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Performance of safety management systems in Spanish food service establishments in view of their context characteristics

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ABSTRACT

Food service establishments (FSE) operate under restricted technological and organisational circumstances, making them susceptible to food safety problems as reported frequently. Aim of this study was to get insight in Food Safety Management System (FSMS) performance in different types of FSE in view of their context characteristics. Assessment of fifty Spanish FSE indicated that all work with high-risk products and processes, are at a vulnerable chain position, provide different organisational support, and adapted differently their FSMS to their high-risk context. Hierarchical cluster analysis showed four clusters of FSE differing in organisational characteristics and FSMS activity levels. The largest cluster, including all small restaurants, showed lowest FSMS performance levels and limited organisational support, i.e. lack of safety expertise/support, restricted requirements on operator competences, limited training, restricted employee involvement, and no formalisation. Overall, they apparently did not use sector guidelines or any expert knowledge to design their FSMS. However, some crucial control measures (like cooling and cooking) performed at an average level; they use professional equipment with known capability with only sometimes unstable performance. Only a small cluster of FSE provided supportive organisational conditions and their systems perform at an average to advanced level. They invested in best available equipment, some tested and adapted to their circumstances, and acquired expertise support to design and independently evaluate their system. FSE with insufficient organisational conditions suffer both a risky context and low activity levels of control and assurance activities, which increases the risk of insufficient safety of meals served. The insights of this study could support food authorities to target their attention to specific groups of FSE and enhance supporting activities.

1. Introduction

Nowadays, Food Service Establishments (FSE) in Europe must comply with strict food legislation, that requires them to have a Food Safety Management System (FSMS) in place (852/2004 EC Regulation). Various studies demonstrated that implementation of FSMS in FSE indeed improved safety of meals served (e.g. Cenci-Goga et al., 2005; Doménech, Amoros, Pereze-Gonzalvo, & Escriche, 2011; Osimani, Aquilanti, Babini, Tavoletti, & Clementi, 2011; Soriano, Rico, Moltó, & Mañes, 2002). However, FSE still seem an important source of foodborne outbreaks, with a reported occurrence of 29% in industrialised countries (WHO, 2007). According to Jones, Parry, O'Brien, and Palmer (2008a), catering businesses continue to be the most common setting for foodborne disease outbreaks in England and Wales. In a study in Spain, 37% of the gastroenteritis outbreaks studied in the period 2004–2005 were due to collective catering (Dominguez et al., 2008). Also in the US, the growing number of foodborne disease outbreaks and studies of sporadic (non-outbreak-associated) gastrointestinal diseases suggest that eating food prepared in restaurants is an important source of infection (Jones & Angulo, 2006). A number of studies indeed found unacceptable high counts of pathogens and hygiene indicators in products served in food service establishments (e.g. Fontanarosa, Novello, Conversano, Musti, & Tantillo, 2004; Giraudon et al., 2009; Guida, Marino, Buonaguro, & Melluso, 2006). Above studies, underline that food safety output of FSMS in food service establishments is still variable. Research on implementation of food safety practices in FSE pointed out typical system

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deficiencies, such as poor compliance to hygiene procedures, lack of monitoring activities, restricted use of measuring equipment, inadequate heating and cooling practices (Clayton, Griffith, Price, & Peters, 2002; Eves & Dervisi, 2005; Osimani et al., 2011; Worsfold, 2001).

However, various authors argued and demonstrated that the safety output of an implemented FSMS is not only dependent on the performance of system activities, but also on the context wherein it operates (Luning, Jacxsens et al., 2011; Luning, Marcelis et al., 2011; Sampers, Toyofuku, Luning, Uyttendaele, & Jacxsens, 2012). Context factors are situational characteristics of the system environment that are not (easy) changeable but affect the food safety output, and thus entail requirements on the system (Luning, Marcelis et al., 2011). The authors hypothesised that companies or establishments that operate in a high-risk context require an advanced FSMS to be able to realise a good food safety output, whereas in a low-risk context more simple systems would be sufficient. Major context factors affecting FSMS activities include characteristics of respectively products, production processes, organisation, and chain environment (Luning & Marcelis, 2007; Luning, Marcelis et al., 2011). Safety management systems in FSE commonly operate in a context, which is different from food manufacturing industries. For example, they have to manage a high assortment of meals that must be prepared partly in advance, often in the same area, with pressure of time, and the number of clients is usually not known in advance (Chinchilla, 2009; Sun & Ockerman, 2005; Worsfold, 2001). These typical context characteristics may entail demands on safety management systems of FSE and affect food safety output.

The main objective of this study is to get an insight in the performance of food safety management systems in different types of food service establishments, in view of their context characteristics. Moreover, we discussed the usefulness of previously developed diagnostic tools for assessment of FSMS performance in food service establishments.

2. Materials and methods

2.1. Characterisation of participating food service establishments

Fifty FSE located in the area of Burgos (Spain) participated in the study. The group consisted of 4 residence halls, 10 hotels, and 36 restaurants. Table 1 summarises the workforce and menu characteristics, and their maximum capacity. The participants in the group represent the major types of FSE in Spain. Residence halls for students are typical because they deal with a constant capacity and have a fixed menu. The hotels have different sizes and capacities varying from 150 to 1200 customers per day, but are commonly full during the weekends; meals are prepared for groups and clients typically request the menus in advance. The restaurants include ones that belong to a chain, tapas restaurants, 'ala carte' and fixed menu restaurants, and student cafeterias. All restaurants (except the ones that belong to a chain) are micro enterprises with less than 10 employees.

2.2. Diagnosis of performance of Food Safety Management System activities

Previous diagnostic tools were used for assessment of performance levels of core control and assurance activities in implemented FSMS, separate from quality assurance standard(s) and or guideline(s) used for system design. The tools involve sets of indicators to analyse design of preventive measures (8 indicators), design of intervention processes (3), design of monitoring systems (7), and actual operation of control strategies (7), i.e. core control activities (Luning, Bango, Kussaga, Rovira, & Marcelis, 2008). Likewise, it includes indicators to analyse core assurance activities, i.e. setting system requirements (2 indicators), validation (3), verification (2), and documentation and record keeping (2) (see Table 3) (Luning et al., 2009).

Each indicator has an assessment grid including four situational descriptions corresponding with respectively, a low (score 0), basic (score 1), average (score 2), and advanced (score 3) performance level. Score zero represents that an activity is not possible/applicable (e.g. when products are eaten raw an intervention process is not applicable), or is not applied/not done although it is possible (e.g. calibration of equipment), or is unknown (e.g. in case of lack of information on actual operation of control activities). The basic level (score 1) for control activities is typically characterised by aspects like, use of own experience, use of general knowledge, ad-hoc analysis, incomplete methods or programmes, not standardised equipment/facilities/methods, and unstable equipment performance in actual operation. The basic level for assurance activities is typified by being problem driven, only checking and no analysis of collected data/information, lack of reporting, data/information are evaluated by own people, no independency. The average level (score 2), for control activities is characterised by use of expert (supplier) knowledge, (sector, governmental) guidelines, best practices, best available equipment, standardised methods, and sometimes having variable equipment performance but with known causes. For assurance activities, the average level corresponds with active approach, additional analysis of records, regular reporting and documentation, expert support, independency in system evaluation. The advanced level (score 3) of control and assurance activities is typified by use of scientific knowledge/evidence and specific information, applying critical analyses, procedural methods and systematic activities, use of independent positions (Luning et al., 2008, 2009).

In advance, the QA responsible of the FSE had to define major meal preparation processes that are most critical for their FSMS (i.e. representative meal-preparations) in order to position performance levels of their safety management activities. For each FSMS activity was assessed which situation description was most archetypal for the FSE, using supporting questions. To illustrate for the indicator 'adequacy of cooling facilities', the question is asked: "at which level would you place the cooling facilities relevant for your representative meal preparations?" The corresponding grid includes following four descriptions. Situation 1: cooling facilities not used. Situation 2: use of domestic/general cooling facilities, principal cooling capacity is unknown, no testing of product temperature. Situation 3: use of professional cooling facilities, information about principal cooling capacity obtained from suppliers, no testing of product temperature for different circumstances. Situation 4: professional cooling facilities adapted and tested for FSE's specific production circumstances, capacity tested by temperature check of both environment and products for different circumstances. For each indicator we provided supporting statements (i.e. "when…..then situation 2 or 3, crucial for situation 3 is that…..") to enable differentiation between situation three (moderate) and four (advanced); low and basic levels were obvious for the respondents.

2.3. Diagnosis of context riskiness

The instrument also comprises 16 indicators to analyse the context factors product & process characteristics (5 indicators), organisation (7), and chain-environment (4) characteristics (listed in Table 3). These factors together comprise the FSMS context. A context factor is a structural element(s) of a situation that affects decision-making activities in the FSMS and its food safety output