Quantification of human exposure to antimicrobial resistant *E. coli* using a farm-to-fork model in broiler chicken production.

Subhasish Basak[1], Nunzio Sarnino[2], Roswitha Merle[2], Lucie Collineau[1]
1. ANSES – Laboratoire de Lyon, France 2. Freie Universität Berlin, Germany

CONTEXT

PROJECT ENVIRE

CONSORTIUM AND FUNDING

- Project duration: 2022-2025
- Germany, France, Lithuania, Poland, Tunisia
- Funded by the European Transnational Programme - JPIAMR-ACTION

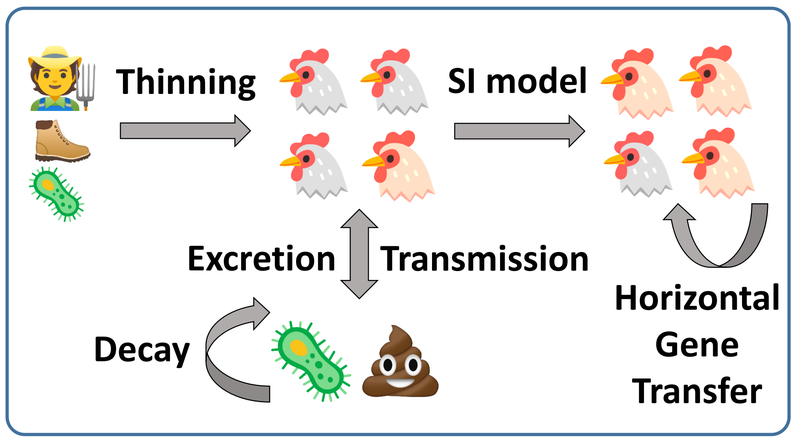
OBJECTIVES

- Reduce antimicrobial-resistant (AMR) bacteria spread from broiler chickens
- Investigate the potential of various on-farm intervention measures
- Reduce transmission and human exposure to ESBL *E. coli* from broiler chicken

WORKFLOW – WP 3

- Quantitative Risk Assessment with pathways:
  - FOOD-BORNE ✅
  - ENVIRONMENTAL
  - OCCUPATIONAL
- Incorporate on-farm intervention measures

MATERIALS & METHODS FOOD-BORNE FARM-TO-FORK PATHWAY ✅



FARM MODULE

DYNAMICS of ESBL *E. coli* in farm environment

Transmisson model Dame-Korevaar et al. (2020)
Horizontal Gene Transfer Fisher at al. (2019)
Susceptible-Infected model Becker et al. (2022)

FOOD-BORNE MODULE

DYNAMICS of ESBL *E. coli* in processing

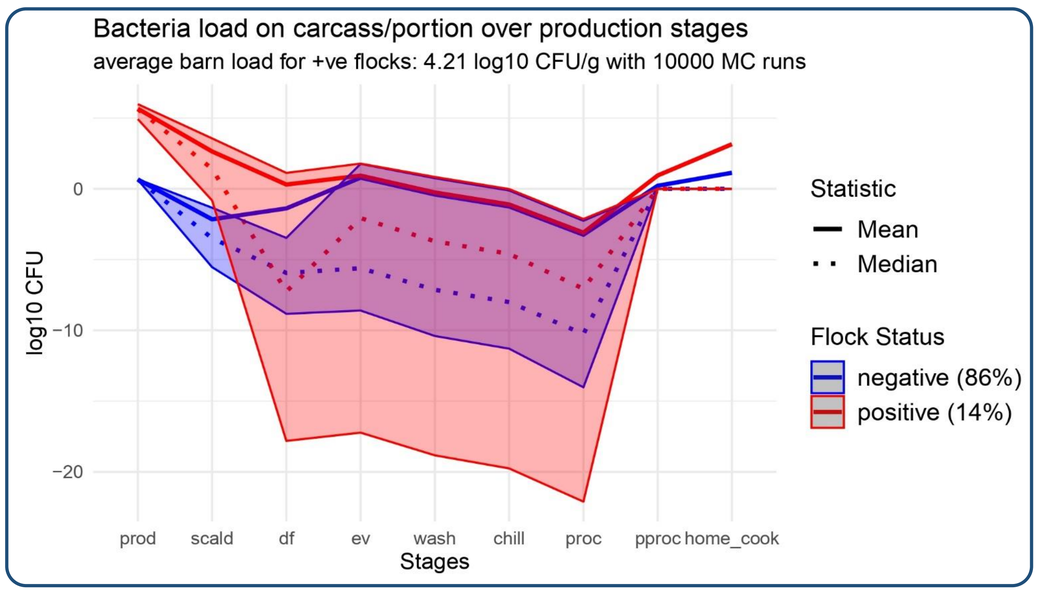
Collineau et al. (2020) in ESBL *E. coli* setup
Updated with EU poultry farming practices
Simulates the processing of 1 chicken flock

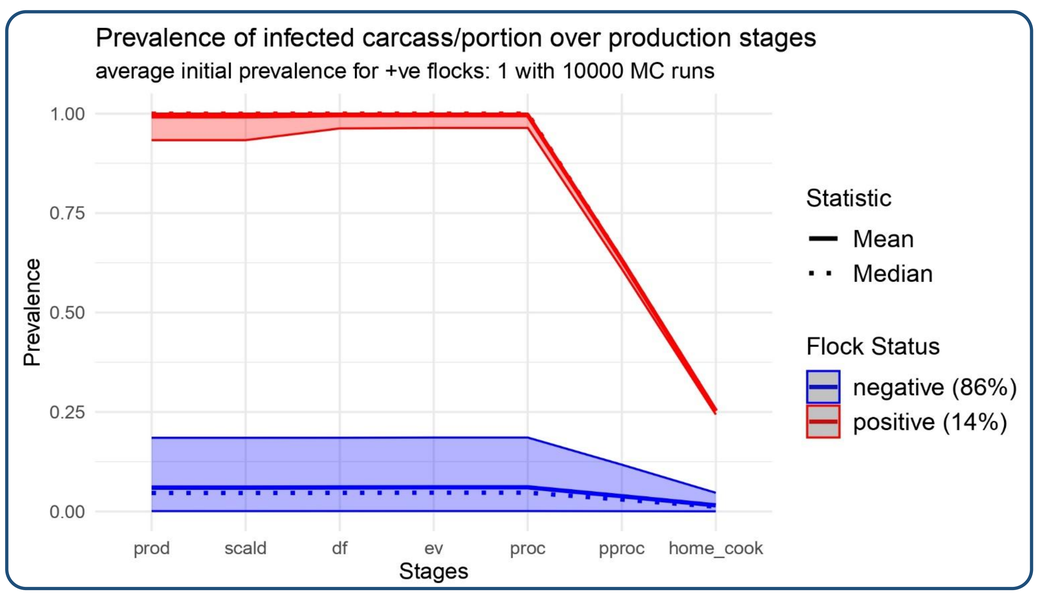
Flock Risk from 1 chicken portion consumed

- Prob. of ESBL *E. coli* carriage by consumer
- Conditional on Pprev, Cload after cooking

PDR : Dose-Response Furusawa et al. (2024)

RESULTS & PERSPECTIVES



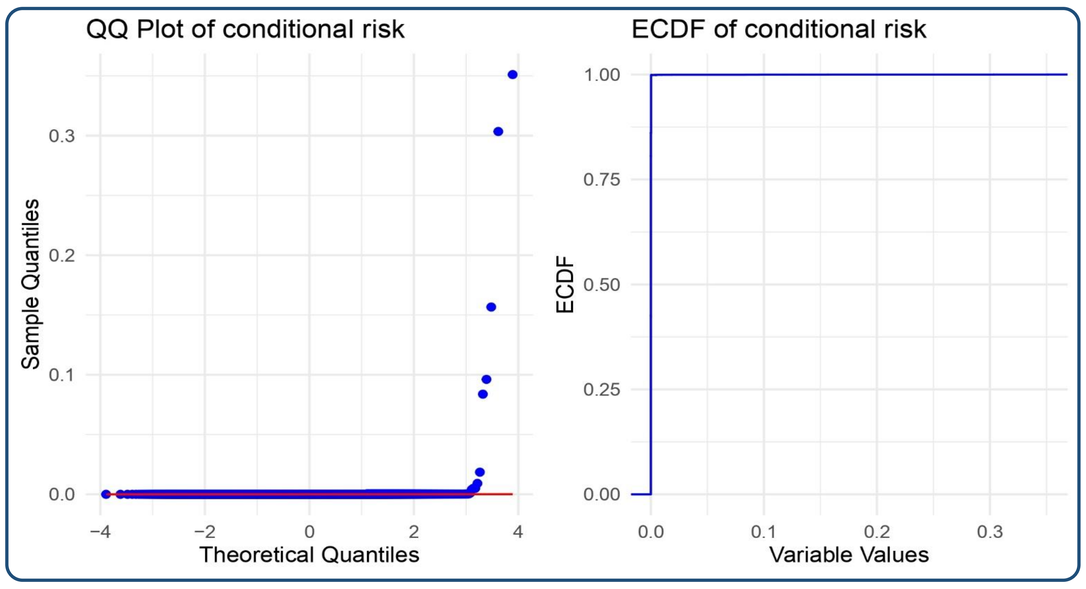


Average risk of ESBL *E. coli* **carriage by consumer from 1 chicken portion consumed**

$$R_\theta^{\text{portion}} = \int P_{\text{DR}}(c_{\text{load}}) \cdot p_{\text{prev}} \cdot p(p_{\text{prev}}, c_{\text{load}}) \cdot \text{dp}_{\text{prev}}\,\text{dc}_{\text{load}}$$

To estimate: 10k independent flocks simulated with Monte Carlo runs

Average risk in a baseline scenario defined by input parameters Θ : 1.4e-5



HEAVY TAILED Distribution

Quantile metrics ?

Difficult to interpret ?

Food-borne QRA module perspectives

Validation: Simulation results are comparable with Faverjon et al. (2022)

Calibration: Input parameters Θ can be adapted to different EU country protocols

Work in Progress: Integration of ENVIRE experimental data on interventions

subhasish.basak@anses.fr
www.envire-project.de