chickens and in humans randomized to the control and intervention groups.

Conclusions

- All human participants carried tetracycline AMR genes at baseline, and chickens were directly exposed to only tetracycline in this study. However, chickens were found to carry a range of clinically significant AMR genes to other classes of antibiotics, including Vancomycin.
- Women exposed to one year of small-scale chicken farming acquired more AMR genes compared with unexposed participants.
- While our study did not assess for mechanisms of AMR gene acquisition in humans, one possible explanation for our findings is transfer of AMR genes from chickens to humans through direct contact.

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