# Modeling Human Exposure to Fluoroquinolone-Resistant *Campylobacter*

Tschritter D[1], Carson C[2], Murphy CP[2], Smith B[3], Otten A[3], Reid-Smith RJ[2], Li Q[1], Ashbolt NJ[1], Otto SJG[1]

1. School of Public Health, University of Alberta; 2. Canadian Integrated Program for Antimicrobial Resistance Surveillance, Public Health Agency of Canada; 3. National Microbiology Laboratory, Public Health Agency of Canada
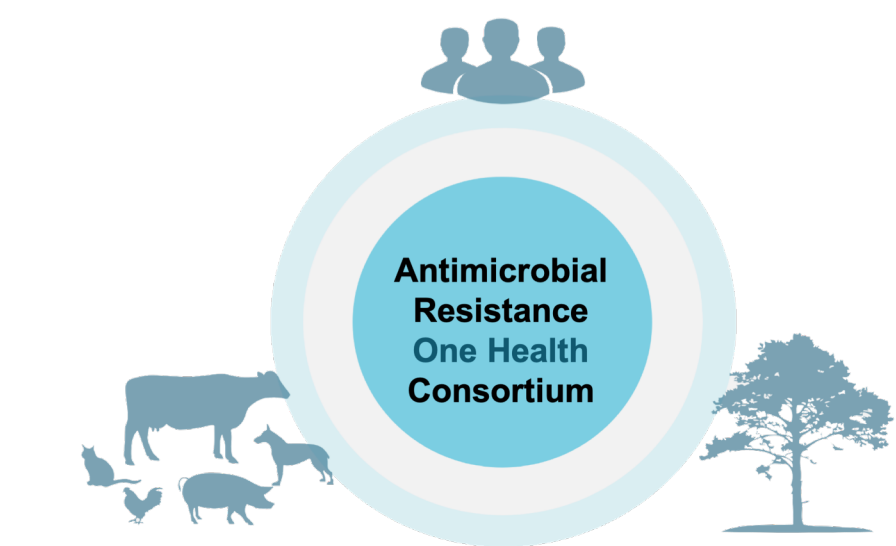
Background

- *Campylobacter* is an extremely prevalent foodborne pathogen in Canada[1]

- The World Health Organization identified antimicrobial resistance (AMR) as a top threats to human health in 2014[2]

- Infection with fluoroquinolone-resistant *Campylobacter* leads to exacerbated symptomology and increased risk of death[1]

- It is critical that we quantify and characterize the transmission of resistant *Campylobacter* to humans through Canadian chicken production

Objective

Assess the Canadian public's exposure to fluoroquinolone-resistant *Campylobacter* from broiler chicken meat using a farm-to-fork model

Methods

- *Campylobacter* was sampled at key nodes along the production pathway

  - Tested for susceptibility to fluoroquinolones

- These data will be used as probability distribution inputs to build stochastic risk models

  - Monte Carlo simulation with Latin Hypercube sampling (LHS)

- Track prevalence of fluoroquinolone-resistant *Campylobacter* contamination and corresponding colony-forming units (CFUs) throughout farm-to-fork food chain

- Can estimate the probability of purchasing raw chicken meat contaminated with fluoroquinolone-resistant *Campylobacter*

Predictor probabilities →
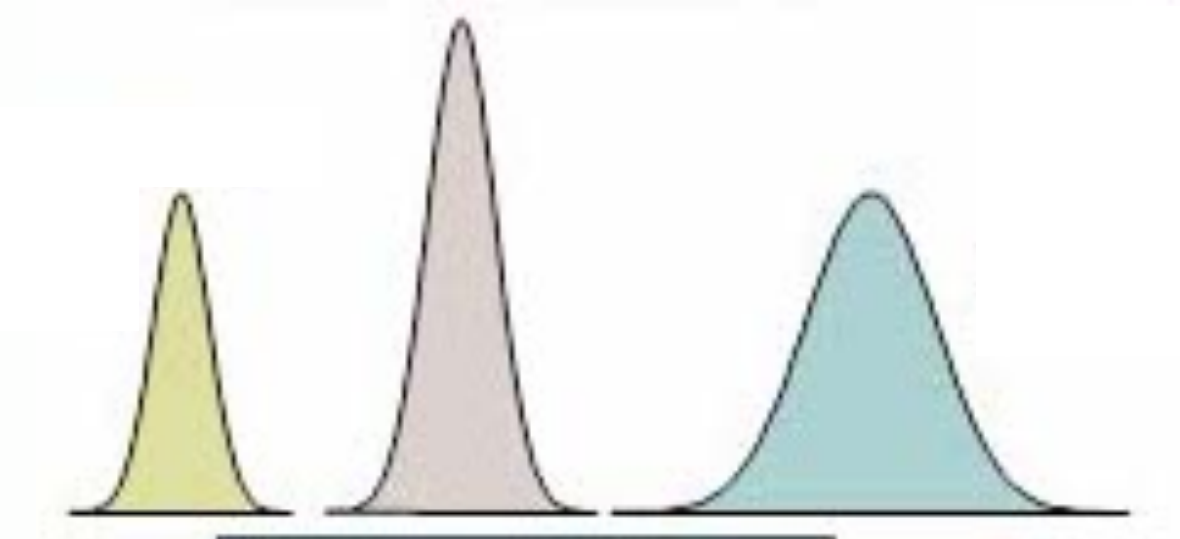
Simulations →

Outcome probability →

Figure 1: The Monte Carlo simulation process[7]

Expected Results & Implications

- Provide comprehensive description of the exposure to Canadians of fluoroquinolone-resistant *Campylobacter*

- Key advantage of exposure assessments is identifying data gaps in the surveillance systems and the scientific literature

- Provide key component for future risk characterization

References

1. Helms M, Simonsen J, Olsen KEP, Mølbak K. Adverse health events associated with antimicrobial drug resistance in *Campylobacter* species: A registry-based cohort study. *J Infect Dis.* 2005;191:1050-1055.
2. World Health Organization. Antimicrobial resistance: Global report on surveillance. https://apps.who.int/iris/bitstream/handle/10665/112642/97892 41564748_eng.pdf?sequence=1. Published April 2014. Accessed October 16, 2019.
3. Pinclipart. Barn clipart. https://www.pinclipart.com/downpngs/xxxmR_free-barn-clipart-free-barn-clipart-farm-barn/. Accessed October 16, 2019.
4. Pngtube. Whole chicken cut. https://www.pngtube.com/viewm/ihbxoTJ_fryer-chicken-whole-or-cut-up-10-lbs/. Accessed October 16, 2019.
5. Clipartmag. Grocery bag clipart. http://clipartmag.com/groceries-clipart#groceries-clipart-7.jpg. Accessed October 16, 2019.
6. 123RF. Chicken breast. https://www.123rf.com/photo_24935427_chicken-breast.html. Accessed October 16, 2019.
7. US Department of Transportation. Simplified techniques for evaluation and interpretation of pavement deflections for network-level analysis. https://www.fhwa.dot.gov/publications/research/infrastructure/pavements/ltpp/12023/005.cfm. Published December 2012. Access October 16, 2019.

Farm-to-Fork Model

CFUs → # CFUs → # CFUs →

Farm [3]   Abattoir [4]   Retail [5]   Home [6]