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Risk assessment model of Campylobacter in Germany via broiler chicken meat: From farm to economic impact of human infection

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Introduction

Campylobacteriosis is an important human health issue in developed countries where contaminated broiler chicken meat is assumed to be the major source of human infection. This disease is responsible for economic and life comfort losses in infected humans. Current control strategies are mainly based on biosecurity measures at the farm level and HACCP measures at slaughterhouses. These measures are not sufficient to effectively control the disease in humans.

Objectives

- Quantitative risk assessment (QRA) of campylobacter via broiler meat in Germany
- Assessing the effectiveness of non biosecurity control measures to decrease campylobacter infection in humans via broiler meat using the developed QRA model

Chosen model: Modular structure

Farm model

Previous models

- VLA model: mechanistic model
- DVFA model: non mechanistic model of prevalence and bacterial concentration
- CARMA project model: between / within flocks transmission
- FAO/WHO model: same model as VLA

Chosen approach

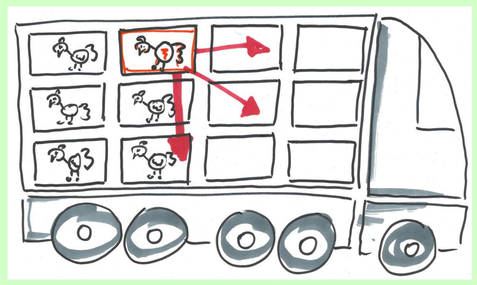
- Primary disease spread then SI mechanistic model (Fig.1)
- Calibration based on experimental study (in progress)

Fig.1: model of Campylobacter transmission dynamics within flock

Transport model

Previous models

- FAO/WHO model: vertical and horizontal cross contamination between crates



Chosen approach

- Adaptation of the FAO/WHO model
- Field study in progress

Processing model

Previous models

- FAO/WHO model: proportion of remaining bacteria at each processing step
- DVFA model: a number of bacteria added/ removed at each step
- CARMA project model : mechanistic representation of the bacteria exchange at each step

Chosen approach

- Adaptation of the CARMA project model (Fig.2)
- Calibration based on field study

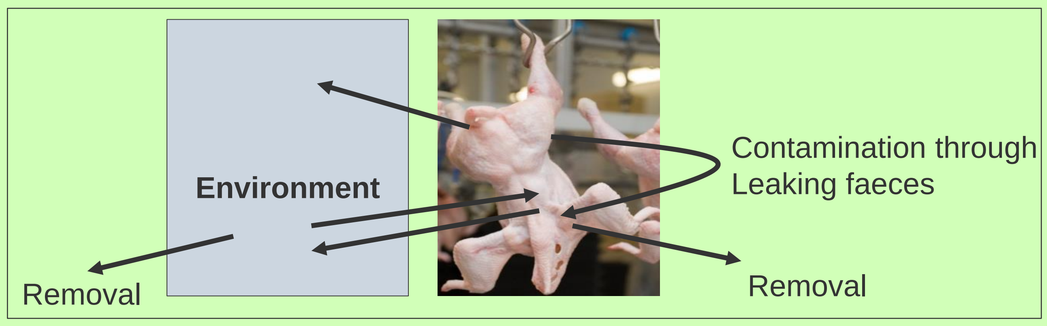


Fig.2: Campylobacter dynamics through slaughter processing steps

Transformation + storage model

Previous models

- CARMA project model : cutting of the breast cap into breast filets and bacteria inactivation during storage

Chosen approach

- Bacteria concentration in entire carcasses or cut pieces (legs + filet)
- Bacteria survival among storage

At home preparation model

Previous models

- CARMA: cross contamination of salad
- BfR/DVN and FAO/WHO: Number of bacteria inside and on surface of meat + in cross contaminated accompanying food

Chosen approach

BfR/DVN:

- Mechanistic representation of the food cross contamination
- Based on field study in Germany

Human infection + Economic impact model

Previous models

- FAO/WHO
- CARMA
- BfR/DVN
- DVFA model

Probability of infection when eating bacteria: Poisson distribution based on an experimental study (Black & al. 1988)

Chosen approach

- BfR/DVN: accounts for low dose response
- Estimation of the disease impact: DALY

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Conclusion

- Reviewing and comparing published QRA models for campylobacter enhanced by the existence of an online data bases: ICRA
- Development of the first from farm to consumer QRA model designed and calibrated to represent the German context: adapted from published models
- Individual based model: easier implementation of individual targeted control measures

ONE HEALTH APPROACH CAMPYLOBACTER
Preventing and Combating Infections

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