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FACULTEIT BIO-INGENIEURSWETENSCHAPPEN

Detailed analysis of the 2008 Belgian *Campylobacter* baseline data

Ihab Habib, Dirk Berkvens, Lieven De Zutter, Katelijne Dierick, Xavier Van Huffel, Niko Speybroeck, Annemie Geeraerd, Mieke Uyttendaele

FWO-Vlaanderen, project G.024.09N

Aim:

- Using the Belgian data collected in the frame of the EU baseline study in 2008:
  - What are the risk-profiles and factors associated with *Campylobacter* contamination in broiler carcasses?
- Using the results of hygiene and infrastructure inspections performed by the FAVV in 2008:
  - Is there a correlation between slaughterhouse hygiene and *Campylobacter* contamination in broiler carcasses?

Methodology

2008 EU baseline data:

- Microbiological data
- 9 broiler slaughterhouses
- 389 post-chill carcasses
- Enumeration & Detection
  - Direct plating+ Enrichment
- Data handling issues:
  - Mistakes in reporting (cleaning)
  - Unreported variables !!
    - E.g. Thinning
  - Handling <limit of quantification

2008 FAVV-check data:

- Official hygiene audit
- Harmonized checklist: "DPA-2286"/ 138 items
- Observed/scored/weighted
- 8 broiler slaughterhouses
- Data handling issues:
  - Cleaning of data!
  - Non-conformity scores:
    (Number of nonconformities/ Number of audited items) x 100

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Results:

Prevalence:

- *Campy* positive: **51**%

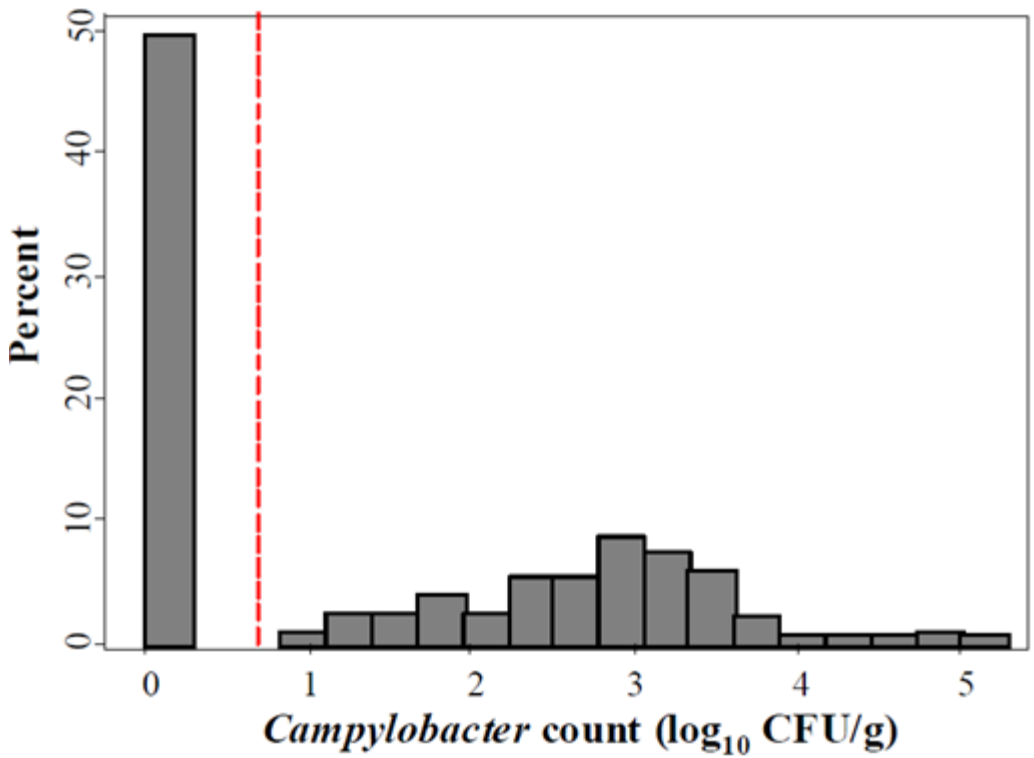
Counts summary:

- Mean: **1.89** log10 CFU/g, StDev: **1.78** log10 CFU/g

Counts distribution:

- <10 CFU/g in 49.6% of the carcasses;
- **>1000** CFU/g in **20.6%** of the carcasses.

Overall *Campylobacter* contamination in broiler carcasses:



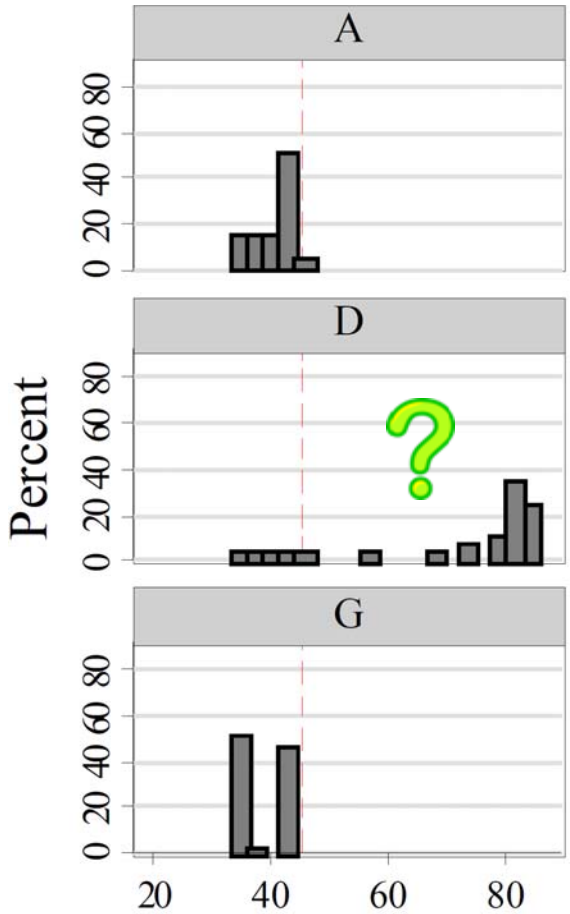
Results:

Determinants of *Campylobacter* contamination risk-profile;

(1) The slaughterhouse

Slaughterhouse	No. of samples	Total no. (%) positive [b]	Frequency of count bands/ no. (%)		
			<1 $\log_{10}$ CFU/g [c]	≥ 1 & < 3 $\log_{10}$ CFU/g	≥ 3 $\log_{10}$ CFU/g
A	20	13 (65.0)	7 (35.0)	6 (30.0)	7 (35.0)
B	66	39 (59.1)	28 (42.3)	27 (41.0)	11 (16.7)
C	50	28 (56.0)	23 (46.0)	11 (52.0)	16 (32.0)
D	30	23 (76.6)	7 (23.3)	14 (46.7)	9 (30.0)
E	38	17 (44.7)	22 (57.9)	12 (31.6)	4 (10.5)
F	47	29 (61.7)	18 (38.3)	18 (38.3)	11 (23.4)
G	50	21 (42.0)	31 (62.0)	12 (24.0)	7 (14.0)
H	64	23 (35.9)	41 (64.1)	11 (17.2)	12 (18.7)
I	24	9 (37.5)	16 (66.7)	5 (20.9)	3 (12.4)

Slaughterhouse-D ???

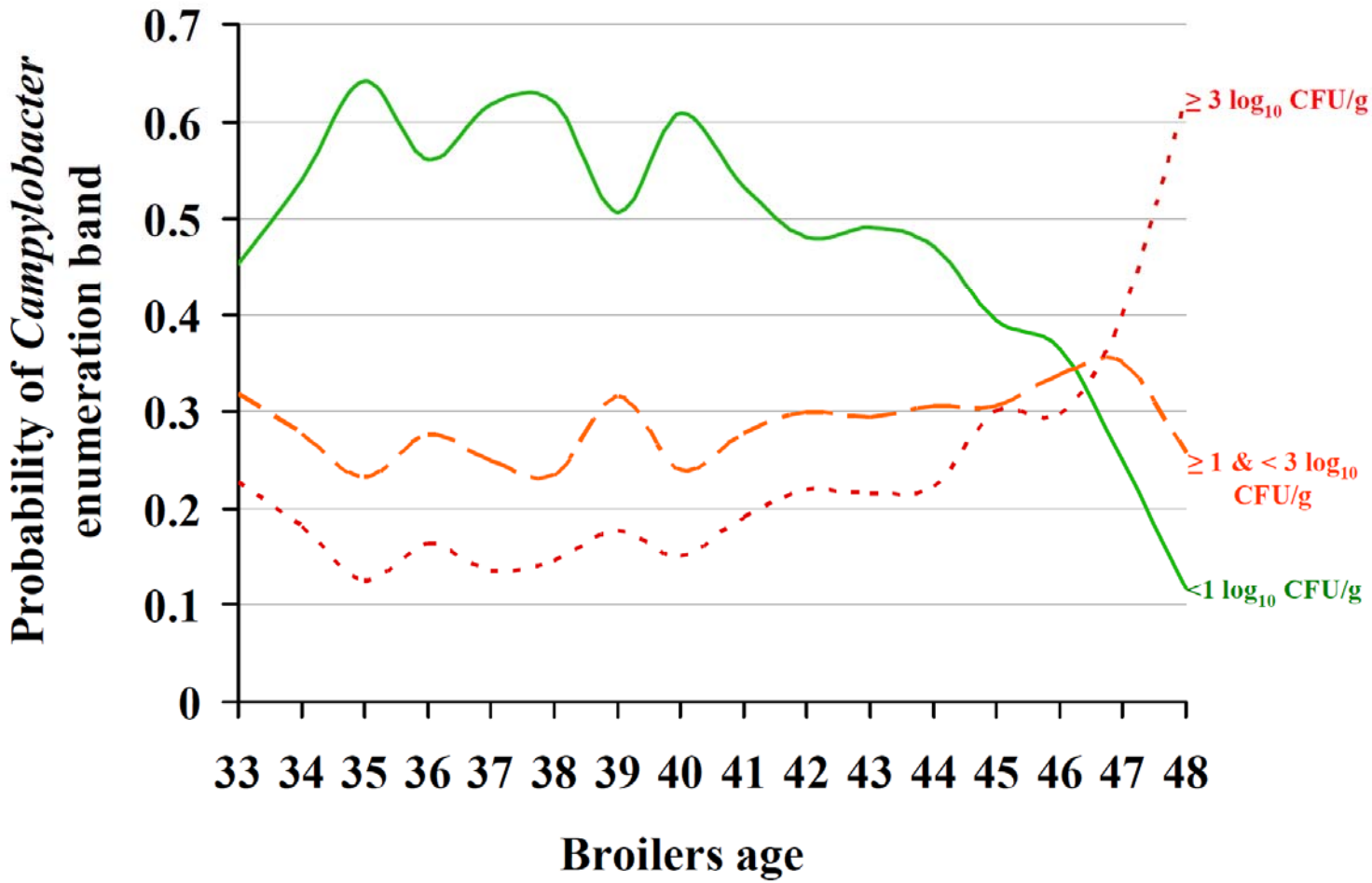

A
D
G
Percent
0 20 40 60 80
20 40 60 80
Slaughter age


Organic/ Biological

Results:

Determinants of *Campylobacter* contamination risk-profile;

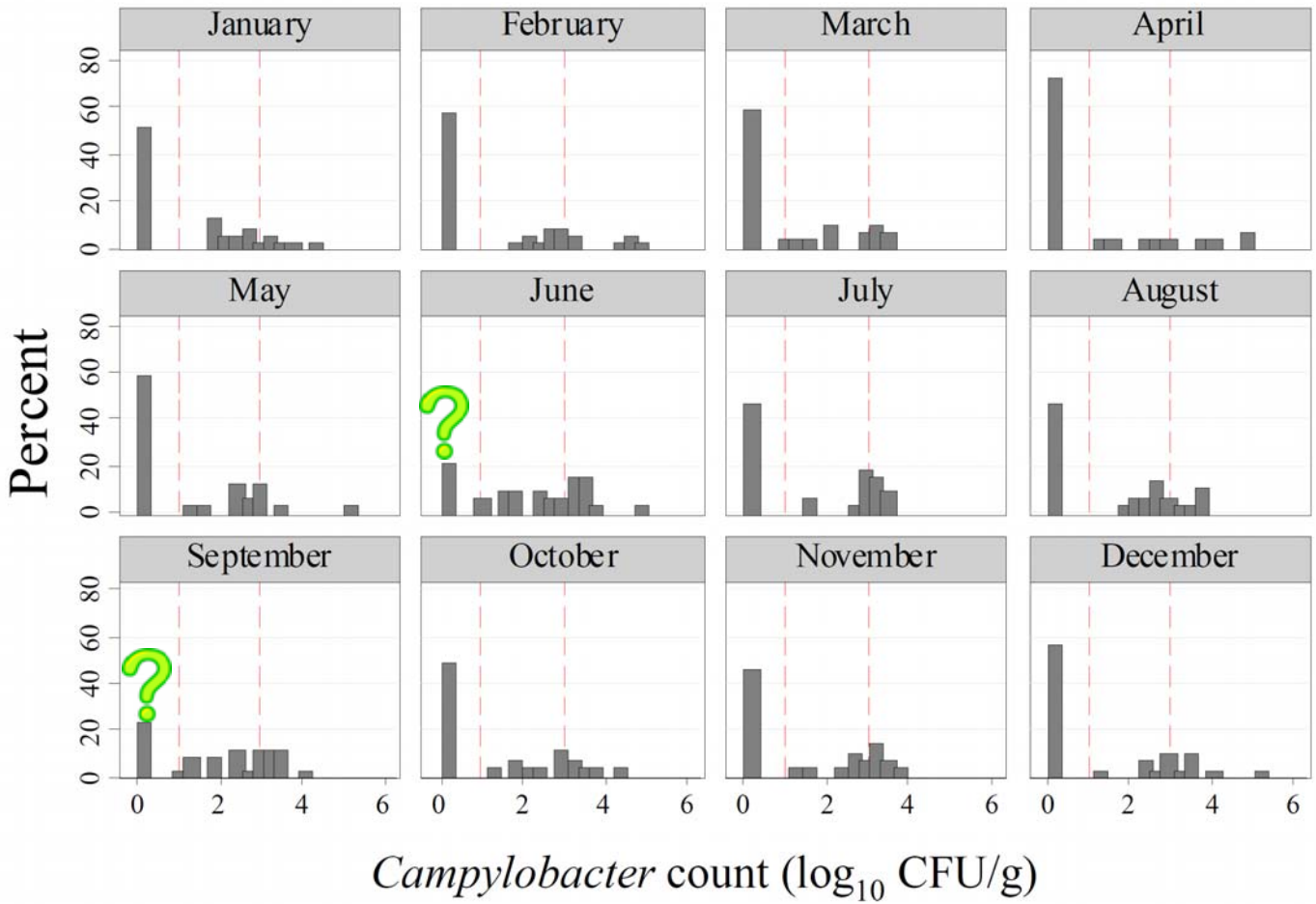
(2) Birds age:



Results:

Determinants of *Campylobacter* contamination risk-profile;

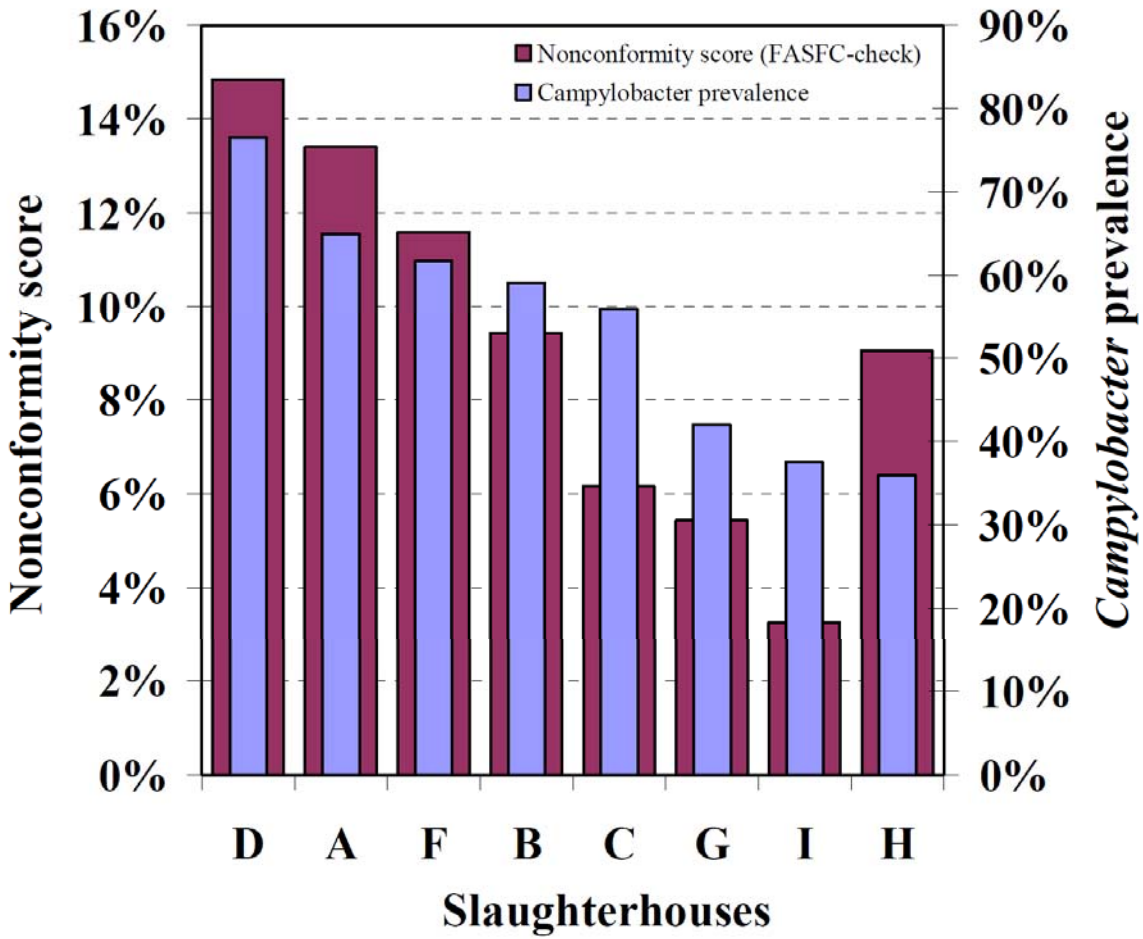
(3) Month of sampling (season):



Results:

Determinants of *Campylobacter* contamination risk-profile;

(3) Slaughterhouse hygiene:



Conclusions :

- This study provides input data for *Campylobacter* risk assessment model in broiler carcasses
  - Prevalence, counts (+ distribution)
- Risk factors:
  - Slaughterhouse (variability), birds age (organic), season (M6&9);
  - Increased prevalence=Increased counts

Conclusions :

- Slaughterhouse hygiene and *Campylobacter*:
  - From theory as indicated by EFSA…

"The risks for contamination of carcasses with *Campylobacter and for higher Campylobacter counts on carcasses varied significantly between countries and between slaughterhouses within countries*, even when other associated factors, such as the prevalence *Campylobacter-colonised batches, were accounted for. These findings indicate that certain slaughterhouses are more capable than others in preventing Campylobacter contamination and in controlling the contamination and/or the Campylobacter counts on the carcasses. This implies that slaughterhouse processing offers an opportunity for Campylobacter risk mitigation*" …..to proof

BUT HOW/WHAT CAMPYVAR Project FPS Public Health !

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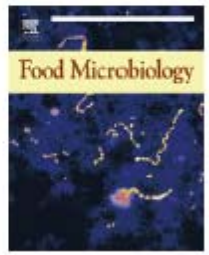

Campylobacter contamination in broiler carcasses and correlation with slaughterhouses operational hygiene inspection

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Escherichia coli as a surrogate indicator for postchill broiler carcasses with high *Campylobacter* counts

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KATHOLIEKE UNIVERSITEIT LEUVEN

FWO-Vlaanderen, project G.024.09N

Motive:

- **The debate for a process hygiene target for *Campylobacter* contamination in broiler carcasses:**
  - To be based on counts (numbers) target
  - Not only presence-absence (Yes/No)
  - *Campylobacter*-QMRA:
    - Correlation between high numbers of *Campylobacter* on chicken meat and the probability of human infection
    - Reducing numbers (load) on carcasses is more reliable risk management option compared to reducing prevalence in broilers flocks
    - The tail of the distribution (highly contaminated carcasses) determines the risk of illness



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efsa
European Food Safety Authority

Summary: EFSA Journal 2011; 9(4):2105

SCIENTIFIC OPINION

Scientific Opinion on *Campylobacter* in broiler meat production: control options and performance objectives and/or targets at different stages of the food chain[1]

EFSA Panel on Biological Hazards (BIOHAZ)[2, 3]

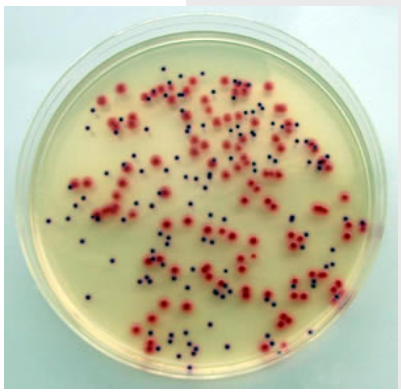
European Food Safety Authority (EFSA), Parma, Italy

The public health benefits of setting microbiological criteria were evaluated using data from the 2008 EU baseline survey. These estimates are average values for the whole EU; the impact could be very different between MSs. Theoretically, a public health risk reduction > 50% or > 90% at the EU level could be achieved if all batches that are sold as fresh meat would comply with microbiological criteria with a critical limit of 1000 or 500 CFU/gram of neck and breast skin, respectively. Correspondingly, a total of 15% and 45%, of all batches tested in the EU baseline survey of 2008, would not comply with these criteria.

- **But… some obstacles facing having such numerical target for *Campylobacter* :**

  - Heterogeneous distribution of *Campylobacter*
  - Expensive testing (how many-and-how much!!)
    - No legislation (criteria)/ Not yet agreed target
    - Additional testing for slaughterhouses
  - Method of testing
    - *Camylobacter* enumeration is not routine analysis yet
      - How confident???
  - So…

- **Surrogating *Campylobacter* with other bacterial indicators that are already used to evaluate the hygiene level in the slaughterline operations:**
  - ***E. coli***
    - Originate from the intestinal tract of slaughtered birds
    - Mesophilic
    - Testing for *E. coli* (vs. *Campylobacter*):
      - Easy, cheap, and quick
      - More samples testing than could be made when comparable resources are allocated for testing *Campylobacter*



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Aims:

►Could a quantitative relationship be demonstrated between *E. coli* and *Campylobacter* on postchill broiler carcasses?

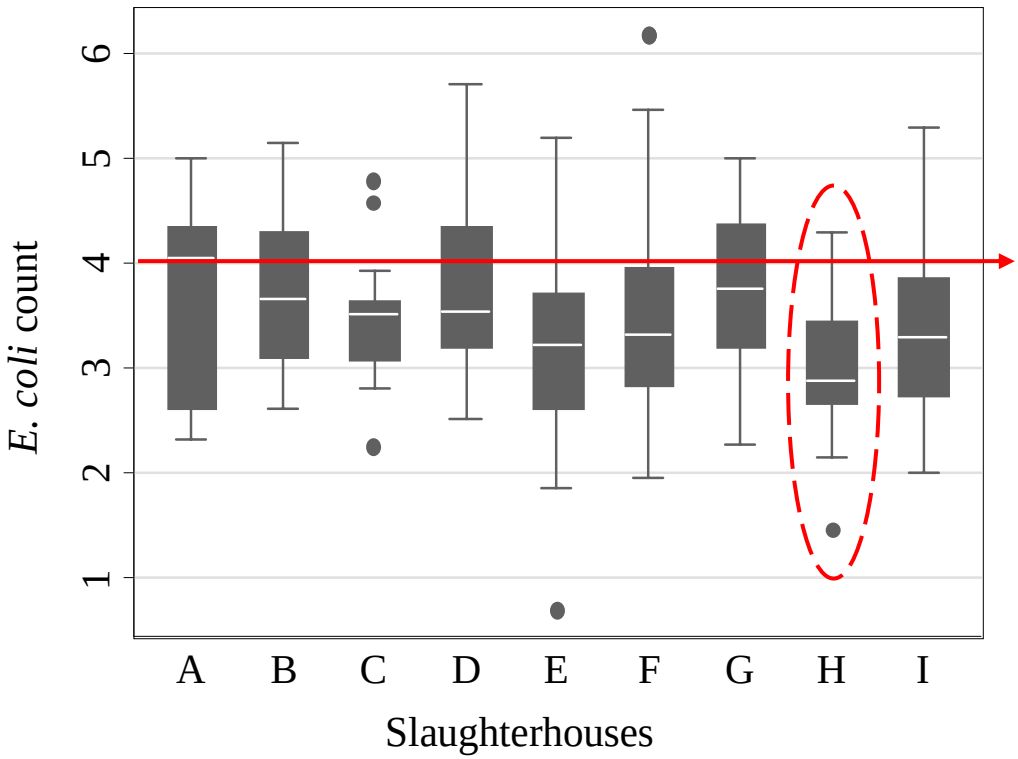
►What is the impact of setting a hypothetical target limit based on *E. coli* count on decreasing the proportion of broiler carcasses in the most contaminated group with *Campylobacter*?

(hereafter defined as ≥ 1,000 CFU/g)

Methodology:

- 231 broiler carcasses (post-chill)
  - Tested in 2009
  - Sampled from 9 Belgian slaughterhouses:
    All use soft scalding, air chilling, and HACCP certified
  - *Campylobacter* and *E. coli* were counted in parallel in each carcass (neck skin)
    - *Campylobacter* : ISO 10276: 2006
    - *E. coli* : RAPID'E.coli

Results



E. coli in broiler carcasses:

- Mean: 3.5 log10 CFU/g
- StDev: 0.8 log10 CFU/g

Slaughterhouses variability:

- *E. coli* counts in carcasses from Abattoir-H are significantly lower than other abattoirs.
- In 5 abattoirs: in 75% of the carcasses *E. coli* count was below 4 log

Results

"Overall correlation" between *E. coli* and *Campylobacter* counts

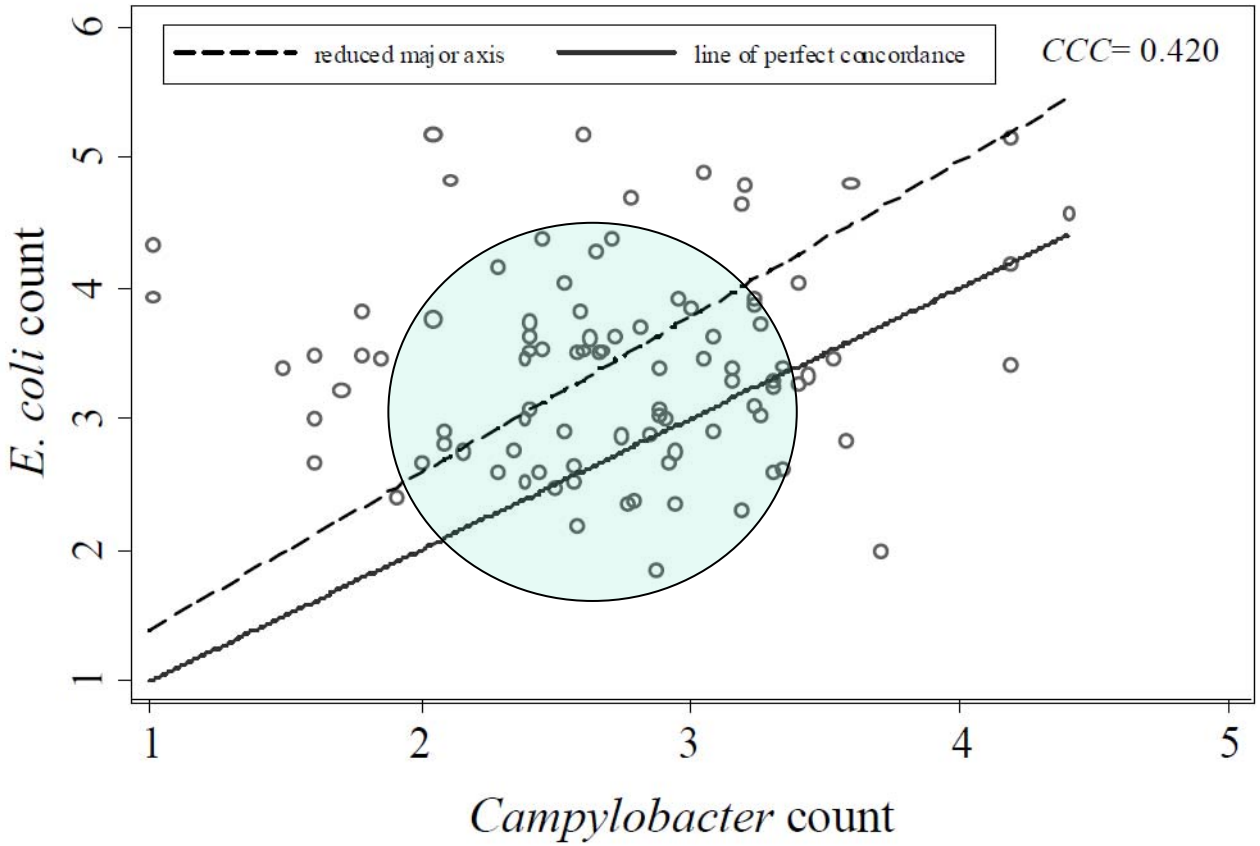
- 54.8% (17/31) of the carcasses with *Campylobacter* counts of ≥ 3 log10 CFU/g were also correlated with the *E. coli* count range of ≥ 3 & < 4 log10 CFU/g.

E. coli count range	*Campylobacter* count range			Total
	≥ 3 $\log_{10}$ CFU/g	≥1 & < 3 $\log_{10}$ CFU/g	< 1 $\log_{10}$ CFU/g*	
≥ 5 $\log_{10}$ CFU/g	1	3	15	19
≥ 4 & < 5 $\log_{10}$ CFU/g	7	8	22	37
≥ 3 & < 4 $\log_{10}$ CFU/g	17	29	54	100
≥ 2 & < 3 $\log_{10}$ CFU/g	6	22	43	71
< 2 $\log_{10}$ CFU/g*	0	1	3	4
Total	31	63	137	231

* Below the limit of quantification by direct plating method.

Results

"Overall correlation" between *E. coli* and *Campylobacter* counts

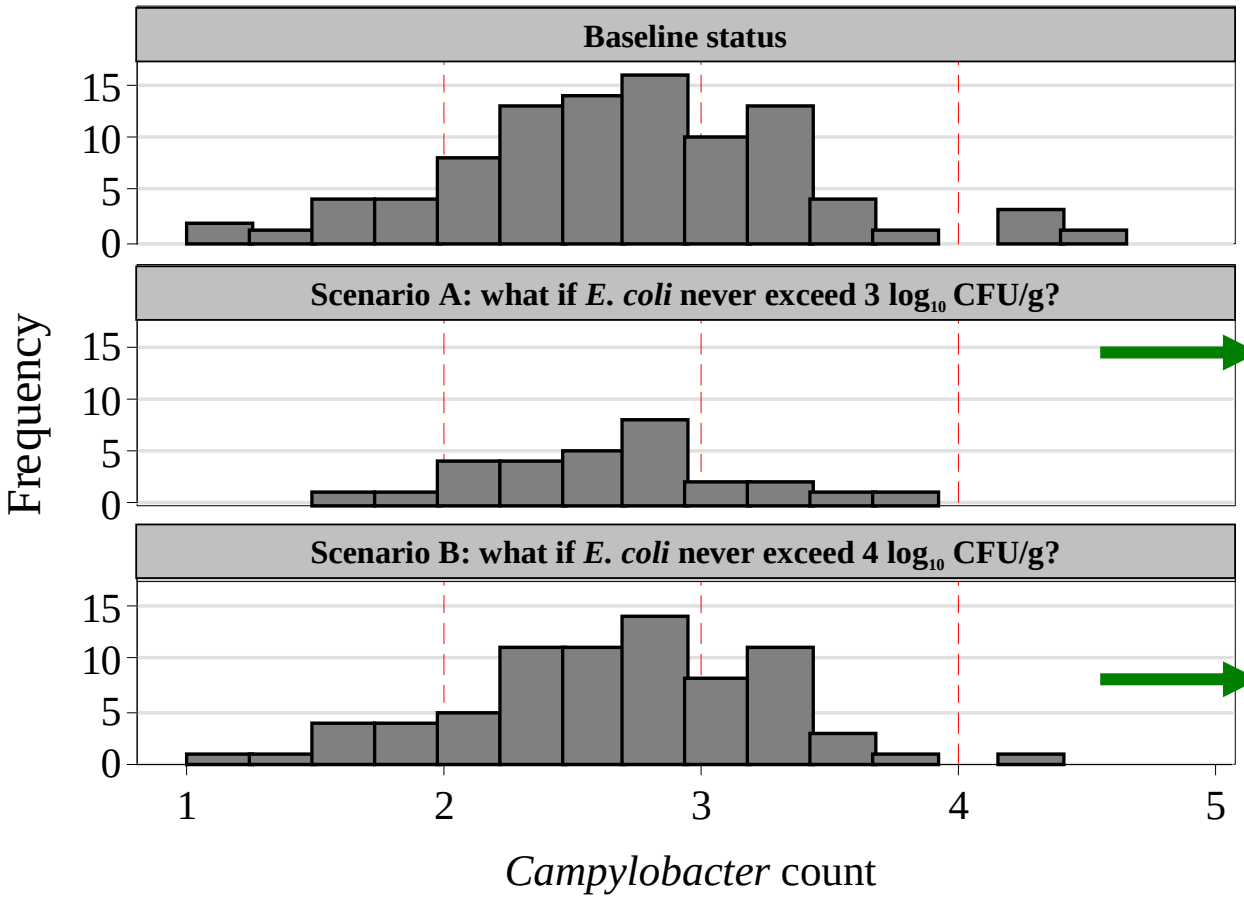


the gradual increase of *E. coli* numbers to more than 4 log CFU/g was not associated with a parallel increase in numbers of *Campylobacter* in broiler carcasses

Results

impact of setting a hypothetical *E. coli* target on decreasing the proportion of broiler carcasses with high *Campylobacter* load?

(hereafter defined as ≥ 3 log10 CFU/g)



►*Campylobacter*-positive carcasses could drop from 40.6% to 12.5%.

►80.6% (25/31) of the carcasses with *Campylobacter* counts of ≥ 3 log10 CFU/g could be targeted

►25.8% (8/31) of the carcasses with *Campylobacter* counts of ≥ 3 log10 CFU/g could be targeted

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Potential of *Escherichia coli* as a surrogate indicator for postchill broiler carcasses with high *Campylobacter* counts

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- ***E. coli* is a practical proxy indicator for monitoring unacceptable functioning of the slaughter processing that leads to carcasses with potentially higher *Campylobacter* counts**

  - The use of *E. coli* as an indicator organism rather than *Campylobacter* enumeration itself may reduce the burden of testing cost and time;
  - *E. coli* testing (as a hygiene indicator) provides verification of the overall performance of the food safety management system

Thank you

Any questions ?