



Influence of food handlers' compliance with procedures of poultry carcasses contamination: A case study concerning evisceration in broiler slaughterhouses



Ewa Pacholewicz^{a, b, *}, Sri Aika Sura Barus^c, Arno Swart^d, Arie H. Havelaar^{e, a}, Len J.A. Lipman^a, Pieter A. Luning^c

^a Division Veterinary Public Health, Institute for Risk Assessment Sciences, Utrecht University, Utrecht, 3508 TD, The Netherlands

^b MEYN Food Processing Technology B.V., Oostzaan, 1511 MA, The Netherlands

^c Food Quality and Design, Department of Agrotechnology and Food Sciences, Wageningen University, 6708 WG, Wageningen, The Netherlands

^d Centre for Infectious Disease Control, National Institute for Public Health and the Environment, Bilthoven, 3720 BA, The Netherlands

^e Emerging Pathogens Institute and Department of Animal Sciences, University of Florida, Gainesville, FL, USA

ARTICLE INFO

Article history:

Received 22 January 2016

Received in revised form

6 April 2016

Accepted 7 April 2016

Available online 11 April 2016

Keywords:

Campylobacter

Processing hygiene

Food handler

Compliance with procedures

ABSTRACT

Campylobacter remains the most commonly reported zoonotic agent worldwide. Reducing the concentration of *Campylobacter* on chicken meat is seen as the most efficient strategy to diminish the number of human campylobacteriosis cases. Analysis of risk factors related to characteristics of broiler batches and processing conditions could, however, not fully explain differences in impact of processing on contamination levels between slaughterhouses. Our study aimed at investigating whether compliance of food handlers with procedures on setting and controlling evisceration process parameters could explain differences in microbial concentrations on carcasses between slaughterhouses. The study was conducted in two commercial broiler chicken slaughterhouses. Analysis of documentation provided insight in the adequacy of procedures, and observational studies revealed insight in compliance with procedures by using a set of criteria for evisceration control. The frequency of carcasses with visible faecal contamination was counted and *Escherichia coli* concentrations on carcasses classified based on visible contamination was analysed. *E. coli* was found to be a valid indicator for *Campylobacter* during evisceration. Food handlers' knowledge, attitude and practices related to evisceration control tasks were analysed based on a validated questionnaire. Documentation analysis revealed obvious differences in the procedures between slaughterhouses. The observation study revealed that in the slaughterhouse with advanced procedures, the food handlers more often complied with these procedures and a lower frequency of carcasses with visible faecal contamination was observed. Carcasses contaminated with visible faecal spots, even at a low level, carried significantly higher concentrations of *E. coli* than visibly clean carcasses. Food handlers in both slaughterhouses revealed a good knowledge level. The attitude of food handlers differed between slaughterhouses. In one slaughterhouse, where food handlers complied more frequently with procedures their attitude was at a good level, and practices at good and moderate levels. In the other slaughterhouse the attitude of food handlers was at moderate level and practices at moderate and poor levels. In conclusion, the results from our case study suggest that management factors like availability of adequate monitoring procedures and food handlers' compliance with these procedures may influence the bacterial concentrations on carcasses. Our study demonstrated that compliance with procedures differed between slaughterhouses, and might be associated with faecal contamination of carcasses and thus with higher bacterial concentrations. These results suggest that managerial improvements, supervising and motivating food handlers could be an important control point. To validate the observed relation between compliance with procedures and contamination of carcasses, an intervention study is needed.

© 2016 Elsevier Ltd. All rights reserved.

* Corresponding author. Yalelaan 2, PO Box 80175, 3508 TD Utrecht, The Netherlands.

E-mail address: e.pacholewicz@uu.nl (E. Pacholewicz).

1. Introduction

Campylobacter remains the most commonly reported zoonotic agent worldwide. A high fraction of campylobacteriosis cases in humans is accounted to the poultry reservoir and 20–30% of the cases to the handling, preparation and consumption of broiler meat (European Food Safety Authority, 2010). Risk assessment studies indicate that compliance of broiler meat batches with a *Campylobacter* microbiological criterion is the most efficient strategy to diminish human infection (European Food Safety Authority, 2011). Setting a hygiene target based on *Escherichia coli* concentrations of carcasses after chilling was proposed to be useful as an indirect sanitary tool for reducing the level of *Campylobacter* contamination of post-chilled broiler carcasses (European Food Safety Authority, 2012a; European Food Safety Authority, 2012b). In addition, changes in concentrations of *Campylobacter* and *E. coli* throughout the processing are similar (Pacholewicz et al., 2015). *Campylobacter* as well as *E. coli* concentrations on broiler chicken carcasses after chilling vary between slaughterhouses (Anonymous, 2011; Habib, De Zutter, Van Huffel, Geeraerd, & Uyttendaele, 2012; Pacholewicz et al., 2015; Seliwiorstow, Baré, Van Damme, Uyttendaele, & De Zutter, 2015). Identifying the causes of variation in the bacterial concentration between slaughterhouses could support the development of strategies to reduce the bacterial concentrations on chicken meat and thus the number of campylobacteriosis cases in humans.

The impact of processing steps on *Campylobacter* and *E. coli* contamination levels was reported to vary between two slaughterhouses (Pacholewicz et al., 2015). These slaughterhouses have similar equipment and operational food safety management systems based on HACCP principles and prerequisite requirements, and comparable contamination levels of *Campylobacter* and *E. coli* in the incoming batches. The effect of processes such as evisceration on bacterial concentration on carcasses has frequently been reported to differ between slaughterhouses, causing either an increase or no change in concentrations (Pacholewicz et al., 2015; Rosenquist, Sommer, Nielsen, & Christensen, 2006; Seliwiorstow et al., 2015). These differences might stem from processing parameters or characteristics of incoming batches, which will be reported separately (Pacholewicz, Swart, Wagenaar, Lipman, & Havelaar, in preparation). Also such differences might be influenced by factors related to food handlers.

Luning and Marcelis (2006) hypothesized that food quality is not only affected by the behaviour of the food systems (i.e. the properties of the product and processes), but could also be affected by the decision making behaviour of people operating the food production system within a certain company context. Moreover it was observed that food handlers did not always follow prescribed hygiene practices (Baş, Şafak Ersun, & Kıvanç, 2006; Jianu & Chiş, 2012; Walker, Pritchard, & Forsythe, 2003). Variable compliance of food handlers with procedures may impact product safety parameters as demonstrated in the case of concentration of acrylamide in French fries (Sanny, Jinap, Bakker, van Boekel, & Luning, 2012; Sanny, Luning, Jinap, Bakker, & van Boekel, 2013). Compliance with adequate procedures is necessary to produce food products that do not contain bacteria above an acceptable level (Luning, Bango, Kussaga, Rovira, & Marcelis, 2008).

Despite the high automation level in poultry processing (Barbut, 2014), certain activities still need to be executed by food handlers, e.g. adjusting the equipment to the size of the carcasses and taking corrective actions in case processes do not perform properly. Proper adjustment of equipment prevents the leakage of faecal contamination and thus prevents an increase in bacterial concentration on carcasses. Presence of visibly contaminated carcasses after evisceration was previously reported (Burfoot & Allen, 2013; Cason,

Berrang, Buhr, & Cox, 2004; Cibin et al., 2014; Smith et al., 2007). Based on our literature survey, the compliance of food handlers with hygiene and food safety procedures in broiler chicken slaughterhouses and its impact on microbiological concentration has not yet been studied.

This study aimed to investigate whether compliance of food handlers with procedures on setting and controlling evisceration equipment could explain differences in the impact of the evisceration process on *E. coli* concentrations between slaughterhouses. To reach this goal, the structure of available procedures related to the evisceration process in the slaughterhouses was analysed against Good Manufacturing Practices. Furthermore, a set of criteria for optimal control of evisceration was developed and it was observed whether the available procedures and food handlers complied with these criteria. The frequency of carcasses with visible faecal contamination after evisceration was calculated and the *E. coli* concentration on the contaminated carcasses was analysed. *E. coli* was chosen because its concentration after evisceration changes in a similar way as *Campylobacter* (Pacholewicz et al. 2015). The quantification of *E. coli* is more rapid and cost effective than quantification of *Campylobacter*. In addition *E. coli* occurs frequently on carcasses, whereas presence of *Campylobacter* is seasonal.

In addition, the level of knowledge, attitude and self-reported practices were investigated among the food handlers to understand a relationship with their compliance with the criteria.

2. Materials and methods

2.1. Slaughterhouses

The study was performed in two commercial broiler slaughterhouses in which the evisceration process had different effects on bacterial concentrations as described previously (Pacholewicz et al., 2015). In Slaughterhouse A, both *Campylobacter* and *E. coli* concentrations increased after the evisceration process, whereas concentrations did not increase in Slaughterhouse B (Pacholewicz et al., 2015).

2.2. Development of the assessment criteria

A set of assessment criteria for evisceration process control was developed in order to conduct both a documentation analysis and observational study of food handlers. Food handlers included operators responsible for setting and controlling the equipment and post mortem inspectors. The criteria included activities that the food handlers should carry out in order to control the evisceration process and were based on a literature survey and preliminary observations as recommended by Martin, Bateson, and Bateson (1993). Moreover, quality managers were interviewed and the available procedures were analysed. This resulted in fifteen assessment criteria: ten criteria dedicated to operators and the other five dedicated to post mortem inspectors (Table 1). During observations, three scores were used to rate the actions performed by the food handlers: good, sufficient and poor compliance. These scores were prepared based on the notational coding method (Clayton & Griffith, 2004). A criterion was scored as good compliance when the food handlers completed the task in a consistent way within the specified time interval and took sufficient time to perform observations and activities. A sufficient score indicated that food handlers performed the activities as specified by the criteria incompletely, e.g. only a hasty evaluation, or performed actions inconsistently. A poor score was given when the food handler did not perform the tasks or was not present at the production site.

Download English Version:

<https://daneshyari.com/en/article/4559063>

Download Persian Version:

<https://daneshyari.com/article/4559063>

[Daneshyari.com](https://daneshyari.com)