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Documenting HACCP in a small restaurant – a practical approach

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RESEARCH ARTICLE

Abstract

The documenting of hazard analysis and critical control point (HACCP) principles must be flexible due to the specific conditions in small catering facilities. This paper analyses a short, simple format of selected parts of the HACCP documentation system based on a simplified product description and the process packs and hazard analysis sheet in a typical small restaurant. The development process of HACCP documentation in a small restaurant presented in this paper considerably reduces the volume of HACCP documentation. This is due to a shortened product description and the introduction of the process packs concept, without affecting the identification of any critical control points and control points important for the safety of dishes being prepared. Moreover, the paper presents limitations of the presented simplifications, the most important of which include the proficiency and experience of the persons developing the HACCP documentation. The author emphasises that an important factor in the effectiveness of the proposed solutions is cooperation with regulatory food safety inspectors, who should be frank and flexible in their approach to the Codex HACCP principles.

Keywords: HACCP, catering, food safety, process packs, small businesses

1. Introduction

Even though the number of catering establishments in Poland in recent years has decreased from 92,072 in 2005 to 65,508 in 2014 (Anonymous, 2015; CSO, 2015), the catering industry is still an important part of the Polish food industry. The catering industry in Poland mainly comprises restaurants and cafés/bars (making up more than 60% of all catering facilities in 2013) largely existing as small enterprises (more than 95%).

Until 2001, the current system of mandatory application of the Codex hazard analysis and critical control point (HACCP) principles (CAC, 2009) in Poland was an obligatory requirement only during the manufacturing of dietetic foodstuffs (RP, 1996). Since 2001, the HACCP principles have been required by Polish food law to implement the principles gradually in large, medium and small-size food businesses (RP, 2001, 2003). Finally, after accession of Poland to the European Union in 2004, the Codex HACCP principles became obligatory in all Polish food businesses according to Regulation (EC) No. 852/2004 of the European Parliament and of the Council (EU, 2004).

In Poland, in 2014, the National Sanitary Inspection (NSI) services covered 78,768 open mass catering facilities (i.e. restaurants, cafés, bars) and 41,055 closed mass catering facilities, i.e. hotels, hospitals, canteens (schools, day care centres, residential homes, prisons) and street vendors (CSI, 2015). Among the open facilities, small catering facilities represented up to 56% of the facilities (CSI, 2015).

In most of the large and medium-sized Polish food processing plants, the Codex HACCP principles were implemented voluntarily many years before accession to the EU in 2004. The catering industry, along with many small and less-developed food businesses (SLDFBs), were among the last to implement the HACCP principles. This resulted from a lack of documentation models to implement HACCP effectively under SLDFBs conditions, mostly due to the economic and technical limitations in this specific group of food businesses (Dzwolak, 2014; FAO/WHO,

2006). It proved difficult to effectively apply the HACCP principles in many catering businesses using HACCP system documentation models which had been applied for years in large and medium-size food processing plants (Dzwolak, 2016).

According to the data from the Chief Sanitary Inspectorate, among all food businesses and catering businesses subject to National Sanitary Inspection, in 2013 up to 78.33% implemented good manufacturing practice/good hygienic practice (GMP/GHP) principles, while 45.37% implemented the HACCP principles (CSI, 2015). This high level of implementation is because sanitary inspectors do not assess actual implementation or effectiveness of GMP/GHP and HACCP in the inspected businesses. This evaluation was based on finding that a business possesses HACCP and GMP/GHP documentation, which is not equivalent to the implementation and application of Codex HACCP principles (Mortimore and Wallace, 2013).

In small and less-developed catering businesses, there are very specific conditions that make it difficult to implement the HACCP principles as practiced in food processing plants. These factors include the great diversity and complexity of raw materials/components/produced meals and used recipes, high staff turnover, financial resource constraints, the great variety of operations, low level of knowledge of the staff concerning food safety (lack of or insufficient training), lack of technical support and lack of expert knowledge (FAO/WHO, 2006; Fielding *et al.*, 2011; Luning *et al.*, 2013; Seward, 2000; WHO, 1999Worsfold and Griffith, 2003). Extensively developed HACCP documentation has been indicated as one of the most important constraints during implementation of the HACCP principles in SLDFBs (Dzwolak, 2014; Mitchel, 1998; Violaris *et al.*, 2008). Adequate HACCP documentation covering specific catering conditions is recognised as an important factor in the successful adoption of HACCP principles to catering businesses (Dzwolak, 2014, 2016; Mitchell *et al.*, 2007; Shih *et al.*, 2011; Stedefeldt *et al.*, 2013).

Although the available literature includes scientific papers concerning the implementation of HACCP and food safety principles in catering (Bata *et al.*, 2006; Garayoa *et al.*, 2011; Gramza-Michalowska *et al.*, 2011; Soriano *et al.*, 2002), there are no specific guidelines on hazard analysis in catering businesses which are sufficient to develop the HACCP plan in catering facilities on their own (Gramza-Michalowska *et al.*, 2011). However, there are publications describing a flexible approach to the HACCP principles in catering, e.g. those established in the Salford model (FSA, 2006). Despite the proven effectiveness of this model (Taylor, 2008), since it is not applied in non-English-speaking countries it is necessary to search for any possible modifications of the classic approach towards documenting of HACCP principles in small catering businesses (Dzwolak, 2014; Mortimore and Wallace, 2013).

Some guidelines for catering and food service have been available for years (Anonymous, 1995, 2008; CAC, 1993; FSA, 2015; IFST, 1992), but they are too general and they present very limited information on practical hazard identification and control measures. On the one hand, these guidelines are very good as a starting point, but when developing a specific and accurate HACCP plan in small catering and/or food service establishments, more specific guidance is needed. In this context, any example of the HACCP plan developed for specific catering conditions would be beneficial for the common implementation of the Codex HACCP principles in all small catering businesses (Dzwolak, 2014).

The objective of this study was to develop and discuss a simple and short format of selected parts of HACCP documentation based on a simplified product description (catering service description), flow diagrams (the process packs; PPs) and the hazard analysis sheet in the context of a flexible approach to documenting the Codex HACCP principles in a typical small restaurant.

2. Materials and methods

The subject of the study was the food safety management system in a small restaurant, based on the Codex HACCP principles (CAC, 2009). The methodology consisted of an analysis of the HACCP plan existing in the restaurant, as well as on direct observation and analysis of catering processes. The obtained information was transferred into the new form of a brief HACCP plan based on the PPs (Dzwolak, 2014).

The modifications included the replacement of classic flow diagrams by the PPs. The PPs map was the basis for the new hazard analysis, covering classic and new food safety hazards (e.g. acrylamide and acrolein), to which relevant control measures were attributed. Afterwards, determination of the critical control points (CCPs) and control points (CPs) was carried out by assessment of the hazard significance based on a simplified failure mode and effect analysis approach. The genuine CCPs have been defined according to the Codex HACCP guideline (CAC, 2009) as steps at which controls can be applied and are essential to keep food safety hazards at acceptable levels. Steps at which some specific significant hazards existed but where the control must not be applied for food safety (Mortimore and Wallace, 2013) were defined as CPs. It is worth noting that a key attribute of the CP is that the frequency of control measure monitoring is not sufficient to assure current corrective actions (Gaze, 2009).

The level of the significance for every hazard has been expressed as a significance index (SI), using such criteria of assessment as the severity of the hazard (S), frequency (F) and growth of the hazard in subsequent PPs or operations (G). To each of the criteria, one of three levels was attributed: low – 1, middle – 2 and high – 3. The SI value (S×F×G), which indicates the level of the risk, was also used for CCP/CP determination (CCP: SI≥18; not CCP (CP): 2<SI<18; not significant hazard: SI≤2).

Part of the documentation relating to monitoring CCPs/CPs and describing corrective actions was described in the traditional way according to internationally-recognised practices (CAC, 2009; Mortimore and Wallace, 1998, 2013). Therefore, this unmodified part of HACCP documentation was excluded from the scope of the study.

The research related to selected HACCP system documentation areas was carried out from July to September 2013. Following the implementation of PPs and the modified part of the HACCP plan, the system was monitored for the next 14 months, when systematic routine audits and independent official NSI inspections were carried out.

3. Results and discussion

Product description

A traditional product description presenting all of the properties that determine food safety (CAC, 2009; Gramza-Michalowska *et al.*, 2011) is of low practicability as concerns mass catering due to the very wide range of dishes produced (Dzwolak, 2014; Mortimore and Wallace, 2013). In catering facilities, a description of a catering service can be used instead, including all the information important for food safety (Dzwolak, 2014). In a restaurant, classic characteristics of products/product groups were replaced with the characteristics of a catering service (Table 1). Consequently, instead of 18 initial characteristics of meals and meal groups, the information necessary to conduct a hazard analysis was included in one document (Table 1).

Such a reduction in HACCP system documentation is of key importance in small catering facilities, where an excess of documentation is a basic factor that makes it difficult for the HACCP principles to be applied effectively (Mortimore and Wallace, 2013; Walker and Jones, 2002).

Flow diagram and process packs

As per the definition given by CAC FAO/WHO (CAC, 2009), a flow diagram may be drawn using any technique, i.e. as a flowchart described under the ISO 5807 standard (ISO, 1985) and as modular flow diagrams with or without process parameters (CAC, 2009; Dzwolak, 2014; Wallace *et al.*, 2010). These methods of graphic presentation of the sequence of stages/operations, including material flow (raw materials, ingredients, packages, waste, etc.), have been commonly used for many years in the agro-food sector (Anonymous, 1995; CAC, 1993, 2009; Gramza-Michalowska and Korczak, 2008; Mortimore and Wallace, 1998). For the catering industry, where there is a high number of production steps and operations and range of raw materials used and dishes produced, the classical modular flow diagrams for individual products or product groups are inconvenient to prepare and update, especially in small catering facilities (Dzwolak, 2014).

During a documentation review carried out in the restaurant, over ten detailed flow diagrams were identified. They were developed for defined processes and groups of catering products (Table 2). Developing flow diagrams separately for every prepared meal is a quite common practice in many Polish catering businesses, causing a fundamental hindrance for effective HACCP implementation in catering. Such practices are caused by many factors, but misleading HACCP publications (Wallace *et al.*, 2012) seems to be a key factor, especially where such guidelines were never verified by practitioners and/or HACCP experts.

The PPs developed in the analysed catering business are presented in Figure 1. The PPs-related concept also was presented earlier in some HACCP guidelines (Anonymous, 2008; IFST, 1992;) and HACCP books (Mortimore and Wallace, 2013) where the authors described specified modules in one diagram, but it was eventually developed into several extended flow diagrams. In this work, the PPs map, constructed as a relation diagram (Oakland, 2005), was the only module for developing the HACCP plan. Such approaches and other examples of simplified food safety systems (Taylor, 2008) are sometimes criticised as being overly simple (Mortimore and Wallace, 2013) and some hazards may be overlooked. As was emphasised in an earlier work (Dzwolak, 2014), such simplification requires great experience and knowledge of the team developing the PPs and hazard analysis. It must also be pointed out that even when the HACCP team is not experienced enough, validation as part of the verification process (principle 6) should be done (Anonymous, 2008; CAC, 2009). As long as the HACCP plan validation is aimed at correction of the HACCP plan by elimination of errors, the risk of incomplete hazard analysis using PPs is negligible. Even so, to minimise the risk of incomplete hazard identification during hazard analysis, it is very useful to specify the detailed operations and other additional information needed to correct hazard identification in every PP (Figure 1).

Table 1. Catering service description.

<table>
<tr><td colspan="2">Applied raw materials and ingredients
Raw materials (meats, eggs, vegetables, fruits, mushrooms), ready-to-eat foods (sausages, milk products, dumplings, bread and baked goods), frozen foods (meats, fish, fruits, vegetables, dumplings, burgers), dried goods (flour, groats, rice, pastas, sugar, salt, spices, powdered soups/sauces), liquid goods (oils, vinegar, sauces), canned foods (meats, fruits, vegetables, mushrooms).</td></tr>
<tr><td>Scope of activities
In kitchen facilities, the following activities/processes are executed:
ordering and transport of raw materials, additives, half-products and products to make dishes and drinks;
preparation of raw materials, additives, half-products and food products;
preparation of dishes and drinks;
preparation for issuing and serving finished dishes and drinks;
washing and disinfection of tableware, cutlery, trays, as well as kitchenware and kitchen appliances.</td><td>Prepared meals
Catering service comprises starters, soups, main dishes and desserts, served warm and/or cold. The products are served as breakfasts, lunches, dinners and suppers.
Dishes and drinks (non-alcoholic) are made based on own recipes and recipes available from the chef and cover the following product groups:
meat dishes;
meatless dishes;
flour dishes;
potatoes, groats, rice, pasta;
soups;
eggs;
dairy products;
cured meats;
mixed dishes (meat and flour, meat and vegetable);
bakery products;
cold and hot drinks;
fresh vegetable salads;
fruits.</td></tr>
<tr><td>Preparation of meals
Dishes are prepared in hygienic conditions according to kitchen instructions (Instruction Manual). All activities related to preparation of dishes are presented as process packs included in the HACCP manual. Raw materials and ingredients are collected from kitchen storage and moved directly to the kitchen premises. Pre-treatment (washing, peeling, etc.) is carried out in separate workplaces or premises.
Prepared dishes are directly served to the customers in a restaurant, and some dishes (meat patties, dumplings, etc.) are stored in refrigerators or in frozen storage according to good manufacturing practice/good hygienic practic instructions.</td><td>Serving and plate waiting
Dishes and drinks are served on an on-going basis by the serving staff. In the summer season, dishes can be served outside of the dining room. Dirty tableware and cutlery are returned by the serving staff to the dishwashing area and subjected to washing and thermal disinfection in a chamber dishwasher.</td></tr>
<tr><td colspan="2">Considered hazards
Pathogenic microorganisms (presence, cross-contamination, growth, surviving thermal treatment).
Chemical contamination (presence, cross-contamination, reactions during thermal treatment).
Foreign bodies (presence, cross-contamination, failures during food preparation).</td></tr>
</table>

Hazard identification

All hazards identified in the developed PPs (Figure 1) are summarised in Supplementary Table S1, where a source or a cause of food safety hazards was also added.

In the catering process under study, several microbial hazards were identified, including: vegetative and spore-forming bacteria, moulds as well as pathogenic viruses and parasites originating from raw foods (meats, eggs, fish, etc.) and parasites resulting from cross-contamination (via hands, food contacted surfaces and kitchen utensils). Microbial contamination resulting from a lack of personal hygiene and hand-washing, as well as from infestation and ineffective cleaning were also considered. The hazards have been described previously in numerous papers related to biological hazards occurring in food service and catering operations (Anonymous, 1995; FDA, 2006; IFST, 1992; Mortimore and Wallace, 2013).

Concerning pathogenic bacteria, hazards resulting from the potential growth of these microorganisms under conditions where the temperature is out of control as a result of non-compliance with refrigeration conditions, food heated by sunlight or due to unjustifiable delays during meal

Table 2. List of flow diagrams for grouped meals identified in the studied catering establishment.

Receiving and storage of materials.
Preparation of raw eggs.
Pre-preparation of fruits and vegetables.
Pre-preparation of raw meats.
Pre-preparation of fish and seafood.
Pre-preparation of ready-to-eat products.
Pre-preparation of bread and baked goods.
Preparation of raw salads.
Preparation of soups and sauces.
Preparation of flour-based meals (dumplings, pancakes, etc.).
Preparation of meat-based meals.
Preparation of mixed meals.
Preparation of starters.
Preparation of additives (potatoes, pastas, rice, groats, etc.).
Preparation of desserts.

preparation or display were also taken into consideration (IFST, 1992).

During the heat treatment of starch products at a temperature above 120 °C, a considerable amount of hazardous acrylamide is formed, especially when baking, frying or grilling (Claus *et al.*, 2008; Da Cunha *et al.*, 2008; JECFA, 2005). Considering the recent Commission guidelines (EU, 2013), according to which member states should aim to determine the scope within which food manufacturing facilities apply known control measures to enable acrylamide level minimisation, this hazard was also taken into consideration.

Moreover, emerging chemical hazards formed during heat treatment include acrolein, which is a product of the thermal decomposition of milk fat, formed under prolonged heating of butter or dehydrated milk fat at temperatures above 130 °C, e.g. during pan frying (Drozdowski, 2007).

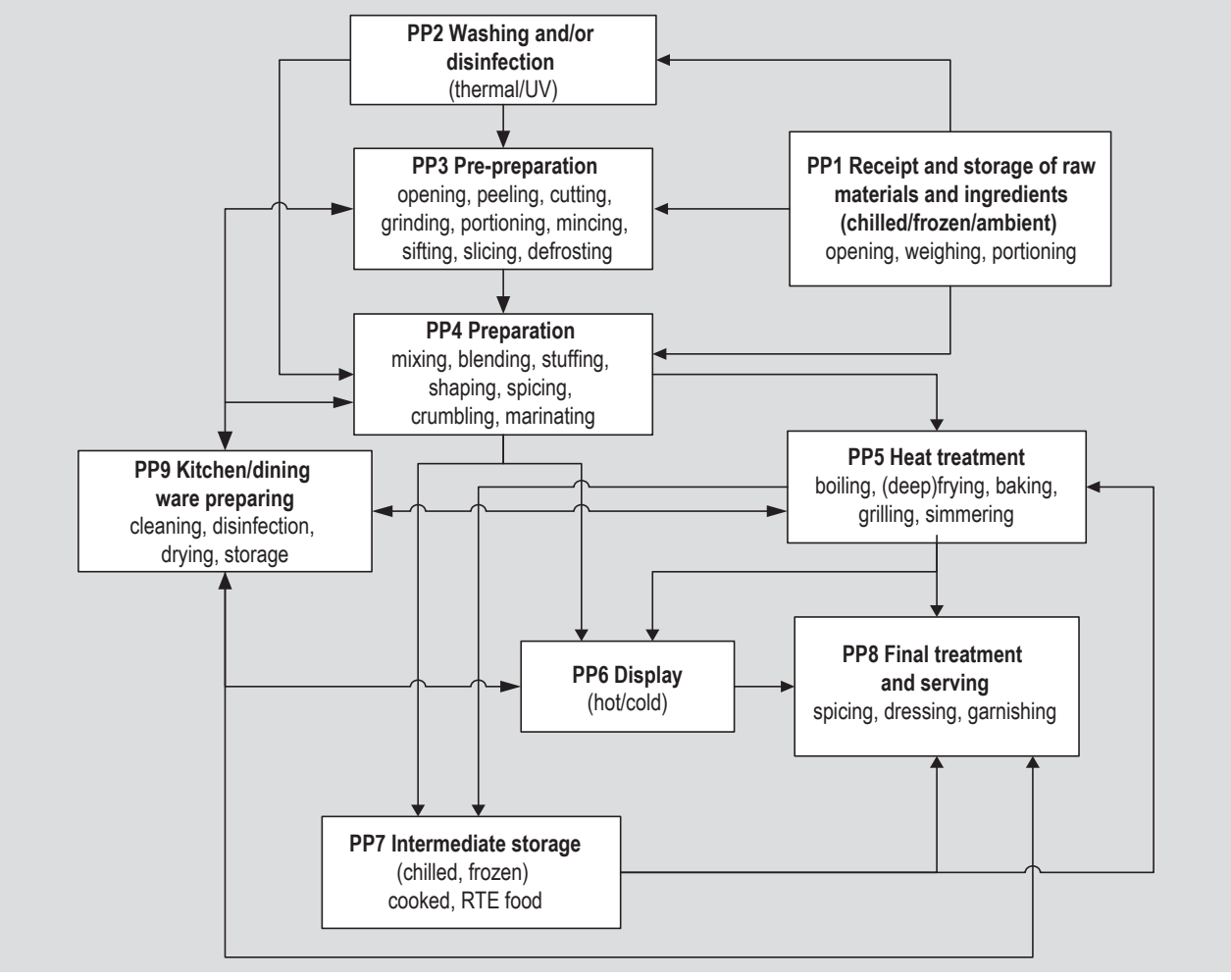

Figure 1. Process packs (PPs) for food service and catering operations.

These chemical hazards also include contaminants such as food allergens and residues of chemicals used for washing and disinfection. In relation to food allergens during hazard analysis, two groups of allergen hazards were considered: allergenic ingredients and allergens resulting from cross-contamination (Anonymus, 2012; Dzwolak, 2017; Mortimore and Wallace, 2013).

In spite of the existing internationally-recognised HACCP guidelines (Anonymous, 2008; Codex, 2009; NACMCF, 1997), assessment of the food safety hazards still remains the main area of difficulty for HACCP teams (Wallace *et al.*, 2014). In the restaurant analysed for the assessment of food safety hazards, three criteria were applied (see: Materials and methods), which were also used to determine CCPs/CPs. Consequently, three CCPs and thirty-one CPs (Supplementary Table S1) were identified from the specific conditions occurring in the restaurant which were consistent with CCPs/CPs determined in the initial HACCP plan worksheet used in the restaurant. As the hazard significance is specific for an individual catering site and personnel, it can fluctuate among different catering businesses and countries.

Physical hazards in the form of foreign bodies mostly included chips of metals formed due to mechanical damage (nicking) of kitchen knives or working elements of kitchen appliances (meat grinders, blender, etc.). In this group of hazards, foreign bodies such as personal items (earrings, rings, hairpins, etc.) were also taken into account.

Although in this paper the hazard analysis sheet was developed in a classic table form, this part of the HACCP plan was considerably reduced (by 65%) compared to the initial version due to the introduction of the PPs concept. Such a considerable reduction within this documentation area is of key importance for successful implementation of the HACCP principles, especially in small food service and catering establishments.

It is well-recognised by some practitioners (Wallace *et al.*, 2014) that the application of detailed flow diagrams does not guarantee an appropriate or complete hazard analysis, which is strongly affected by the knowledge of the HACCP team or any persons conducting hazard analysis. As can be seen, even with simplified presentation of the catering processes in the PPs form, it is possible to conduct the hazard analysis in a sufficiently detailed manner, enhancing the strength of the developed HACCP plan. Therefore, the risk of conducting an incomplete hazard analysis is unjustified and depends heavily on the persons developing the HACCP plan (Bolton *et al.*, 2008; Dzwolak, 2014).

HACCP system with process packs

During the 14-month period of the application of the PPs and the modified hazard analysis sheet, systematic internal audits conducted by internal auditors as well as regulatory inspections conducted by NSI inspectors were carried out. An analysis of internal audit and inspection reports revealed no symptoms that could indicate a lack of appropriateness or effectiveness of the modified part of HACCP documentation. All non-conformities detected during scheduled internal audits and external inspections, such as partial non-compliances with GHPs procedures, incomplete training of new staff, unclean kitchenware, damaged kitchen equipment, etc. were unrelated to PPs and the modified hazard analysis sheet. On this basis, it was concluded that partial modification of HACCP documentation does not have any negative effect on the food safety of the prepared meals.

4. Summary

The development process for HACCP documentation in a small restaurant which is presented in this paper considerably reduces the volume of HACCP documentation due to reduced product description and the introduction of the PPs concept to identify CCPs/CPs important for the maintenance of food safety.

The PPs concept can be applied instead of typical flow charts with no risk of incomplete hazard analysis in further steps of the development of the HACCP plan. It should be emphasised that PPs can be identical in various food services and catering businesses. The difference will be in various relationships between individual blocks/packs and different operations included in individual PPs. Therefore, when developing PPs, no partial operations should be omitted, since this may result in the hazard analysis being incomplete, resulting in an increased risk of reducing the food safety level.

An inexperienced HACCP team implementing the PPs for the first time, especially in a small business where there is a lack of knowledge, may have some problems with understanding the PPs concept. Therefore, a key element is to have a well-trained and experienced HACCP team supported by an external expert during the first stage of HACCP implementation. It should be noted that when applying the simplifications as described above, one should seek the support of regulatory inspectors, who have to be frank and show flexibility in their approach to the Codex HACCP principles.

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Supplementary material

Supplementary material can be found online at http://dx.doi.org/10.3920/QAS2015.0813.

Table S1. Hazard identification and critical control points (CCPs) and control points (CPs) establishing for the process packs.

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