Implementation of Food Safety Management System in Food Production and Handling in Northern Serbia

Radoslav Grujić[1], Marina Ivanović and Bogoljub Antonić

University of East Sarajevo, Faculty of Technology Zvornik, Bosnia and Herzegovina,
Ministry of Health, Department of Sanitary Inspection, Subotica, Republic of Serbia,
PAN-European University APEIRON, Banja Luka, Bosnia and Herzegovina

Summary: HACCP means a prevention-based food safety system that identifies and monitors specific food safety hazards which can adversely affect the safety of food products. Food business companies in northern Serbia have worked on the implementation of HACCP systems for 10 years. This paper analyzes degree of implementation of HACCP, degree to which workers in production understand the importance of HACCP and how the food business companies are applying HACCP procedures in practice. The study was conducted through a survey that included 642 employees in 191 food business companies in northern Serbia.

Efficiency of food safety management system application, such as, knowledge about food safety management systems, benefits of implementing food safety management system, barriers for implementation of food safety management systems, priorities of companies for implementation of food safety management systems etc). Results presented in this paper are the results of surveys conducted in food businesses in northern Serbia.

Introduction

Hazard analysis and critical control points (HACCP) is worldwide considered as effective and rational means of assuring food safety, which can be applied trough-out food chain from primary production to final consumption (Domenech et al., 2008). The application of HACCP to food production was pioneered, during the sixties, by Pillsbury Company Aeronautics and NASA to ensure safety of food that astronauts would consume in space.

Hazard Analysis Critical Control Point (HACCP) is a systematic preventive approach to food safety and pharmaceutical safety that addresses physical, chemical, and biological hazards as a means of prevention rather than finished product inspection (Mortimore, Wallace1998; Grujić et al., 2003). HACCP used in the food industry to identify potential food safety hazards, so that key actions, known as Critical Control Points (CCPs) can be taken to reduce or eliminate the risk of the hazards being realized. The system is used at all stages of food production and preparation processes including packaging, distribution, etc. HACCP expanded in all realms of the food industry, going into meat, poultry, seafood, dairy, and has spread now from the farm to the fork.

HACCP means a prevention-based food safety system that identifies and monitors specific food safety hazards that can adversely affect the safety of food products. HACCP is food safety and self-inspection system that highlights potentially hazardous foods and how they are handled in the food service environment. This is a systematic approach to the identification, evaluation, and control of a food safety hazard.

Each year, millions of people worldwide suffer from food borne diseases (WHO, 2000). Illness resulting from consumption of contaminated food has become one of most widespread public health problems in contemporary society (Karaduk et al., 2008). As reported by Bolton and co-workers (2008) Agency for Food Safety in Ireland has identified six factors that are in catering companies associated with food poisoning: sick workers, cross-contamination, inadequate heat treatment, inadequate storage of food, in-

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[1] e-mail address of the corresponding author: grujicr@blic.net

adequate defrosting of food and inappropriate serving of food. In England and Wales 29% of cases of food poisoning was associated with inadequate heat treatment of foods, inadequate storage 28%, and 25% cross-contamination and contamination of food by sick workers 10%. Olesen et al. (2001) reported that 60% of inadequate cooling factors that can lead to food poisoning, poor personal hygiene in 31%, contaminated equipment in 26% and inadequate heat treatment process in 18% of cases of food poisoning. The prevention of food borne disease requires cooperation of person those who involved in food chain and implementation of HACCP concept in all phases in food chain (WHO, 2000).

HACCP system proposed by the Codex Alimentarius Commission (2009) for implementation in the food industry in general, and meat, poultry, and seafood industry in particular, has been adopted by 150 countries. HACCP system is based on seven principles of HACCP, which are included in the international system ISO 22000 (ISO 2005). This standard is a complete food safety management system incorporating the elements of prerequisite programmes for food safety, HACCP and quality management system, which together form an organization's Total Quality Management. Regulation No 852/2004 of European Parliament and Council (2004) establish that since 1 January 2006 this Regulation shall be binding in its entirety and directly applicable in all Member States, which states HACCP requirements should take account of seven principles contained in Codex Alimentarius (2009). In Bosnia and Herzegovina HACCP is practically implemented in the food industry since 2000 year, when the first export-oriented companies implemented HACCP. In last 2-3 years numbers of companies involved in processing and distributing food, which implement ISO 22000, are increasing (Grujić, Radovanović, 2008). From moment when regulations in Bosnia and Herzegovina will officially be adopted, appropriate is to expect that other food business companies will implement HACCP as a system for managing food safety. According to published papers involving in study on the application of HACCP in food business companies, the initial phase for implementation HACCP were similar in China (Jin et al., 2008), in Cyprus (Violaris et al., 2008), in Brazil (Lucca and Torres, 2006), in Serbia (Radovanović, 2009) and in Slovenia (Jevšnik et al., 2008).

Implementation of HACCP system effectively means the introduction of procedures during which different hazards will be eliminated or reduced to acceptable levels, the required documents will be introduced and the procedures of verification and control of the activities will be realised (Grujic et al., 2003, Codex Alimentarius, 2009). Barriers for implementation of HACCP systems in small and medium enterprises were identified as lack of experience, lack of regulations, lack of financial means and desire to introduce changes in the business; and barriers to better training for employees of hygiene are associated with lack of motivation, low socio-economic and educational level of employees, rapid staff turnover, a large number of workers in the latter years, and lack of courses maintenance (Taylor, 2001; Seaman and Eves, 2006; Bas et al., 2007; Grujic, 2010, b, c). In addition, the degree of acceptance of training was associated with the following factors: biographies of people who are trained, the quality of courses offered to employees, high costs of courses offered and the traditional problems of monitoring the efficiency of courses (Harris, 1995).

Several authors (Violaris et al., 2008) in their research found that the oldage of small and medium-sized enterprises have impact on management commitment to implement the food safety system, and in manner and speed of implementation HACCP system in practice. Some authors (Taylor, 2001) suggest that workers from newly formed companies easier implement HACCP, because the companies have newer equipment and their employed workers are thinking in a modern way.

Similar studies were carried out in enterprises in Bosnia and Herzegovina (Grujic et al., 2010, b). In Bosnia and Herzegovina, workers employed in companies which work with food have developed high level of responsibility for sanitary measures and HACCP system realization, also for minimizing of risk for health of consumers or users of their products or service.

The aim of this study was to determine how many workers, who manipulate the food understand importance of HACCP system for safety of manufactured food products, and to determine the degree of experience of workers in the implementation of HACCP and possible antagonism from workers for the practical implementation of HACCP Plans in food business companies in northern Serbia.

Materials and methods

Questionnaire design

The questionnaire was designed using questions described in similar surveys from previous research (Grujić et al., 2010, b, c; Jevšnik et al., 2008, Jevšnik et al., 2009). Questionnaire contains open, clear and interrelated issues, which was adapted to assumed knowledge and education of respondents. The questionnaire included questions related to the manufacturing process in which the worker-respondents participate and who really need to know the answers.

The questionnaire, which was offered to workers, consisted of a series of questions pertaining to the implementation of safe management system in the companies included in the survey. In addition, respondents should answer six questions that were related to the company and the perosnally. For all items in the questionnaire several responses were offered (between two and 14), and the respondents should tick numbers or letters before the text gives their answer.

Survey conducted during the study included the number of companies with various employees, which is one of the parameters for international companies by grading size. Survey included most companies that employ 200 or more persons (289 surveyed respondents), followed companies which employed 11-50 person (154 surveyed respondents), then companies which employed from 51 to 200 employees (116 surveyed respondents), and companies with 5-10 employees (45 respondents of the respondents). 39 surveyed respondents work in companies which employed fewer than 5 employees (Grujić, 2010c]. The largest number of respondents worked in large companies, and the lowest number were from so-called small businesses.

Conducting surveys

The study was conducted in collaboration with health and sanitary inspectors in several towns in northern Serbia. Surveys were collected from food business companies: processing companies (food processing, food manufacturing, and crafts) and companies involved in storage and distribution (retail chains, hotels, restaurants, shops, fast food, etc.). Each of the respondents answers the questions personally. The total time that subjects had available to fill in the questionnaire was 45 minutes. The survey was anonymous. (NOTE: The names of companies are known only to authors of this paper!).

The survey covered a total of 191 companies (part of them implemented HACCP system, part of them were implementing system in that moment, and part of them did not work on implementation HACCP system) and 642 respondents. The survey was conducted during September 2009 and October 2009. After the survey, we analysed the collected answers.

During the survey, the authors wanted to know where the percentage is applied to the HACCP system or another food managing safety in food business companies and with how many degrees of

severity of approaching implementation of the system and how it applies in practice documentation system. In this regard, respondents were asked five questions which they are supposed to respond with YES or NO.

Results and Discussion

The survey results are presented in 5 tables.

To the question "*Are all workers who manipulate the food trained in relation to hygiene*"; the majority of respondents answered affirmatively (84.1%). Such high percentage of positive answers is associated with obligation to maintain two-year courses about hygienic minimum. "*Do workers know the HACCP principles*"; and "*Are all workers who manipulate with the trained in relation to HACCP*"; were following questions. To these questions affirmatively answered few of the respondents (75.7% and 73.2%). According to statements by respondents in 77.9% of the companies there is food safety system, while 69.8% of the companies formed a HACCP team. The answers to these two questions are not fully aligned with each other (Table 1).

TABLE 1. THE ANSWERS GIVEN IN RELATION TO KNOWLEDGE ABOUT FOOD SAFETY MANAGEMENT SYSTEM

Regarding to the knowledge about food safety system, could you please answer the following statements:	YES		NO	
	N	%	N	%
Workers have heard about HACCP	568	88.5	50	7.8
Do you keep records obtained during monitoring	552	86.0	66	10.3
Are all workers trained to manipulate the food according to the hygiene	540	84.1	38	5.9
Have you a written statement of compliance with hygiene	532	82.9	86	13.4
Do you have a system for managing food safety	500	77.9	118	18.4
Workers know the principles of HACCP system	486	75.7	132	20.6
Are all workers trained to manipulate the food according to the HACCP	470	73.2	148	23.1
There is established HACCP system	448	69.8	170	26.5
Not answered	24			

Respondents were asked for a personal opinion about using a company from implementing food safety management system. The largest number of respondents considered that the benefits of implementing HACCP and other safety related control systems is in prevention of food poisoning (74.8%), improvement of consumer confidence (50.8%), matching with the regulations (31.2%), reducing the number of customer complaints (8.4%), and legal protection of companies from complaints from dissatisfied customers (4.7%) (Table 2).

TABLE 2. THE ANSWERS GIVEN REGARDING THE BENEFITS OF IMPLEMENTING FOOD SAFETY MANAGEMENT SYSTEM

In your opinion, the benefits of implementation of food safety management system are:	N	%
Prevent Food Poisoning	480	74.8
Improving consumer confidence	326	50.8
Agreement with the regulations	200	31.2
Increasing labor discipline	178	27.7
Reducing the number of complaints	54	8.4
Legal protection from complaints	30	4.7
Not answered	26	4.0

For question "*How a manager can improve food security in the enterprise*" 12 responses were offered. Each respondent could choose one or more answers. The largest number of respondents believes that managers should follow rules given in the HACCP plan (68.8%), that managers should provide additional training for employees (51.4%), to require the application of basic principles of food (50.5%), and regularly carry out control of performance task workers (38.9%) and constantly be prepared for improvement of labour conditions (35.8%). It is interesting that a relative small number (11.5%) of respondents believe that problem in implementation of food safety management systems is related to constant turnover of workers, although their knowledge, skills, and work related to products safety, depending on the length of the specific jobs (Table 3).

TABLE 3. THE ANSWERS GIVEN REGARDING THE ROLE OF MANAGERS IN FOOD SAFETY IMPROVING

Manager can improve food security in the enterprise:	N	%
Following the HACCP system principles	442	68.8
Providing additional training to improve awareness among all	330	51.4
Applying the basic principles of food hygiene	324	50.5
Holding seminars and lectures for staff	288	44.9
Implementing a routine control	250	38.9
Always be aware of new improvements	230	35.8
Be sure to have produced only good products	192	29.9
Controlling temperature	184	28.7
Avoiding cross contamination	160	24.9
Giving simple directions	152	23.7
Reducing the change of staff	74	11.5
Not answered	30	4.7

To the question "*What are the barriers of implementation of food safety management system*" on the first place, of the provided 14 responses, 398 responses (62.0%) respondents pointed to lack of knowledge related to the HACCP. Other problems in the application of HACCP system in enterprises classified in the following order: implementation costs (43.3%), lack of motivation (28.7%), insufficient training of workers (28.2%), too extensive documentation and administrative work (20.9%), shortcomings in infrastructure (17.1%), staff turnover (16.5%), inadequate management structure (15.3%). 10.3% of respondents as a problem in the implementation of HACCP, indicated the time required for documentation preparing and correct implementation of planned activities, and 3.7% highlighted the need for simple guidelines for the implementation of the system (Table 4).

The respondents were asked to choose one of ten statements related to the application of HACCP system. For each answer they were able to respond with YES or NO, or to agree or disagree with the statement aforesaid. Answers to this question are presented in Table 5. These responses indicate the actual situation in the food business enterprises in Vojvodina about their application of food safety system. Most respondents have a positive attitude towards it and fully understand the significance of HACCP implementation, and problems to be rectified in order to improve work in this sector and ensure a completely safe of food products.

Success of Food Safety Management System implementation, as the HACCP System is, in companies which work with food, depends of employed workers personal knowledge, and of their personal responsibility level for food safety.

Table 4. The answers given concerning the existence of barriers for implementation of food safety management system

What are the barriers for implementing food safety management system:	N	%
Lack of knowledge about HACCP system	398	62.0
Costs	278	43.3
Lack of motivation	184	28.7
Lack of personal training	181	28.2
Excessive work documentation	134	20.9
Lack of facility	110	17.1
The volatility of employees	106	16.5
The lack of appropriate management structure	98	15.3
Lack of **Prerequisite Program**	90	14.0
Insufficient support from authorities	76	11.8
Time for implementation of HACCP system	66	10.3
Complicated technology	26	4.0
The need for simple guidelines	24	3.7
Not answered	30	4.7

Table 5. The answers given in relation to the priorities of companies for implementation of food safety management systems

Would you be able to say that you agree with any of the following statements:	I agree		I do not agree		I don't know	
	N	%	N	%	N	%
Food safety is a real priority for companies	34	5.3	566	88.2	16	2.5
I have no time for matters of food safety	40	6.2	564	87.9	12	1.9
Food safety is top priority for companies	44	6.9	556	86.6	16	2.5
I do not see the benefits of HACCP / FSM	52	8.1	522	81.3	42	6.5
I do not know what HACCP is	70	10.9	492	76.6	54	8.4
HACCP / FSM is too complicated	80	12.5	462	72.0	74	11.5
It is too expensive to have adequate food system in practice	116	18.1	420	65.4	80	12.5
There is no real stimulation for the implementation of HACCP system	124	19.3	390	60.7	102	15.9
Not enough local information about HACCP / FSM	220	34.3	328	51.1	68	10.6
We should have more control by the authority	306	47.7	222	34.6	88	13.7
Not answered	26/ 4.0%					

Conclusion

Survey conducted among workers in 191 food business enterprises in Vojvodina, showed:

- that more than two-thirds of the workers know the HACCP principle, that they are trained to use the HACCP system and to follow basic procedures in relation to food safety,
- that, according to the opinion of the workers, the benefits of applying HACCP system are related to the prevention of food poisoning, improving consumer' confidence, compliance and increasing labour discipline at work,
- workers believe that the current situation in enterprises can be improved by the management company consistently respect of the principles of HACCP systems and principles of hygiene in food production, providing more training for workers and working on improvement the workers awareness, and especially regularly controlling the application of HACCP Plans in practice,

- that for the effective implementation of HACCP or other food safety managing systems there are certain barriers. According to the opinion of the workers, most impact on the implementation of HACCP systems in enterprises have: lack of knowledge of HACCP, high costs of implementation, lack of motivation among workers, increased number of documentation and additional administrative work, and frequent changes of workers on the key working places,

- workers believe that the safety of food should be managed in a form of self-control, top priority for the company and other form control (control by public authorities), should be minimized.

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