Impact of food safety climate on safety and hygiene output in vegetable processing companies

De Boeck E.1, Jaccxens L.1, Dequidt L.1, Vlerick P.2
1Laboratory of Food Microbiology and Food Preservation (LFMFP), Department of Food Safety and Food Quality, Faculty of Bio-science engineering, Ghent University, Belgium
2Department of Personnel management, Work and Organizational Psychology, Faculty of Psychology and Educational Sciences, Ghent University, Belgium

INTRODUCTION

Up to now scientific research related to food safety focused mainly on analytical methods, food processing technology and product formulations as technological solutions and Food Safety Management Systems (FSMS) as managerial solution to improve the safety status of food products along the food supply chain (Figure 1). However, in practice, a well elaborated and fit-for-purpose FSMS, does not always guarantee the highest level of safety and hygiene and a stable system output (Jaccxens et al., 2015). Human behavior (e.g. the actual execution of procedures), and decision making is influenced by the perceived food safety climate in an organization (Iannas, 2009). In our previous research a definition was already set for food safety climate and culture (Table 1) and a conceptual model was established. Also a self-assessment tool was developed to measure the food safety climate in food companies (De Boeck et al., 2015; De Boeck et al., 2016).

The objective of this study was to compare the food safety climate in two vegetable processing companies with similar size (ca. 90 employees), similar activities (i.e. washing, cutting, assembling and packaging of fresh fruits and vegetables), similar technology and processes and similar level of the FSMS (legal Belgian self checking system and commercial IFS certification). Also the relation between the food safety climate, the FSMS and the actual output of the company (hygiene and food safety) was investigated (= food safety culture).

PURPOSE

MATERIALS AND METHODS

The two vegetable processing companies were screened on their food safety climate by means of 28 indicators of the food safety climate self-assessment survey extended with some questions assessing demographic characteristics. Every employee of the two companies was asked to fill out this survey (total n=88). As such the relation between these variables and the food safety climate perception could be investigated. Also the context riskiness and level of implemented FSMS by application of a self-assessment questionnaire (FSMS-diagnostic instrument (Jaccxens et al., 2015)). Objective data of food safety/hygiene output of the companies were collected by means of microbiological product sampling (n=15 for both companies, analyzed for E.coli, L. monocytogenes, E.coli O157 and Salmonella), environmental sampling (n=15 for both companies, analyzed for L. monocytogenes) and hand swabbing (n=62 for company 1 and n=83 for company 2; analyzed for E.coli). Moreover, as part of the assessment of the food safety/hygiene output all employees were asked to fill out a knowledge and behavior survey to assess their knowledge and behavior concerning hygiene and food safety related matters (n=62 for company 1 and n=83 for company 2). For all the measured variables a ranking was made for the two companies.

The food safety climate score was significantly higher in company 1 compared to company 2 (p < 0.001). This difference was further investigated by looking at the correlation of food safety climate with certain variables (Table 2: Pearson correlation for continuous variables and t-test for categorical variables). The food safety climate was positively correlated with seniority in the current job, seniority in the food industry and conscientiousness. Also, a permanent contract tends to give higher food safety climate scores than fixed term (temporary) contracts.

As expected the results of the FSMS-diagnostic instrument showed that the context riskiness and the level of the FSMS are similar (Figure 2). Context riskiness is for both companies moderate for product and process related context characteristics (assessed score: 2) and low to moderate for organizational and chain related context characteristics (assessed score: 1-2), as both companies are working with the same product and are positioned on a similar place in the chain. The FSMS is based on best practices for the sector for both companies (assessed score: 2). Based on microbiological samples, swabs and the knowledge and behavior survey, it can be stated that also the food safety/hygiene output is on a similar level.

As in company 1 the food safety climate is perceived to be better than in company 2, it is not possible to confirm the relation between food safety climate and the output of the company. However, as the food safety climate is good in both companies (far above average), it cannot be concluded that there is no relation. Possibly the well elaborated FSMS and technology form the main contribution to the food safety and hygiene output of the company. This outcome was also obtained in the previous study in affiliated butcher shops and farm butcheries (De Boeck et al., 2016). In this study, the lower hygiene status of the farm butcheries suggested that a good food safety climate may not be sufficient to counteract the lower level of the FSMS.

RESULTS

Table 2: Correlation of demographic/variable with food safety climate

<table>
<thead>
<tr>
<th>Variable/Variable</th>
<th>Correlation with FSMSclimate</th>
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<tbody>
<tr>
<td>Gender</td>
<td>C (p = 0.273)</td>
</tr>
<tr>
<td>Hours of contact with supervisor/week</td>
<td>C (p = 0.500)</td>
</tr>
<tr>
<td>Seniority in current job</td>
<td>Positive (r = 0.345)**</td>
</tr>
<tr>
<td>Seniority in the food industry</td>
<td>Positive (r = 0.201)</td>
</tr>
<tr>
<td>Conscientiousness</td>
<td>Positive (r=0.499)**</td>
</tr>
<tr>
<td>Type of contract</td>
<td>Permanent contract better climate than temporary contract (r = 0.881)</td>
</tr>
</tbody>
</table>

Figure 1: Evolution of research focus towards food safety climate (based on Wright et al. 2012)

Figure 2: Relative ranking of the two vegetable processing companies (VC1 and VC2) included in the case study for their context riskiness, food safety management system (FSMS), food safety climate and food safety/hygiene output. Product/Process: product and process related context characteristics; Org/Chain: organization and chain related context characteristics. Between parentheses mean and standard deviation are given for the total food safety climate score (28–140), assigned scores for context, FSMS (0–3) and sum of the rankings of the sub dimensions (product, environment, handwashes and survey) for food safety/hygiene output (4–8).

Table 1: Definitions food safety climate and food safety culture (De Boeck et al. 2015)

<table>
<thead>
<tr>
<th>Food safety climate</th>
<th>Food safety culture</th>
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<tr>
<td>Employees’/Shared perception of the leadership, communication, commitment, resources and risk awareness concerning food safety and hygiene within their current work organization</td>
<td>Food safety culture perceived by the employees and the managers of a company (so called ‘human route’) and the context in which a company is operating, the current implemented FSMS, consisting out of control and assurance activities (so called ‘technical-rout’), resulting in a certain (microbiological) output</td>
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Significance

It was not possible to see a clear effect of the food safety climate on the output as the good output level could be a consequence of the good technology and elaborated food safety management system (ceiling effect). However, the study showed some interesting relations between the different variables measured.

Further research

The role of personal characteristics such as conscientiousness, motivation and personal wellbeing (e.g. job stress), in the relation between food safety climate and microbiological hygiene and safety needs to be further investigated. Also, a quantitative study is running to assess the food safety climate in the Belgian food processing industry.

References


For more information:
Tel. +32 9 264.99.02
Fax +32 9 225.55.10
E-mail: Ellen.deboeck@UGent.be