

Occurrence of *Campylobacter* in slaughterhouses before and after cleaning and disinfection

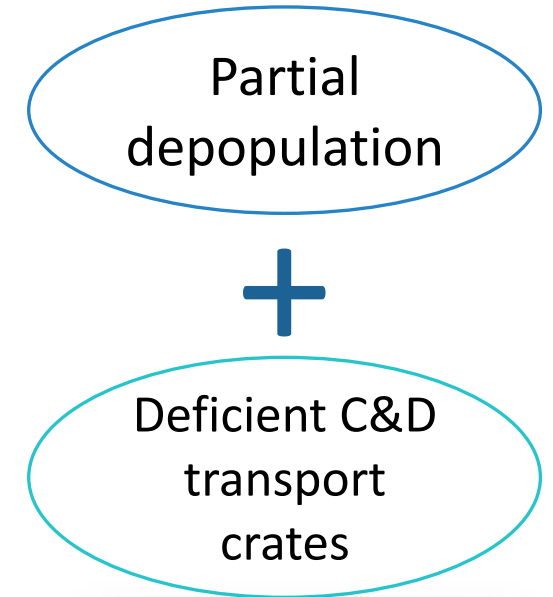
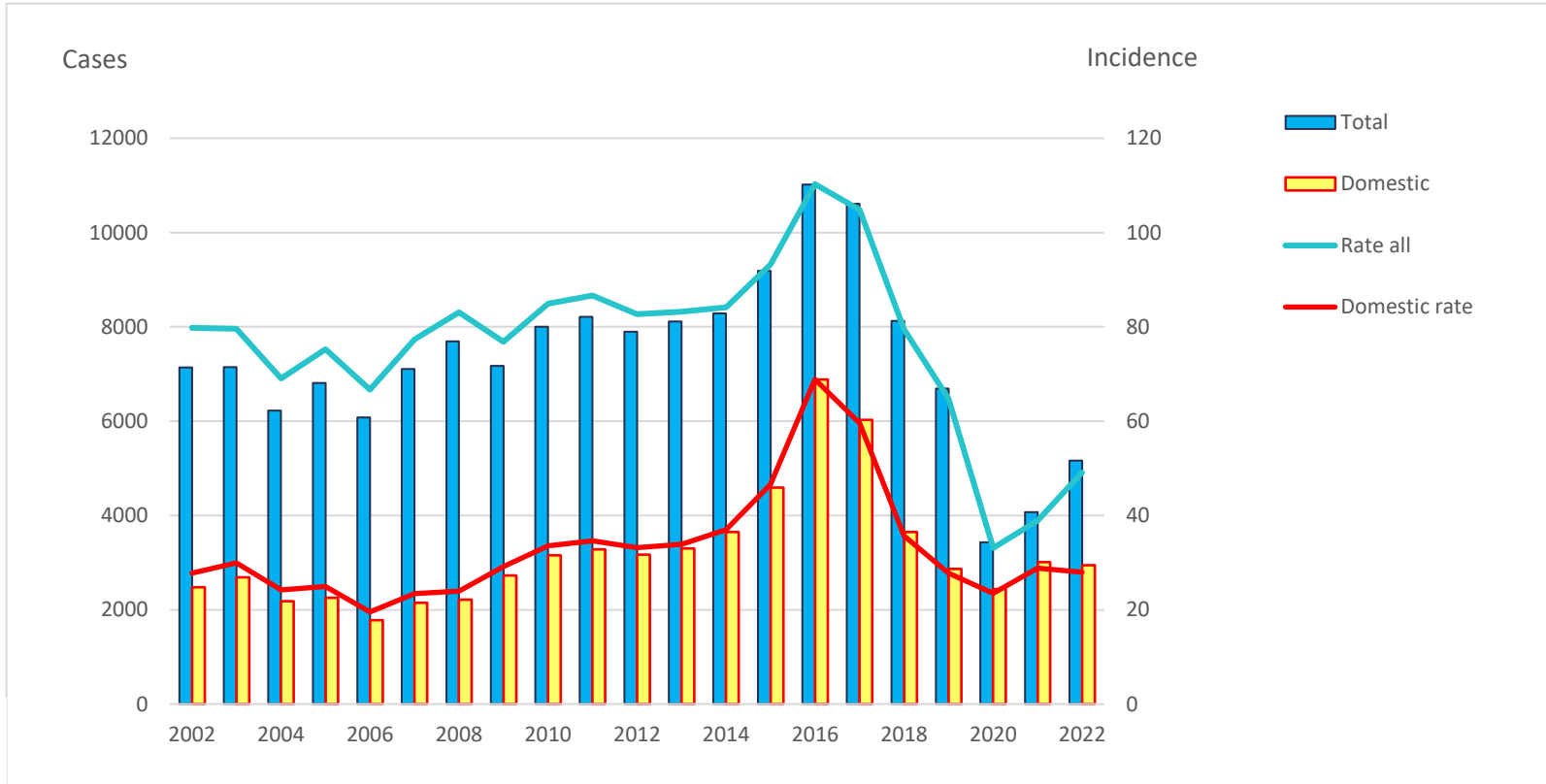
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Campylobacteriosis

Chicken meat



Human cases of campylobacteriosis and incidence (per 100,000 inhabitants) in Sweden.
Source: Public Health Agency of Sweden

Contamination during slaughter



Cleaning and disinfection is an important control measure to prevent bacterial contamination of meat

Cleaning= removal of undesired material also called 'soil' (e.g. microorganisms, food residues, dust, allergens), by use of *detergents*

Disinfection= inactivation of microorganisms to avoid contamination, by use of *disinfectants*

Monitoring cleaning and disinfection procedures

Visual

- Visual inspection

Is it clean?

Microbiological

- Contact plates e.g. dipslides
- Swabbing
- Measure bacteria



Non-microbiological

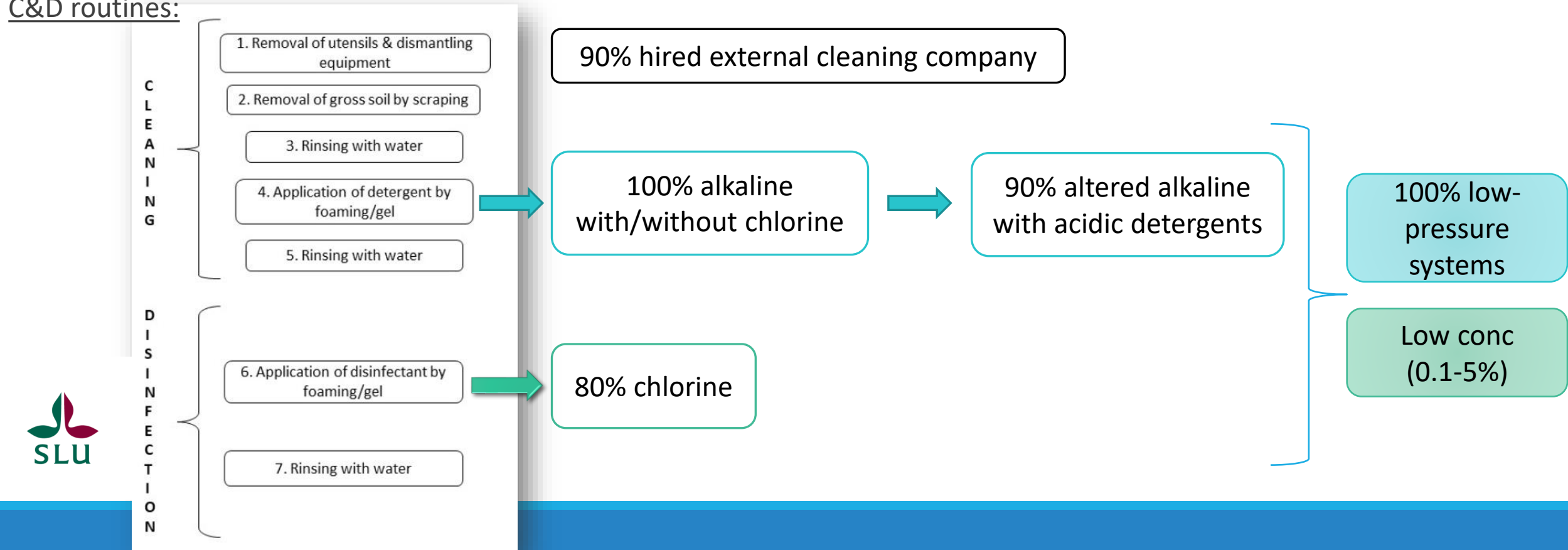
- Adenosine triphosphate (ATP)-bioluminescence
- Measure organic and bacterial cells



Interview study

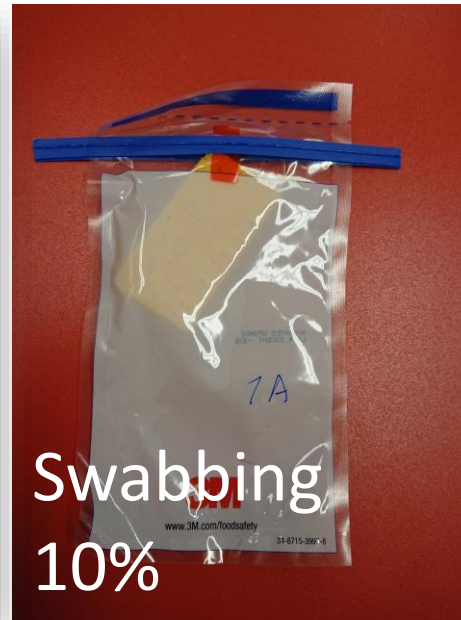
Ten slaughterhouses participated: six red meat (32% of red meat slaughter) & four large scale poultry (90% of chicken slaughter)

C&D routines:



Interview study

Monitoring activities:



Difficult to clean surfaces:
- e.g. conveyor belts,
cutting tools, inside
machines

Study on efficacy of cleaning and disinfection

2 slaughterhouses:

Cattle & swine slaughterhouse

Before

After

6 sampling occasions

Broiler slaughterhouse

Before

After

6 sampling occasions



Cary-Blair

❖ *Food contact surfaces*
(e.g. salt injector needles,
conveyor belts)

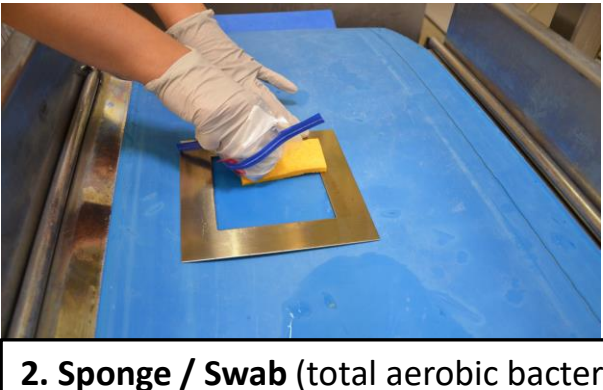
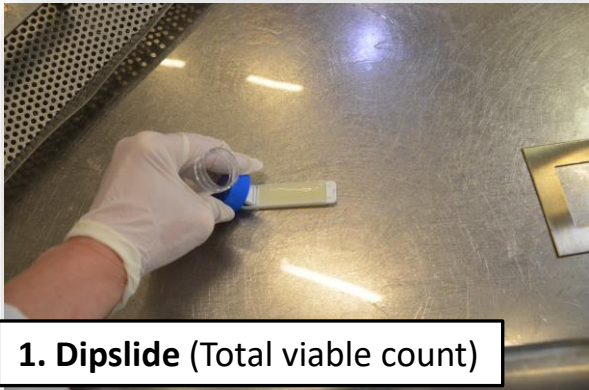
❖ *Non-food contact surfaces*
(e.g. drains,
floor)



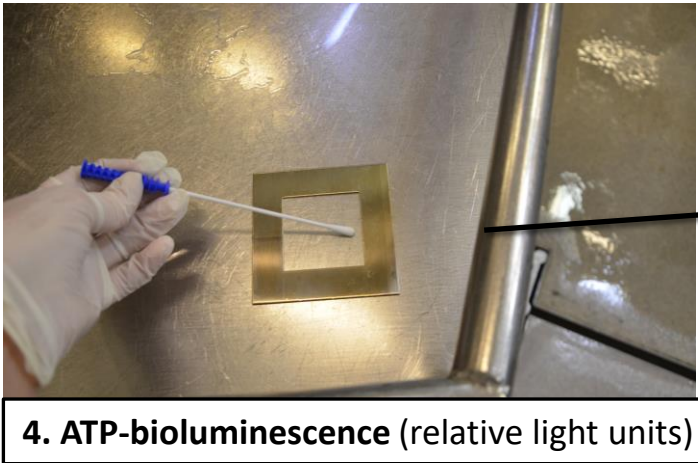
25 cm²/100 cm²

Materials and methods

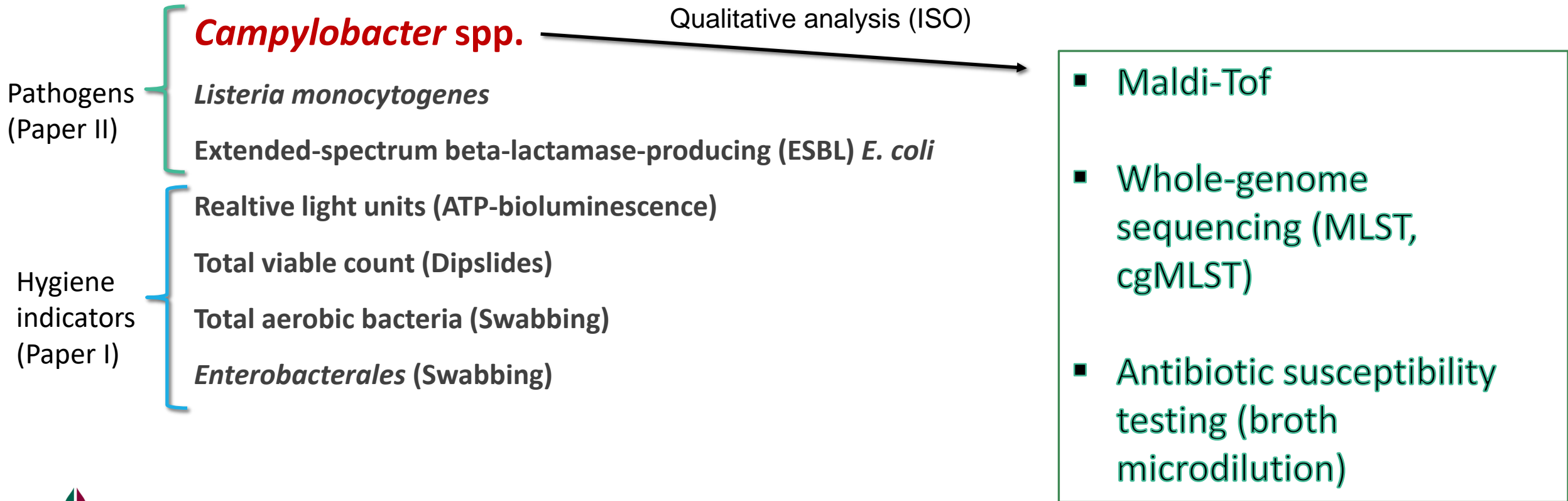
Sampling on each surface:



Scald tank water



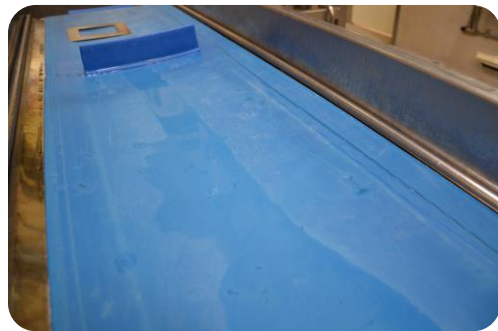
Materials and methods



Results: General hygiene (total aerobic count)

~ 50% of the surfaces were
acceptably clean

Processing areas more
properly cleaned than
slaughter areas



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Journal of Food Protection 86 (2023) 100155

Contents lists available at ScienceDirect

Journal of Food Protection

journal homepage: www.elsevier.com/locate/jfp



Research Paper

Assessment of ATP-Bioluminescence and Dipslide Sampling to Determine the Efficacy of Slaughterhouse Cleaning and Disinfection Compared with Total Aerobic and *Enterobacterales* Counts

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Results: *Campylobacter*

Occurrence (%) of *Campylobacter* spp.
Ratio of positive samples to total number of
samples in brackets



Occurrence of *Campylobacter*, *Listeria monocytogenes*, and extended-spectrum beta-lactamase *Escherichia coli* in slaughterhouses before and after cleaning and disinfection

Madeleine Moazzami ^{a,*}, Emma Bergenkvist ^a, Sofia Boqvist ^a, Sara Frosth ^a, Solveig Langsrud ^b, Trond Møretø ^b, Ivar Vågsholm ^a, Ingrid Hansson ^a

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Slaughterhouse	C&D	Red meat	Poultry
<i>Campylobacter</i> spp.	before	13.0% (8/62)	15.5% (9/58)
	after	0% (0/0)	0% (0/0)

In total 240 samples collected

Results: *Campylobacter*

Table 3. *Campylobacter* spp. isolated from sampling points (SP) on food contact surfaces (FCS) and non-food contact surfaces (NFCS) before cleaning and disinfection in the two slaughterhouses. Superscript numbers indicate sampling occasions (1-12) on which *Campylobacter* spp. were detected

	Red meat slaughterhouse	Poultry slaughterhouse
<i>C. jejuni</i>	<ul style="list-style-type: none"> • Table for cattle gastrointestinal organs (SP 3)^{10,11} NFCS • Cutting blade cattle/pig carcasses (SP 6)¹¹ FCS 	<ul style="list-style-type: none"> • Cutting blade bleeding (SP 12)³ FCS • Shackle after stunning (SP 15)³ FCS • Floor lairage (SP 16)³ NFCS • Conveyor belt (SP 17)³ FCS • Conveyor belt (SP 18)³ FCS • Cutting blade thighs (SP 19)³ FCS • Salt injector needles (SP 20)² FCS • Drain (SP 21)^{2,3} NFCS
	<ul style="list-style-type: none"> • Conveyor belt pig organs (SP 4)^{6,8} NFCS • Drain (SP 5)^{4,6,11} NFCS 	
<i>C. hyointestinalis</i>	<ul style="list-style-type: none"> • Table for cattle gastrointestinal organs (SP 3)¹¹ NFCS 	

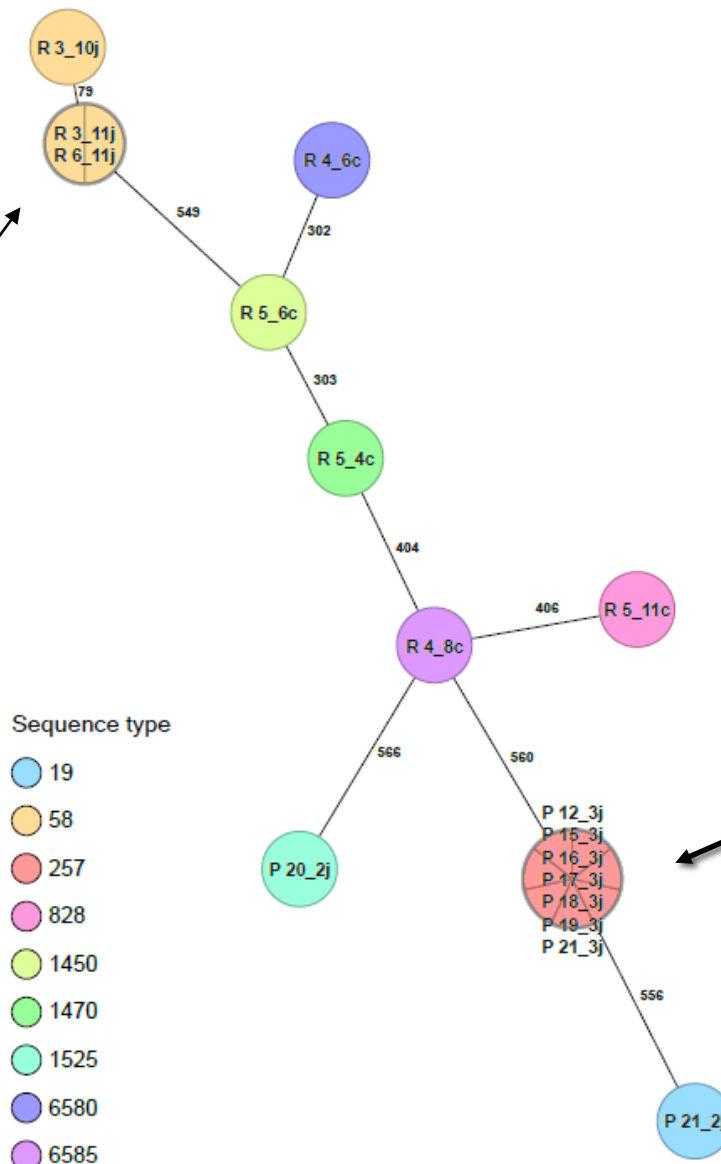
Only *C. jejuni*

Food contact surfaces

Not detected in scald tank water

WGS Results

Red meat slaughterhouse: *C. jejuni* isolates with indistinguishable cgMLST profiles on **cutting blade** for carcasses and **organ table**



Poultry slaughterhouse: *C. jejuni* isolates of ST257 with indistinguishable cgMLST profiles detected on **multiple surfaces** on one sampling occasion

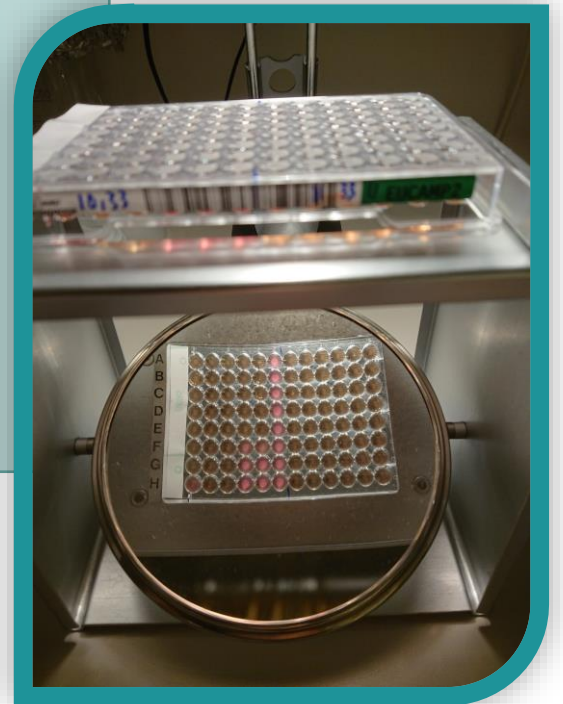
Fig. 2. Minimum spanning tree of core genome multi-locus sequence typing (cgMLST) data from *Campylobacter* spp. isolated from the red meat (R) and poultry (P) slaughterhouse ($n=17$) (first value after slaughterhouse type (R/P) indicates sampling point, second value indicates sampling occasion). $j = C. jejuni$. $c = C. coli$. Values on lines are number of allelic differences (line length not proportional to number).

AMR Results

C. jejuni: one (9.1%) isolate showed resistance to ciprofloxacin and nalidixic acid

C. coli: four (80%) isolates showed resistance to streptomycin

All isolates were susceptible to erythromycin, gentamicin and tetracycline



Discussion

- Broilers are rarely treated with antimicrobials in Sweden → ↓ AMR
- *Campylobacter* were not detected after C&D, but what if the sampling area would have been larger?
- Low number of samples with *Campylobacter* before C&D (only ~5% of chickens *Campylobacter*-positive at the farm)



Biosecurity!

Take home messages



- It is possible to remove *Campylobacter* through proper cleaning and disinfection
- Before C&D: *Campylobacter* spp. were detected on **critical food contact surfaces**
- **Slaughter hygiene** is important to prevent cross-contamination of the meat

Acknowledgements

Co-authors:

Swedish University of Agricultural Sciences (SLU):

Ingrid Hansson

Sofia Boqvist

Sara Frosth

Ivar Vågsholm

Emma Bergenkvist

Norwegian institute of food, fisheries and agricultural research (Nofima):

Trond Møretrø

Solveig Langsrud



Funding



Ivar och Elsa Sandbergs stiftelse



Sveriges lantbruksuniversitet
Swedish University of Agricultural Sciences

Department of Biomedical Sciences
and Veterinary Public Health

Other papers involving reduction of *Campylobacter* in slaughterhouses

572

Journal of Food Protection, Vol. 84, No. 4, 2021, Pages 572–578

<https://doi.org/10.4315/JFP-20-395>

Published 2021 by the International Association for Food Protection

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Research Note

Reducing *Campylobacter jejuni*, *Enterobacteriaceae*, *Escherichia coli*, and Total Aerobic Bacteria on Broiler Carcasses Using Combined Ultrasound and Steam

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MS 20-395: Received 30 September 2020/Accepted 9 November 2020/Published Online 12 November 2020

Food Control 119 (2021) 107424



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Contents lists available at [ScienceDirect](https://www.sciencedirect.com)

Food Control

journal homepage: www.elsevier.com/locate/foodcont



Reducing *Campylobacter jejuni*, *Enterobacteriaceae* and total aerobic bacteria on transport crates for chickens by irradiation with 265-nm ultraviolet light (UV–C LED)

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Thank you for listening!

Questions?

