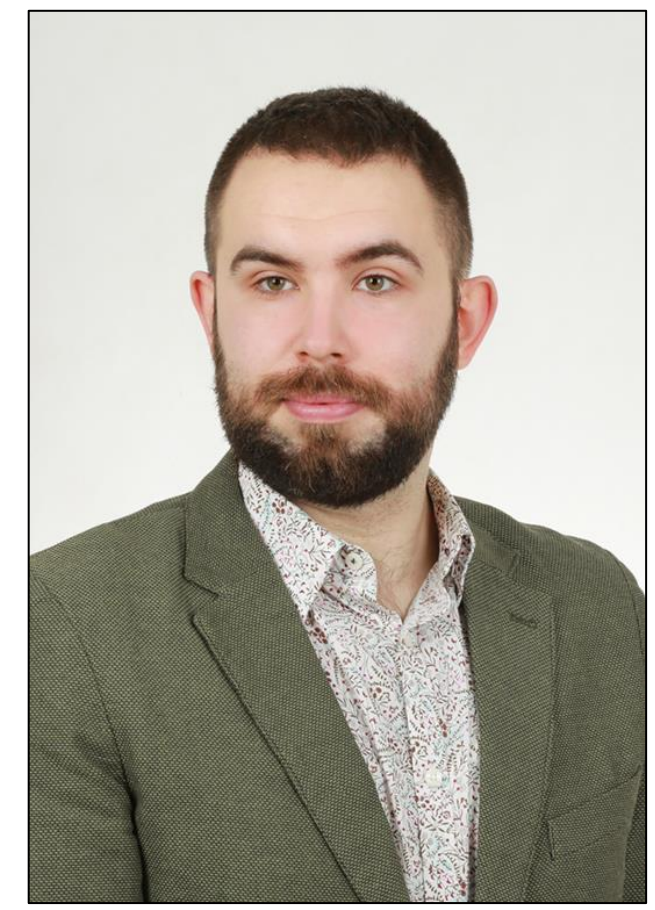




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Small contaminations on broiler carcasses are more a quality matter than a food safety issue – a Monte Carlo simulation study

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1. BACKGROUND

- According to strict European Union law broiler carcasses with **any visible contamination** should be excluded from the food chain due to safety reasons.
- It is **not clear if small visible contamination increases the counts of bacteria on the carcasses to such extent**, that it would result in elevated risk for the consumers.
- Potentially feces, crop content, bile and grease (lubricant from slaughter line) **could contaminate carcasses**.

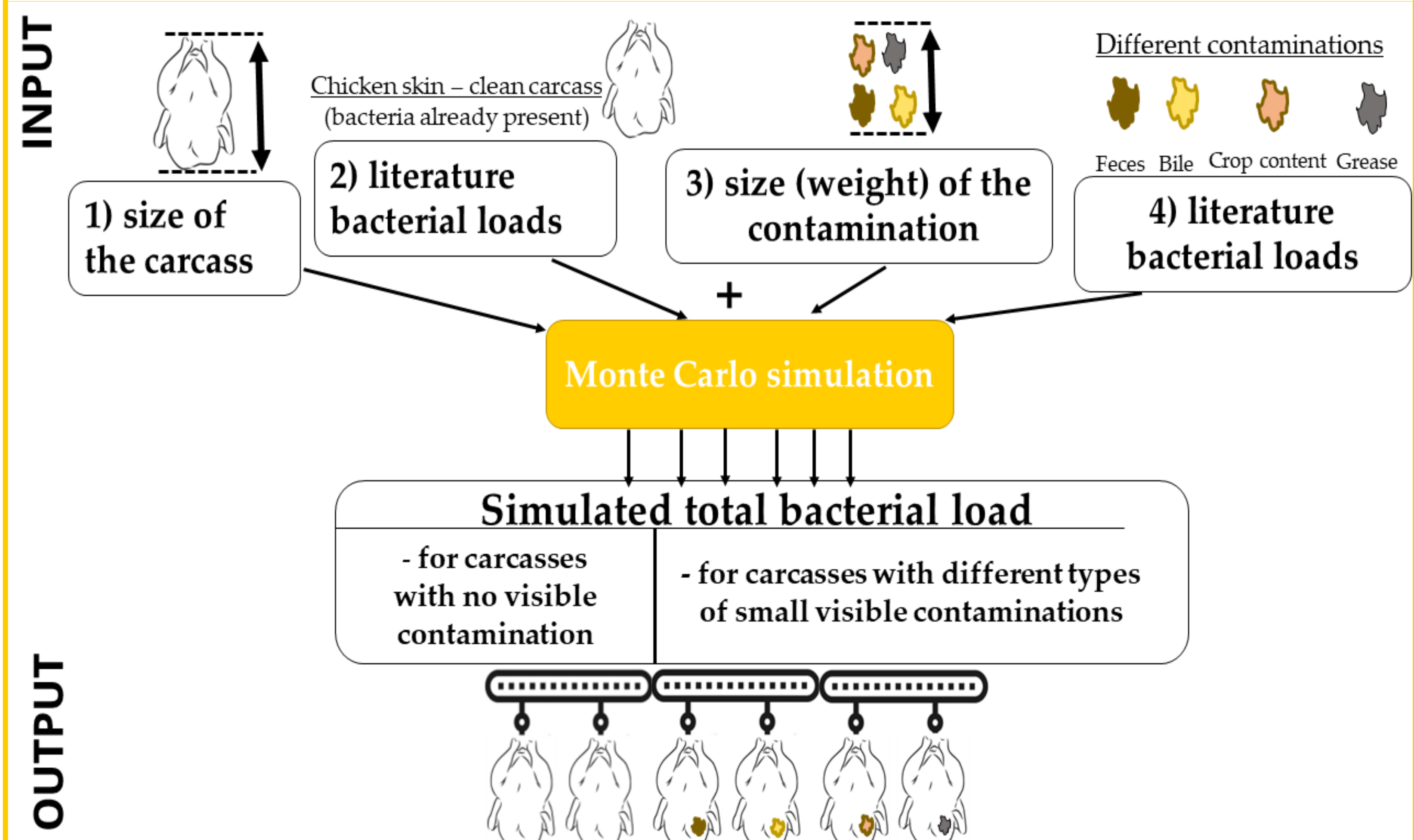
3. MATERIALS and METHODS

- The bacterial counts (total aerobic plate count, *Enterobacteriaceae*, *Escherichia coli*, and *Campylobacter* spp.) were obtained from the literature and used as input for the Monte Carlo model.
- Monte Carlo simulation with 50 000 iterations for each simulation was performed using @Risk software.
- The simulations used different variables as input data, while the output data were the simulated total bacterial loads (**see study design**).

2. AIM of the STUDY and HYPOTHESIS

- Aim of the study was **to investigate the bacterial load on the carcasses with small visible contamination with feces, crop content, bile and grease** and compare them to carcasses without any visible contamination (using probabilistic model).
- We hypothesized that **there are no significant differences** in bacterial loads between carcasses with a small visible contamination and carcasses with no visible contamination.

4. STUDY DESIGN



Assumed sizes of the small visible contaminations (min-max; in g):

- feces: 0.001-0.01
- bile: 0.0375-0.15
- crop content: 0.05-0.2
- grease: 0.01-0.04

EXAMPLE

These are the sizes of the fecal material spots weighing **0.001 g** and **0.01 g** (spots with **0.28 cm** and **0.6 cm** diameter, respectively)

0.001 g spot of feces

0.01 g spot of feces

Assumptions: density of broiler droppings = 0.68 g/cm³, spots are circular, brown points have the same area as the spheres with given amount of the contamination

5. RESULTS

Table 1. The probability (%) that a small visible contamination results in at least 0.5 (logCFU) increase in the total bacterial load of the average chicken carcass (1600 g).

Type of bacteria	Feces	Bile	Crop content	Grease
Total aerobic count	0%	0%	0%	0%
<i>Enterobacteriaceae</i>	5.1%	0%	0%	0%
<i>E. coli</i>	16.7%	0%	0%	0%
<i>Campylobacter</i> spp.	4.1%	0%	0.2%	0%

± 0.5 logCFU
is considered as the precision of the classical microbiological methods.

Table 2. The contribution (%) of small visible contaminations to the total bacterial load of the average chicken carcass (1600 g).

Type of bacteria	Feces	Bile	Crop content	Grease
Total aerobic count	0.001%	0.122%	0.02311%	<0.001%
<i>Enterobacteriaceae</i>	2.031%	<0.001%	0.00143%	<0.001%
<i>E. coli</i>	3.851%	0.002%	0.00615%	<0.001%
<i>Campylobacter</i> spp.	1.077%	0.121%	0.11128%	<0.001%

The microbiome of the visibly clean chicken carcass is already abundant.

Table 3. Monte Carlo simulation of the total bacterial load on the average broiler carcass (1600 g) with or without a contamination with a small amount of material (expressed in logCFU).

Bacterial species	Feces		Bile		Crop content		Grease	
	no contam.	with contam.	no contam.	with contam.	no contam.	with contam.	no contam.	with contam.
Total aerobic count								
mean	7.3535	7.3536	7.3535	7.3625	7.3535	7.3552	7.3535	7.3535
sd	0.4604	0.4604	0.4606	0.4528	0.4603	0.4585	0.4606	0.4605
maximum	9.3717	9.3717	9.4324	9.4324	9.4114	9.4114	9.2766	9.2766
<i>Enterobacteriaceae</i>								
mean	6.9735	7.1181	6.9735	6.9735	6.9735	6.9736	6.9735	6.9735
sd	0.1316	0.1907	0.1318	0.1318	0.1319	0.1319	0.1320	0.1320
maximum	7.5920	8.0262	7.5122	7.5122	7.5480	7.5480	7.5612	7.5612
<i>E. coli</i>								
mean	6.5035	6.7640	6.5035	6.5036	6.5035	6.5039	6.5035	6.5035
sd	0.6003	0.4368	0.6003	0.6002	0.6005	0.6000	0.6004	0.6004
maximum	9.1898	9.1915	9.15620	9.1562	9.2393	9.2393	9.0849	9.0849
<i>Campylobacter</i> spp.								
mean	6.1936	6.2610	6.1936	6.2011	6.1936	6.2005	6.1936	6.1936
sd	0.7001	0.6784	0.7002	0.6946	0.7002	0.6931	0.7003	0.7003
maximum	9.2117	9.2117	9.26841	9.2684	9.10343	9.10343	9.1931	9.1931

6. CONCLUSIONS

- Our calculations revealed that carcass contamination with minute amounts of feces, bile, crop content and grease will not lead to a significant increase of the already present food safety hazards.
- However, the producers should still check for small contaminations, since they might be the indicators that adjustments are required during the processing.

