



Evaluation of a cross contamination model describing transfer of salmonella spp. and listeria monocytogenes during grinding of pork and beef

Møller, Cleide Oliveira de Almeida; de Anderson, S. Sant' Ana; Nauta, Maarten; Aabo, Søren; Hansen, Tina Beck

Publication date:
2015

Document Version
Publisher's PDF, also known as Version of record

[Link back to DTU Orbit](#)

Citation (APA):
Møller, C. O. D. A., de Anderson, S. S. A., Nauta, M., Aabo, S., & Hansen, T. B. (2015). *Evaluation of a cross contamination model describing transfer of salmonella spp. and listeria monocytogenes during grinding of pork and beef*. Poster session presented at The Danish Microbiological Society Annual Congress 2015, Copenhagen, Denmark.

General rights

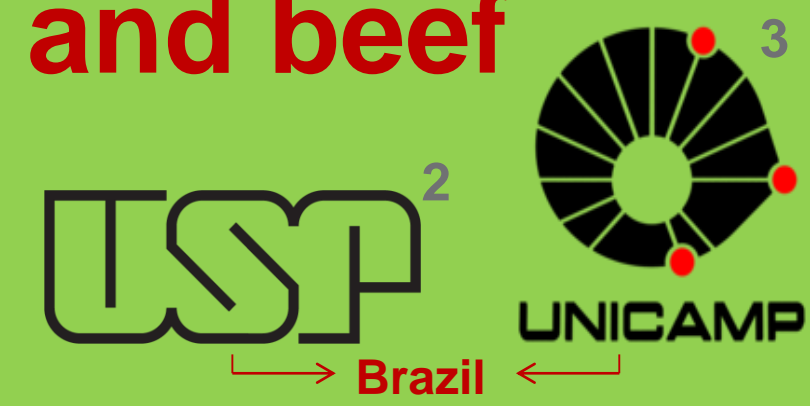
Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

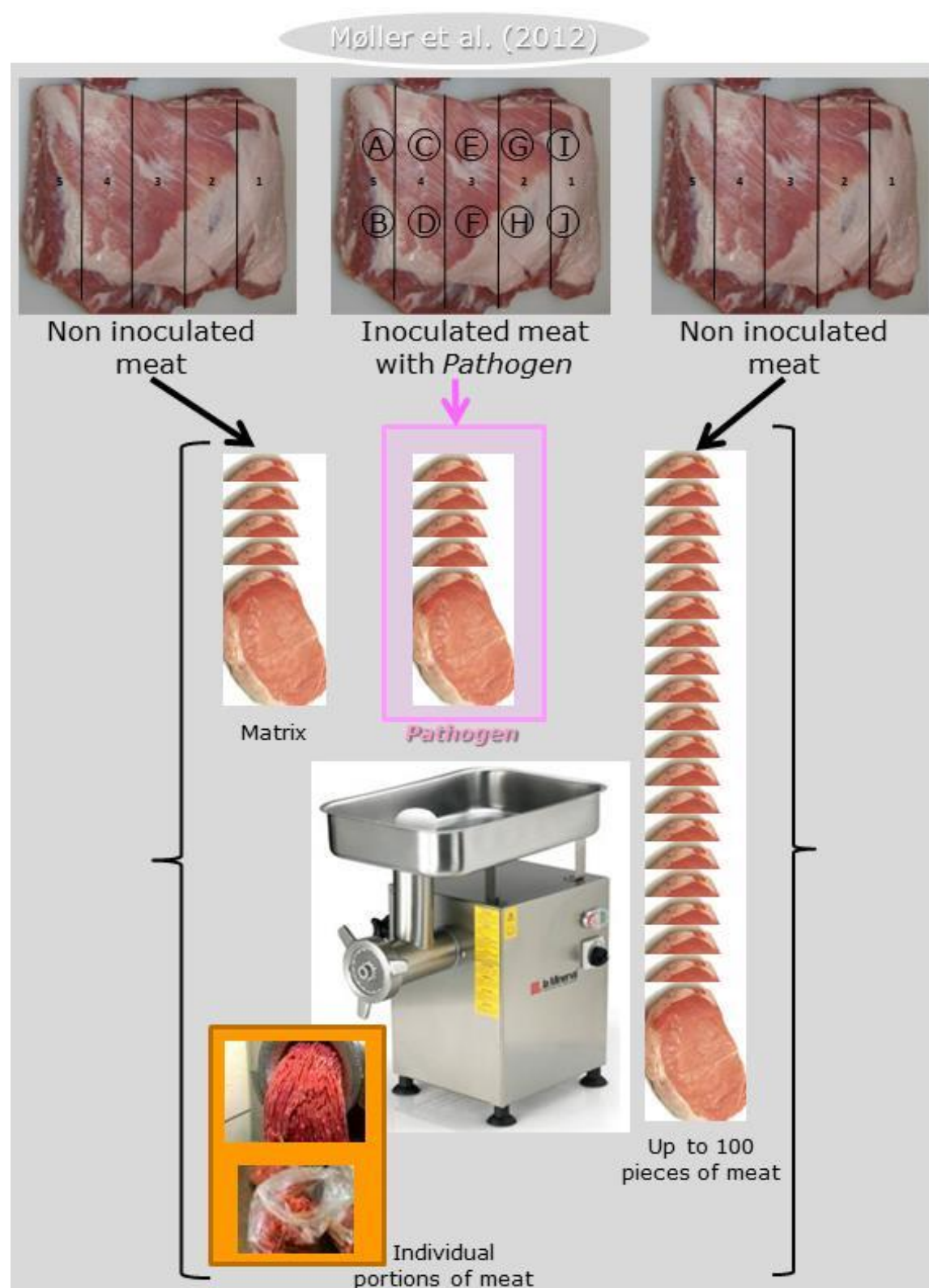
Evaluation of a cross contamination model describing transfer of *Salmonella* spp. and *Listeria monocytogenes* during grinding of pork and beef

DTU¹ Cleide O. de A. Møller¹, Anderson de S. Sant'Ana^{2,3} Maarten J. Nauta, Søren Aabo¹ and Tina B. Hansen¹



Can a promising cross contamination model be successfully applied to any condition of meat grinding? To answer this question we performed different challenge tests and developed a set of evaluation approaches.

The cross contamination model (Møller et al. 2012) was evaluated to investigate its capability of describing transfer of *Salmonella* spp. and *L. monocytogenes* during grinding of pork and beef of varying sizes (50 – 324 g) and numbers of pieces to be ground (10 – 100), in two grinder systems.



Data from 19 trials were collected. Three different evaluation approaches were applied:

- ASZ** – an Acceptable Simulation Zone method which compared observed transfer with simulations using the proposed model
- QMRA** – each trial was fitted to equation 1 and its respective parameter estimates were integrated in a Quantitative Microbiological Risk Assessment model (Møller et al. 2015) to compare risk estimates
- TTP** – the Total Transfer Potential was calculated for each of the trials based on fitted parameter estimates

Møller et al. (2012) model

$$M_i = (1-a_i)(1-a_2)(1-c_2) P_i + (b_1 gr_{1,i}) + (b_2 gr_{2,i})$$

$$gr_{1,i} = a_1 P_i + (1-b_1)(1-c_1) gr_{1,i-1}$$

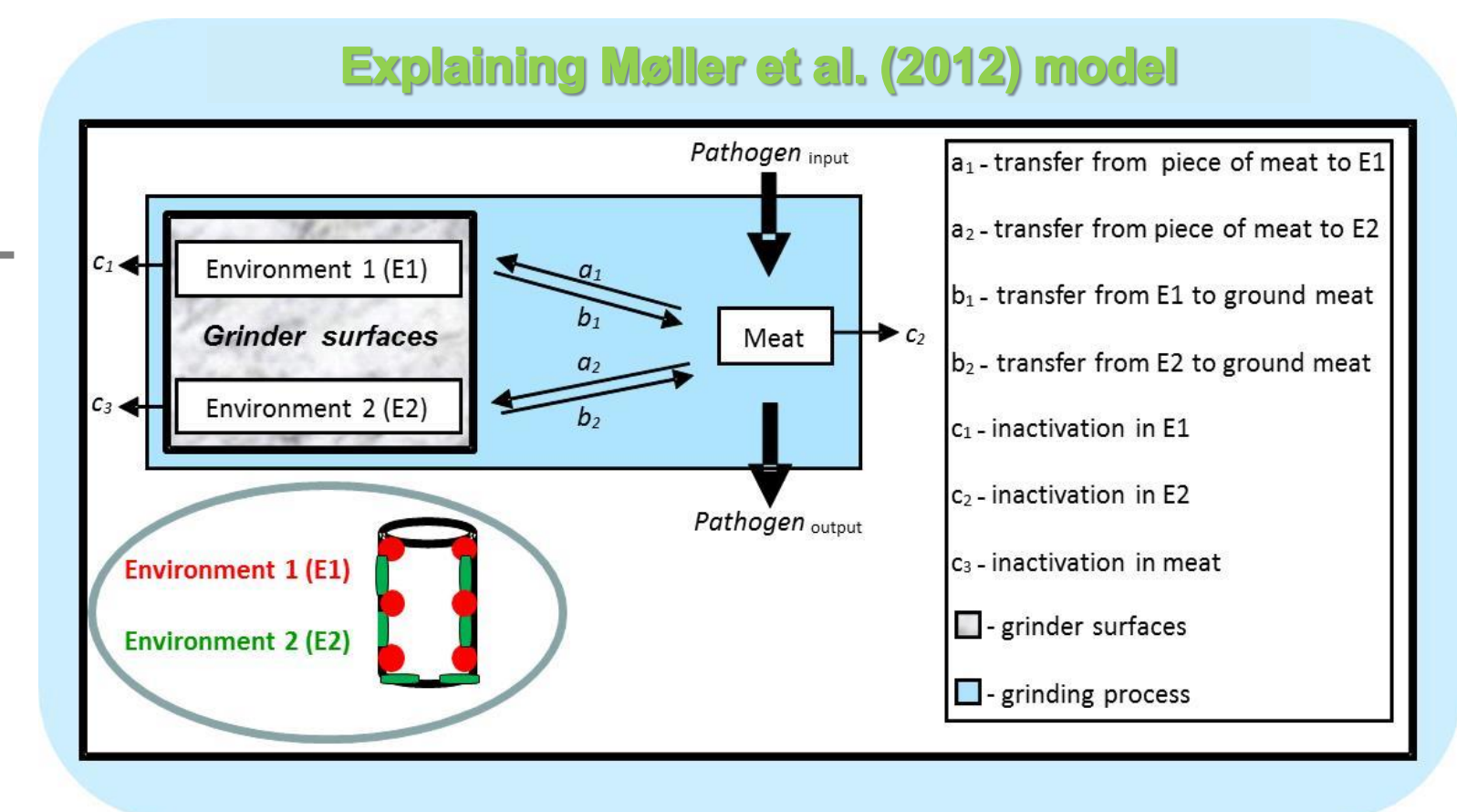
$$gr_{2,i} = a_2 P_i + (1-b_2)(1-c_3) gr_{2,i-1}$$

Equation 1

Evaluated parameter estimates:

a_1	b_1	a_2	b_2	$1 - c_3$
0.0010	0.0275	0.8909	0.0558	0.4887

- Lessons learned:**
- Results indicated that transfer estimates were not applicable for unlike processing
 - QMRA risk estimates and TTP both revealed that risk attribution from grinding was influenced by:
 - sharpness of grinder knife
 - specific grinder
 - grinding temperature
 - specific pathogen was of minor importance

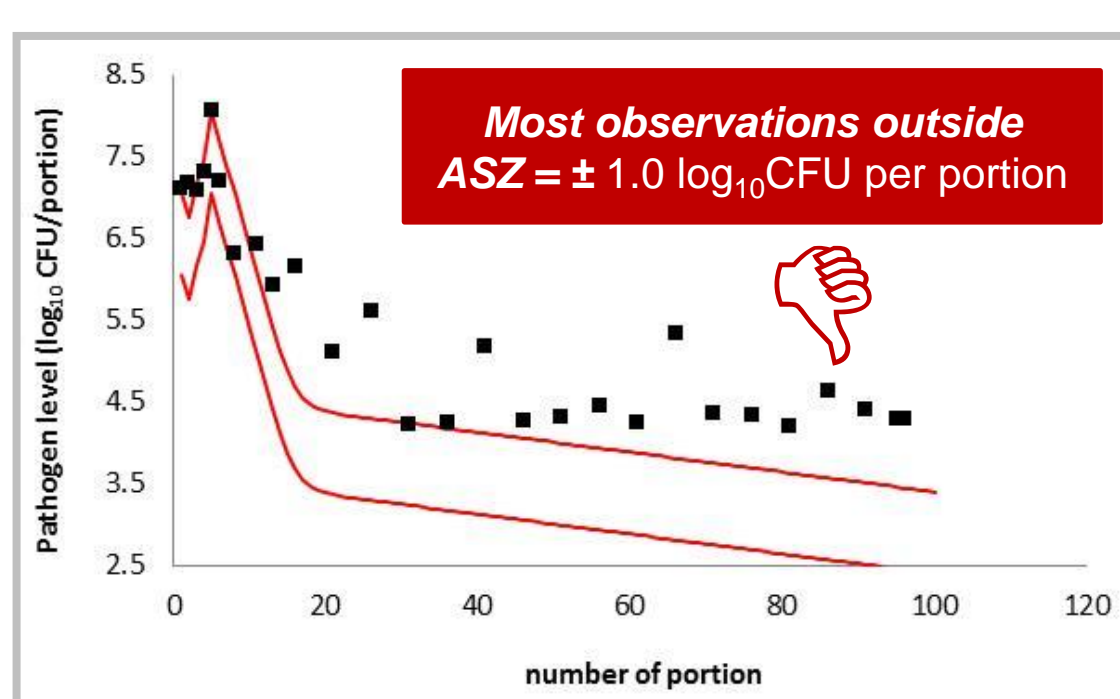
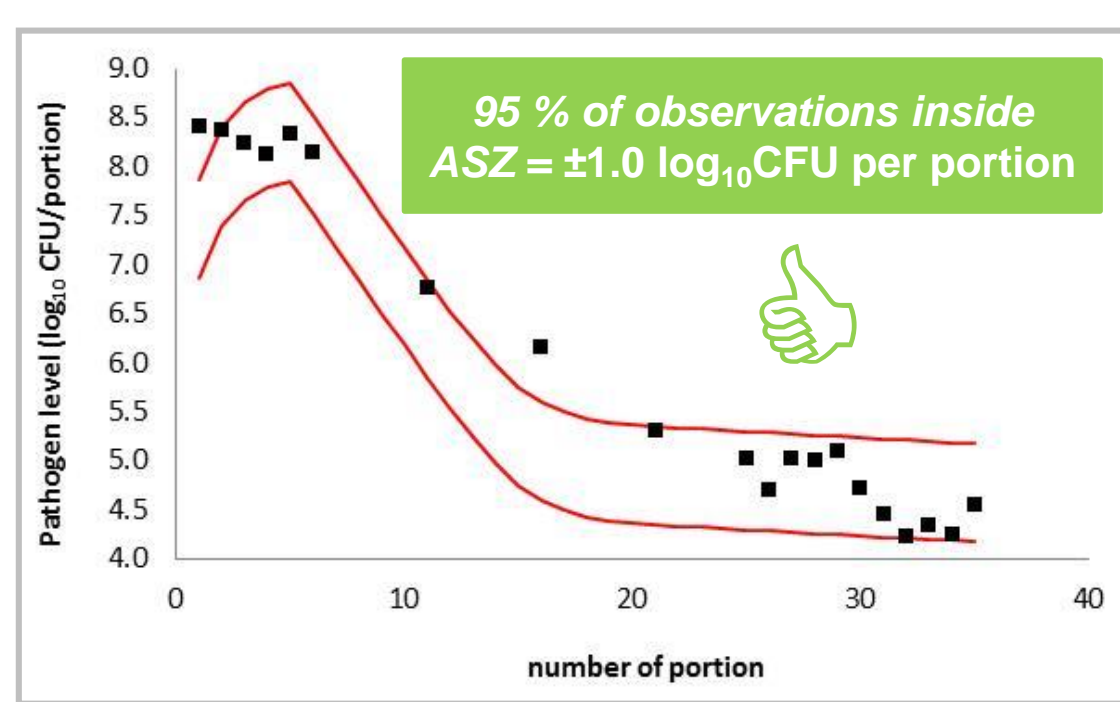


Classification of trials according agreement of results obtained with three different approaches for evaluating performance of the model proposed by Møller et al. (2012) describing the transfer of pathogens during meat grinding in trials with at least 15 pieces of meat.

DECISION MAKING WHEN:
at least 2 evaluation approaches are **IN AGREEMENT**

Trial identification	Size of ASZ ^b to include 95 % of the predictions (\pm CFU/portion of meat)	Absolute Risk ^c Estimates $\times 10^{-3}$	TTP % ^d	Møller et al. (2012) model	
				Applicability	Evaluation approaches in agreement
1	2.0	3.02	103	-	3
2	2.0	2.87	101	-	3
3	2.0	2.94	100	-	3
4	0.8	1.01	21	+	3
5	1.4	1.56	36	+	2
6	1.2	1.10	24	+	2
7	1.1	0.86	16	+	2
8	1.2	0.62	11	+	2
9	2.0	2.21	60	-	3
11	1.1	1.92	51	-	3
12	1.4	3.04	102	-	3
13	1.2	1.44	35	+	2
14	1.5	2.22	64	-	3
15	1.1	1.54	36	+	2
16	1.1	2.24	60	-	3
17	2.2	1.59	39	+	2
18	0.6	1.41	34	+	3
19	0.6	1.14	25	+	3
20 ^a	0.5	0.96	20	+	3

A positive correlation was found between **QMRA risk estimates** and **TTP %**



Evaluated parameter estimates are **APPLICABLE** (58 % of trials)

Evaluated parameter estimates are **NOT APPLICABLE** (42 % of trials)

Nevertheless **All trials were successfully described when fitted to equation 1**

Acknowledgement
The present study was financed by the Danish Council for Strategic Research (DCSR, process 12-1311417) and the State of São Paulo Research Foundation (FAPESP, processes 11/18228-2 and 12/50535-5) through the Strategic Research Collaboration in Food Science in the State of São Paulo, **Brazil and Denmark**.

^a Parameter estimates suggested by Møller et al. (2012) and evaluated in this study were obtained from the fitting of observed transfer in trial 20.
^b ASZ – Acceptable Simulation Zone.
^c Risk estimates from scenarios testing different sets of transfer parameter estimates, and using the QMRA of *Salmonella* in meatball processing model (Møller et al., 2015) at low concentration and prevalence of the pathogen.
^d Calculated with base on Equation 1. It indicates the percentage (%) of CFU of *Salmonella*, from the contaminated pieces of meat that ends up in the total portion of ground meat, assuming that the grinding process will continue forever.

For further details contact Cleide O. de A. Møller, email: clemo@food.dtu.dk

