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Interplay between food safety climate, food safety management system and microbiological hygiene in farm butcheries and affiliated butcher shops

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ABSTRACT

Human behavior and decision-making of employees can be influenced by the food safety climate prevailing in an organization. Four farm based and four affiliated centrally managed butcheries were screened on their food safety climate and level of implemented food safety management system, by application of self-assessment questionnaires. Besides, by product and environmental microbiological sampling, objective data on hygiene status were collected. The food safety climate was scored significantly higher in the centrally managed butcher shops compared to the independent small scale farm butcheries, mainly for the components 'leadership' and 'communication' while 'risk awareness' and 'commitment' were equally evaluated. Food safety climate' component 'resources' was perceived higher in the affiliated butchers shops, but not statistical significant. The study demonstrated that affiliated butcher shops are able to achieve a better microbiological hygiene and safety status, because both a well-elaborated food safety management system and a favorable food safety climate is present in the affiliates. While in the investigated farm butcheries, the overall lower hygiene and safety status is likely to be related to their lower food safety climate score in combination with a more basic food safety management system. This semi-quantitative case study revealed that employees' perception of a favorable food safety climate in combination with a fit-for-purpose food safety management system is likely to result in a good and stable microbiological output in food companies.

1. Introduction

Europe houses a wide range of food companies (Dora, Kumar, Van Goubergen, Molnar, & Gellynck, 2013). On the one hand, globalization results in formation of multinationals, on the other hand more than 90% of the European food companies are small and medium enterprises (SME's) (FoodDrinkEurope, 2014). In certain sectors also micro scale companies are numerous (e.g. traditional dry sausage producers in Northern Italy (Conter et al., 2007) and (raw milk) cheese producers in Greece and Italy (Campolo, Romeo, Attina, Zappala, & Palmeri, 2013; Panagou, Nychas, & Sofos, 2013)). An increasing trend in short food chains is occurring with typical examples such as dairy or meat farms hosting also processing and selling activities to the (local) consumers. Health and sustainability concerns motivate consumers to look for high quality foods, meaning fresh, tasteful, nutritionally qualitative and safe food, and sales direct from the source. The face to face or proximate contact between the grower/producer and the consumer is a typical characteristic of these short food chains (Uyttendaele, Herman, Daeseleire, Huyghebaert, & Pussemier, 2012). The fact that the persons in charge are engaged in multiple simultaneous assignments and the lack of profound knowledge or technically qualified personnel in the short food chain to assess the risks associated with their products may put a challenge to manage food safety (Conter et al., 2007; Uyttendaele et al., 2012). Nevertheless, both small and large companies have to fulfill the same (legal) requirements to obtain safe and hygienic food products (e.g. CAC., 2003; EC., 2002). However, it is stated that certain flexibility is possible for smaller

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food companies in order to ease the burden of administration and implementation of rules for these companies (CAC., 2003; EC., 2002). But the question here remains whether this flexibility and lack of knowledge and technically qualified personnel may pose a greater risk for foodborne disease, especially when working with, for example, raw meat which is a quite risky product from microbiological perspective. Still, the implementation of a FSMS is more challenging for small and medium sized food enterprises mainly due to a lack of resources, competencies and diseconomies of scale in small scale food production units (Antony, Kumar, & Labib, 2008; Dora et al., 2013; Walker, Pritchard, & Forsythe, 2003). For example, Walker, et al. (2003) mention lack of time and expertise as a barrier for adequate implementation of Hazard Analysis Critical Control Points (HACCP). Lack of knowledge and expertise was also identified by Conter et al. (2007) in the traditional dry sausage manufacture in Northern Italy. A cross-European study of Luning et al. (2015) demonstrated that some small and medium enterprises manage to have an advanced food safety management system, and achieve an appropriate safety level of their produced products. However, their typical organizational characteristics such as less resources (educated staff, laboratory facilities, time), more restricted formalization (restricted use of procedures and formal meetings), limited information systems, but more stable workforce, might require more tailored support from government and/or sector associations to develop towards advanced systems in the case of high-risk products and processes such as meat, fish and dairy production. This was also concluded by Oses et al. (2012a) in their study in the lamb chain. The small butcher shops lacked specific food safety expertise and formalization and information systems were restricted. However, also in these butcher shops the variability of the workforce was low and a high degree of employee involvement was reported.

It can be presumed that in smaller companies, more commitment is present from management (often the owners of the company or family businesses) and the small group of employees, because they are more concerned on values as taste, nutrition, quality and safety (Berlin, Lockeretz, & Bell, 2009; Herman, Heyndrickx, De Reu, Van Coillie, & Uyttendaele, 2012; van der Merwe, Venter, & Farrington, 2012). Also, personal contact with the customer can motivate employees towards a larger responsibility and commitment (Herman et al., 2012). Recently, food safety climate/culture was introduced as the human dimension in governing food safety in a food company (Griffith, Livesey, & Clayton, 2010; Powell, Jacob, & Chapman, 2011; Yiannas, 2009). It was proposed that the food safety culture prevailing in the company can influence the human behavior (e.g. actual execution of procedures and tasks) and decision-making of employees. In previous research (De Boeck, Jacxsens, Bollaerts, & Vlerick, 2015) a distinction was made between food safety climate and food safety culture. Food safety climate can be considered more temporal and more subject to the perception of individual employees of an organization or company. The temporal aspect is actually embedded in the fact that climate is dealing with perceptions. We consider a perception as something temporal, which is very depending on the moment at which it is measured. Food safety culture is then the overarching framework of which food safety climate is a component. This framework forms the context for the creation and maintenance of food safety perceptions, attitudes and beliefs, which is more persisting through time (De Boeck, Jacxsens, Bollaerts & Vlerick, 2015). As such, food safety culture was defined as the interplay of the food safety climate 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 *'techno-managerial route'*), resulting in a certain (microbiological) output, being the safety and hygienic status of the food products, production environment and hands of the workers. Specifically, food safety climate was defined as employees' (shared) perception of leadership, communication, commitment, resources and risk awareness concerning food safety and hygiene within their current work organization. A self-assessment tool to measure the food safety climate in companies was developed and validated by De Boeck et al. (2015).

The objective of the present manuscript is to investigate whether there is a difference in food safety culture between micro scale farm butcheries, exemplifying a short food chain, and affiliated butcher shops, all being affiliates of one large scale centrally coordinated meat distribution company, representing the conventional food chain. Therefore, in parallel to questionnaires assessing the food safety climate and performance of the food safety management system, also samples were taken of both minced beef meat and production environment and analyzed for selected pathogens and hygiene indicators to obtain information on the actual level of microbiological quality in the companies included in the case study. As such the food safety culture of both types of butcheries could be evaluated and compared. This in-depth work is considered as a semi-quantitative study.

2. Material and methods

2.1. Assessment of company characteristics and production process

Micro scale farm butcheries (<10 employees (EC., 2003)) are considered as short chain butcheries (n = 4, indicated as FB). FB1 consists of one owner/butcher and one shopkeeper, FB2 of two owners, a butcher and a shopkeeper, FB3 of three owners and seven butchers/shopkeepers and FB4 of one owner and three butchers/shopkeepers. The four participating affiliated butcher shops, all being affiliates of a large scale central coordinated meat distribution company, are uptaken as conventional chain butcher shops (indicated as AB). The large scale meat distribution company employs >1000 employees, spread over different affiliates in Belgium, with in each affiliate five to ten employees. Cooperation to this research was upon voluntary basis and the involved butcheries are therefore not representing the whole meat distribution sector in Belgium. The short chain farm butcheries implemented legal required good practices and self-checking system for small scale butcheries, receive inspections from the Belgian food safety authority but did not have a formal certified food safety management system. Whilst the affiliated butcher shops have HACCP in place and a certified self-checking system for conventional butcheries required in Belgium (EC., 2004a; KB., 2003). In addition, the large scale meat distribution company has a central quality department (four persons) with a quality manager to support its affiliates. The method for the preparation of the raw minced beef meat is quite similar in all investigated short chain butcheries. Meat from carcasses or parts of carcasses of own bred cows, after being slaughtered in a slaughterhouse, are minced and stored in trays in a cooling unit. Only FB3 sells the products vacuum packed and frozen. The affiliated butcher shops start with carcasses and prepackaged meat parts which are centrally purchased from suppliers and delivered on a daily basis to the affiliates. No other ingredients are added to the raw minced beef meat. Also, the minced beef meat was stored no longer than 24 h in refrigerated conditions neither in the farm butcheries nor in the affiliated butcher shops.