

Food safety knowledge and practices among food handlers in Slovenia

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Abstract

The authors present and discuss the results of quantitative research on factors that have impact on food safety in three groups of food handlers in Slovenia. Data were collected via anonymous questionnaire in 2005. Altogether 386 respondents from food production, catering and retail units completed the questionnaire. First the importance of food safety training is shortly discussed. Further the importance of human resource management as well as employees' work satisfaction that is mostly neglected in the units of food supply chain is outlined. Some gaps of food handlers' knowledge on microbiological hazards were found, especially for those working in catering and retail. Analysis of employees' opinion toward food safety requirements has shown which hazards were ascribed as more important regard food safety. Analysis of four foundational pillars of employees' work satisfaction highlighted the importance of them in the units of food supply chain. The field of human resource management should have to become an integral part of HACCP system.

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1. Introduction

In April 2004 the European Parliament adopted regulation (EU) No. 852/2004 on the hygiene of foodstuffs. This has to apply all EU food businesses from 1st of January 2006. The main change to the law relates to food safety management systems i.e. risk based methodologies to ensure the safety of food. Food business operators shall ensure that all stages of production, processing and distribution of food under their control satisfy the relevant hygiene requirements laid down in the Regulation (EC) No. 852/2004. The demand of application of HACCP principles became a law in Slovene in the beginning of 2003. Successful implementation of the procedures based on the

HACCP principles will require the full cooperation and commitment of food business employees. To this end, employees should undergo training.

A major problem that still remains is the employees' fully acceptance of prerequisite programs (PRP) and HACCP system especially in small and medium-sized (SMEs) food businesses. Many authors discuss about barriers or hindrances which have impact to the effective implementation of HACCP in SMEs (Azanza & Zamora-Luna, 2005; Baš, Šafak, & Kıvanç, 2006; Henroid & Sneed, 2004; Hielm, Tuominen, Aarnisalo, Raaska, & Maijjala, 2006; Taylor & Taylor, 2004a; Taylor & Taylor, 2004b; Vela & Fernández, 2003; Walker, Pritchard, & Forsythe, 2003a). Among the key ones Walker et al. (2003a) mentioned lack of expertise and perception of benefits, absence of legal requirements, various attitude barriers and financial constrains. According to Hielm et al. (2006) most difficulties were established in devising the own-checking plan/HACCP plan the most common answers were choosing the critical control points, committing the firm's entire

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workforce and organizing the documentation of monitored results. One of the major problems is that the food workers often lack interest and they often have a negative attitude toward food safety programs (Griffith, 2000).

The acceptance of food safety systems has put employee training under the microscope (Collis & Winnips, 2002). Under the personnel program of HACCP, employees must be trained in such areas as food safety, manufacturing controls and personnel hygiene. Once HACCP plans have been established, employees must be trained to manage any critical control points (CCPs). Though numerous companies have developed, documented and implemented training programs, few understand why employee training is important, what their training requirements are, or how to assess the effectiveness of in-house training programs. So far most publications about HACCP training have described what should be done, but little has been written about effectiveness of such training and how to motivate employees to follow all food safety requirements. Food business operators have to engage with these issues in their own way, as every company has its own specific ways of ensuring safety. HACCP has been described as a philosophy in theory and a tool in practice (Gilling, Taylor, Kane, & Taylor, 2001) and cited by Bryan (1981) "It should therefore come as no surprise that there can be different opinions on how it should be applied" HACCP problems are a complex mix of managerial, technical and behavioral issues requiring specific remedies (Gilling, 2001). By taking a psychological approach and utilizing practical experience and a theoretical knowledge of HACCP, Gilling et al. (2001) identified 11 key barriers and organised them around knowledge, attitude and behavior framework. The proposed behavioral adherence model therefore acts as a diagnostic tool, identifying progressive stages to successful HACCP guideline adherence. They emphasized that the model should be of significant help to those offering advice and guidance to food operators undertaking HACCP implementation. A problem which has considerable influence on acceptance of introduced "new" food safety system especially when it was begun were the way of presenting HACCP and qualification of trainers. Mortimore and Smith (1998) mentioned that many trainers had been willing to provide HACCP training without considering the scope (what had to be taught and what need not) and the depth of coverage. They also described that there was a wide disparity in content and quality between courses. Moreover, several authors suggested that most managers in food industry have limited understanding of the global food safety strategy (Ehiri, Morris, & McEwen, 1995; Mortimore & Smith, 1998; Khandke & Mayes, 1998; Williams et al., 2003). MacAuslan (2003) wrote that the majority of food businesses do not have satisfactory training policies for all their staff. He emphasized that too much reliance is being placed upon attaining a certificate rather than attention is paid to achieving competency in food hygiene practice. He suggested that more emphasis and resources need to be diverted towards assisting managers to become highly

motivated food hygiene managers who develop and maintain a food safety culture within their business. A small business owner may be tempted to place the burden of training responsibility on an external employer, and not shoulder any responsibility them selves. Upon MacAuslan (2003) the problem can have two sides; firstly the employer lacks key management skills in leadership, motivation, training and evaluation and secondly going for a certificate course as it is the "done think".

Factors, which have a significant impact on employers' behavior, are correlated with organizational climate in the company, level of job satisfaction and labour conditions and with relations between employees and their supervisors. Marolt and Gomišček (2005) described a new management approach to employees, which stimulates employees to be initiative, to learn, to devotion to company, to self-confidence, to higher efficiency and better team-work that all contribute to higher successfulness and effectiveness of the organisation. They emphasized a function of leadership, which plays a key role in realization of the new principles into practical work and thus can significantly contribute to better usage of existent resources. A leader should with leadership function persuade the employees to fulfil their needs and desires by effective working and should enable them to use their potentials and by doing so to contribute to achieve the goals of a team and an organisation. It would be ideal if people would be motivated to such level so they would not work just because they have to, but would work with eagerness and with trust. As skills of a successful leader motivation, communication, improvement and introduction of modifications are mentioned (Černetič, 2001; Marolt & Gomišček, 2005). In review on history of motivational research and theory Latham and Ernst (2006) summarized that psychologists now knew the importance of (1) taking into account a person's needs (Maslow's need hierarchy theory, Hackman and Oldham's job characteristics theory), (2) creating a job environment that is likely to facilitate self-motivation (Herzberg's job enrichment theory, Hackman and Oldham's job characteristics theory), and (3) ways to directly modify, that is, to directly increase or decrease another person's behavior by administering environmental reinforcers and punishers contingent upon a person's response (Skinner's contingency theory). They also stress the importance on attaining employees' goals, then they not only feel satisfied, they generalize their positive affect to the task (Locke & Latham, 1990). Jannadi (1995) emphasized that workers are the ones who carry out the work in a company, and they can be an important factor in making the company profitable or bankrupt. Human behavior is very important, and it is difficult to control, so handling people requires situational leadership. Hazards can not be solved and eliminated just through engineering control. They also need to be recognised by employees who will minimize their effects (Jannadi, 1995). Human resource management and education of food safety managers in food premises has not captured the strong attention of researchers.

The aim of this study was to evaluate and compare the three food safety issues: food safety knowledge and practice, employee attitude toward food safety, and employee work satisfaction among three groups of food handlers (employees in food production, retail and catering) in Slovenia.

2. Materials and methods

2.1. Questionnaire design

A self-administrable questionnaire was developed for this study with 20 multiple choice questions with four, five or six possible answers, including “do not know” and “other”, for the purpose of minimizing the possibility of selecting the correct answer by chance. In addition, six questions were related with demographic characteristics of respondents (education level, personal income, type of settlement, gender, age, and number of years in a food business). The questions were designed and structured in three groups. The first group named “Knowledge and practices” (12 questions) was designed to assess knowledge and practice habits focused on microbiologic food hazards, temperature control, food storage, cross-contamination, health requirements and working utensils cleaning. One of the questions was related to respondents’ opinion to additional education and training. The second group of four questions was designated “Employees’ opinion of food safety”. Through correct and incorrect answers an employees’ relation to safe food assurance and their opinion if working conditions are in accordance with food safety principles were determined. With the next question the hygiene violations, which influence food safety the most and the ones, which do not influence food safety were found out. And with the last question of this topic an employees’ opinion regarding carrying out food safety requirements by their co-workers was determined.

The last part of the questionnaire “Employees’ work satisfaction” (four questions) was designed to determine employees’ work satisfaction (their satisfaction with co-workers, managers’ relationships and their opinion on work motivational factors). To measure employees’ work satisfaction a group of experts (content and methodology) adopted several well known scales¹ and arranged them to better suit the specific problems and situation in Slovenia. To balance the scales an equal number of positive and negative items was selected.

The respondents completing the questionnaire remained anonymous and were identified by job description. The

questionnaire was pilot tested by 30 participants during February and March of 2005, resulting in minor modifications of questions’ wording. Each questionnaire took approximately 15 min to complete. A study was conducted from April to November of 2006.

2.2. Participating businesses and questionnaire delivery

For analyzing an employees’ knowledge about general food safety principles, their opinion of their work according to food safety requirements and general employees’ feeling in working environment a questionnaire for employees in three different food dealing work units was designed. The basic guidance for participating units selection was production flow of the selected food item (sauerkraut), namely only units dealing with the sauerkraut were selected. For those purpose three food companies, which produce the sauerkraut, tourist farms, which have the sauerkraut or sauerkraut dishes on their menus and retails, which sell sauerkraut in bulk or in the original packaging were selected.

2.2.1. Food production (P)

The questionnaire was delivered in all three food businesses, which manufacture sauerkraut in Slovenia. In each food business the questionnaire was delivered to the food technologist (who is responsible for the production). The purpose of the survey and instruction for completing the questionnaire were explained to a technologist in person or by phone. The number of respondents was determined with regard to a number of workers, working in the sauerkraut production and with regard to the number of workers present on the day of investigation. Questionnaires were distributed among the workers and their content explained to them by food technologist during the lunch time. Completed questionnaires from three plants ($N = 50$) were mailed the same day by responsible technologists.

2.2.2. Catering (C)

Among catering businesses all tourist farms in Slovenia were chosen. The questionnaires were sent to all the registered tourist farms in Slovenia ($N = 368$). Information regarding the number of tourist farms and their addresses were collected by data base of the Agency of the Republic of Slovenia for Public Legal Records and Related Services (AJPES). Questionnaires together with survey explanation and a short guidance for questionnaire fulfilment were sent by mail to tourist farms. Each envelope included an empty letter with a post stamp and an address of the recipient, so that completed questionnaires could be sent back. After the first dispatch 51 (13.8%) completed questionnaires were received back. With the second letter we thanked to all the participants and we kindly asked again all of those, who had not completed the questionnaire yet, to complete it and send it back. After the second dispatch we received

¹ Job in general scale (Ironson, Smith, Brannick, Gibson and Paul, 1989), Industrial salesperson Job satisfaction: Indsales/Fellow workers, Indsales/Pay, Indsales/Supervision, Indsales/Promotion and advancement (Churchill, Ford and Walker, 1974); Job induced tension (House and Rizzo, 1972); Employee motivation (Stone, 1998; Bearden, Netemeyer, & Mobley, 1993).

25 (6.8%) completed questionnaires more. Total of 76 (20.6%) completed questionnaires were received.

2.2.3. Retail (R)

Among larger retail chains in Slovenia one of them, which sells not only food, but assorted goods as well, was selected (variety of goods depends upon a size of a store located in particular place). Criteria for the sample selection were a site of a store (defined as a store sales area) and a number of employees in a shop. 385 (6.7%) employees from 100 shops were included in the survey. Shops were divided regarding sales area to the small ones ($N = 57$), the middle ones ($N = 35$) and the large ones ($N = 8$).

Questionnaires, together with their instructions, were handed to the company's responsible person for food safety in the company's headquarters. The questionnaires were distributed then by the responsible person of the company to the responsible ones in the separate units (mainly team supervisors). The questionnaires were then during the lunch time distributed among defined number of employees by the responsible persons. Completed questionnaires were then sent back to the responsible person of the whole company. Completed questionnaires were collected by the researchers in the headquarters of the company.

2.3. Statistical analysis

Scores for each test category (i.e., food safety knowledge and practices and opinion of food safety) were calculated by assigning correct responses. Cross tabulations and chi-square tests (5% significance) were used to compare results among three groups of food handlers. Pearson correlation coefficient was used to assess some associations depending on the measurement level of variables. Independent sample *t*-test and ANOVA (confidence interval 95%) were used to compare selected test parameters within three groups of food handlers. The SPSS 13.0 statistical package was used for all analyses.

3. Results and discussion

3.1. Sample characteristics

Of the 386 employees taking part in the research, 76 (19.7%) classified themselves as catering, 260 (67.4%) as retail and 50 (12.9%) as manufacturing. Most of the respondents (88.8%) are female. Average age of respondents are 40.3 (SD = 8.98). Education level of almost half of the respondents (46.1%) are finished vocational school or unfinished high school (1.6%), 8.6% have unfinished vocational school or less, 43.8% have finished high school and more. Personal income 46% of respondents are in the range between 416 and 625 Eur, 44.3% lower than 416 and 9.7% above 625. Types of settlement at half of the respondents are rural, 30.5% lives in suburbia and 19.3% in town. Respondents worked in food business in average 17.3 years (SD = 9.9; max = 38 years).

3.2. Comparative analysis of responses to "Knowledge and practices" questions

With the first set of questions (Tables 1 and 2) we were trying to establish the most effective education and training strategy according to employees. In addition, we were testing the knowledge of employees with emphasis on potential microbiological hazards (preventing cross-contamination, following principles of cold and hot chain, health condition, etc.). Majority (78%) of the respondents is familiar with the basic principle of HACCP system ("maintaining food safety"); while 15% of respondents think that HACCP refers to maintaining food quality. Comparison of the results among three groups of employees working in catering (C), retail (R) and food production (P) has shown no significant differences. Education, provided by experts in a company (82.9%) and education, provided by supervisors during work (73.1%) is most effective according to most respondents. Both ways of education are more effective for employees in production ($p = 0.000$), than for those employed in retail and catering. In a study of Cohen, Reichel, and Schwartz (2001) they established food's microbiological quality improvement after the in-house sanitation training program. Because not all departments benefited equally they suggested that it might be useful to tailor the program to the unique circumstances in each department to maximize the benefits of an in-house sanitation programs. Baş et al. (2006) pointed out that a number of studies have indicated that although training may bring about an increased knowledge of food safety this does not always result in a positive change in food handling behavior. This finding corroborates with the results in a study of Clayton, Griffith, Price, and Peters (2002) in which majority of food handlers operating in a food premises in UK admitted that they did not always carried out all the food safety practices they know they should be implementing. Food safety knowledge and practise questions (Table 1) show inadequate knowledge of employees concerning microbiological hazard protection. A quarter of employees would store a bean salad in the wrong place if a large piece of fresh meat is stored on the middle rack. In a study by Walker, Pritchard, and Forsythe (2003b), 97% of food handlers knew that raw and cooked foods should be separated in order to prevent bacterial transfer. A quarter also chose the wrong temperature value (63 °C) for storing thermically processed meals (among which 16% believe that 37 °C would be adequate). However, there are statistically significant differences between groups ($\chi^2 = 18.684$; $p < 0.005$; $N = 347$). Less catering personnel (C) think that 37 °C is adequate for maintaining food warm than retail personnel (R) and production personnel (P). Poor knowledge of correct temperature for holding hot food was also indicated in a study by Baş et al. (2006) and Walker et al. (2003b). Panisello and Quantick (2001) indicated that small businesses may lack the in-house knowledge and resources to identify foodborne microbial hazards and therefore correctly implement HACCP.

Table 1
Food safety knowledge and practice questions

Questions	%
1	
<i>Where in the cooling unit would you store a bean salad, if there is a large piece of fresh meat stored on the middle rack? N = 381</i>	
On the highest rack in the refrigerator	49.9
Next to the meat	1.0
On the rack under the meat	2.4
On the bottom of the refrigerator	20.7
In another refrigerator as fresh meat and prepared food do not belong together	23.4
I do not know	2.6
2	
<i>What is the lowest allowed temperature for maintaining thermically processed food warm? N = 369</i>	
37 °C	16.0
53 °C	6.8
63 °C	56.9
83 °C	15.2
I do not know	5.1
3	
<i>When would you be certain that food is contaminated with bacteria causing foodborne disease? N = 369</i>	
If it would smell bad	42.5
If it had soury taste	4.9
If it would become mouldy	5.1
That can not be established solely by appearance	48.0
I do not know	0.5
4	
<i>The knife used for cutting raw meat I later ... N = 378</i>	
... wipe with a kitchen cloth	1.3
... thoroughly wash and occasionally disinfect	63.8
... thoroughly wash with boiling water	23.5
... thoroughly wash under running water	9.8
... wipe with a paper towel	0.3
Other	1.1
I do not know	0.3
5	
<i>How would you react if your measurement would show a wrong temperature value (e.g. to low temperature of food during cooking)? N = 377</i>	
I would not do anything	0.3
I would carefully consider what to do and find the best possible solution in peace	11.1
I would consult with my supervisor	18.3
I would call maintenance to repair the measuring device	18.3
I would immediately carry out necessary measures to correct the situation	49.9
I would consult with my co-workers	0.5
I do not know	1.6
6	
<i>When fruit and crops are delivered, the most important thing to do is ... N = 378</i>	
... check the hygiene condition of delivery vehicle	0.0
... check the temperature of fruit and crops	8.5
... check whether the driver is respecting personal hygiene principles	0.3
... check consideration of good agricultural practice requirements	3.7
... check the quality of fruit and crops	86.0
Other	1.6
I do not know	0.0
7	
<i>When thermically processing food, measuring internal food temperature is ...? N = 373</i>	
... not important	0.3
... not important, as the procedure is standardised and time is measured	1.1
... important, so that time of cooking can be adjusted and thus energy can be saved	0.3
... important, so that foodstuffs do not loose nutritional value (e.g. are not overcooked)	15.5
... important, so that we know when harmful microorganisms are destroyed	81.8
I do not know	1.1
8	
<i>In cooling units microorganisms that are on/in a foodstuffs ... N = 381</i>	
... grow very slow	63.4
... grow quite fast	6.0
... grow very fast	4.4
... do not grow	23.4
... all die	2.1
Other	0.5
I do not know	0.3

Majority of respondents (64%) believe that microorganisms (MO) grow very slow in cooling units. Among them there are less of those working in sales than those working

in production ($\chi^2 = 24.295$; $p < 0.002$; $N = 381$). Respondents (23.4%) believe that MO dies in cooling units. Among them there are more R than C and P. In a previous

Table 2
Food handling and health problems

May I handle food when ...	N ^a	Yes	No	I do not know
... having a diarrhoea	384	0.3	99.7	0.0
... having hypertension	371	85.7	11.1	3.2
... having a cold	381	3.1	96.6	0.3
... having a toothache	371	82.7	13.5	3.8
... coughing and wearing protective mask	381	22.3	76.9	0.8
... having raised temperature	374	14.2	84.5	1.3
... vomiting	384	0.8	99.2	0.0
... I had cut myself	378	9.0	89.7	1.3
... wearing nail polish	378	4.8	94.7	0.5
... I am upset	366	79.8	14.2	6.0
... having wounds on my hands	382	0.0	99.7	0.3

^a Number of respondents.

study (Walker et al., 2003b) 21% thought that freezing killed all bacteria; 63% correctly answered that the temperature of the food in a refrigerator should be at or below 8 °C.

Half of employees believe that bad smell, taste or appearance are a certain manifestation of bacterial infection, causing food borne disease. Among groups of employees there were no significant differences. Similar result (57%) was obtained in survey by Walker et al. (2003b). Tauxe (2002) alleged that foods can be contaminated with microbes, and the number of microbes present may be amplified at many points from growing or rearing on the farm to processing to final preparation. After his words understanding those mechanisms of contamination is critical to interrupting them, and thus preventing the infection from reaching the consumer.

Only a half of the respondents would immediately carry out corrective action when the results of internal measured temperature of foods were too low. Others would carefully think how to react (11.1%) or consult their supervisors (18.3%) or co-workers (0.5%) for advice, or call maintenance to repair the thermometer. Among groups there are statistically significant differences ($\chi^2 = 67.253$; $p = 0.000$; $N = 368$). Namely, among R are less of those that would carefully think how to react than among P, and more of those that would call maintenance to repair the thermometer than among C. Among C there are less of those that would consult their supervisor than among P and more of those that would immediately carry out necessary measures than among P. Most respondents (81.8%) are aware of the importance of measuring internal temperature to check the doneness of cooked foods, in order to establish when harmful MO are destroyed. However, among them there are more C than R and P. In the study by Greene et al. (2005) more than half of the respondents indicated that a thermometer was not the method they used most often to check the doneness of cooked foods. Their results suggest, that workers use a variety of methods, other than a thermometer (e.g. checking the doneness of

cooked foods by the length of time the food cooked or by the appearance and feel of the food), to determine when food is sufficiently cooked. Since temperature treatment is frequently the critical control point in a production process, the issue of poor temperature understanding could be a major hindrance of effective HACCP implementation (Walker et al., 2003b).

More than half (63.4%) of respondents believe that cooling process slows down the growth of MO in/on foodstuffs. Among them there are statistically less R than P, as among R there are more of those that believe that MO are not growing during cooling ($\chi^2 = 24.295$; $p < 0.002$; $N = 381$). Baş et al. (2006) reported the lack of knowledge about the critical temperatures of hot or cold ready-to-eat foods, acceptable refrigerator temperature ranges, and cross-contamination among food handlers. Most of employees (77.1%) in our study would reject frozen meat if its temperature at delivery would be too high (e.g. -9 °C). Among them there are statistically more R than P ($\chi^2 = 74.628$; $p = 0.000$; $N = 364$). The rest of employees (12%) would immediately put the meat in the freezer (among them there are more P and less R) and the remaining 5.6% would consult their supervisors.

Most employees believe they should not handle food when dealing with health problems (Table 2). However, there are statistically significant differences between groups. In comparison with P and C, more R ($\chi^2 = 30.384$; $p = 0.000$; $N = 375$) believe they should not work with food when they are coughing and wearing mouth masks for protection; when they have a cut ($\chi^2 = 19.017$; $p = 0.000$; $N = 370$); and when they are wearing nail polish ($\chi^2 = 7.505$; $p = 0.023$; $N = 373$). It is obvious that employees do not fully understand individual hazards, their risks and methods of managing such hazards, since food handling while coughing is allowed if protective mask is worn. Certainly rules for stricter hygiene regime must be followed in cases of weak health problems (e.g. employees should not handle high-risk foods, protective mask should be changed more frequently, hands should be washed more frequently, etc.). In the study by Greene et al. (2005) almost 5% of the workers reported working while sick with vomiting or diarrhea. They argue that this could be cause for concern, as ill workers can potentially expose large numbers of costumers for their illnesses. Such ascertainment was also confirmed by Bryan (1988). Evans et al. (1998) reported that only 12% of food handlers identified the need to report illnesses which may be significant given that an infected food handler has been described as a contributing factor in 12% of outbreaks in England and Wales.

Meta-analysis of barriers during HACCP implementation has shown that among twenty one elements we can allocate seven elements (training, human resources, planning, knowledge and competence, management commitment) representing almost 50% (47.8%) of all identified barriers. The influence of each element on HACCP efficiency was ranked according to frequency of their citation in analyzed studies (Jevšnik, Hlebec, & Raspor, 2006).

From the available data reported by Food Safety Department, WHO (Rocourt, Moy, Vierk, & Schlundt, 2003) time/temperature abuse appears to be the most frequent contributing factor in eleven OECD (the Organization for Economic Co-operation and Development) countries. In Slovenia it is estimated that outbreaks related to microbial contamination represent the highest number of foodborne disease outbreaks and are the consequences of unsuitable hygiene and technological conditions in production and trade as well as low hygiene level and poor knowledge of food workers (Pollak, 2005).

3.3. Comparative analysis of responses to “Employees’ opinion of food safety” questions

Employees’ relation about food safety is high, confirmed by relatively high average values (Table 3). Among groups there are statistically significant differences in average values regarding statements No. 4 “It is important that I constantly educate myself about food safety” ($p = 0.02$), No. 5 “Foodborne disease are more dangerous for vulnerable groups of people (e.g. children, older people, pregnant women)” ($p = 0.003$) and No. 9 “All conditions that enable me to do my job according to food safety principles, are ensured” ($p = 0.000$). With statement No. 4 agree significantly more P than C; with statement No. 5 more P than R and with statement No. 9 more C than R and P. Food handlers in catering are more satisfied with work conditions than those in retail and food production. Insufficient or bad work conditions could be one of main barriers to carrying out proper food safety actions. Clayton et al. (2002) pointed out that food handlers may be aware of

the need to carry out certain practices but without the provision of adequate resources these practices become difficult, if not possible to implement. In the study of Mortlock, Peters, and Griffith (2000) they found a generally negative attitude towards the applicability of HACCP in retail and catering premises in UK. The findings in the study of Toh and Birchenough (2000) affirmed education as an important link to the two variables (knowledge and attitudes; culture and environment). Their results showed strong relationships between knowledge and attitudes. According to the results of Shojaei, Shooshtaripoor, and Amiri (2006) a dramatic reduction in hand contamination was observed after a simple intervention which included a face-to-face health education on strict hand-washing after toilet. They suggested that much emphasis should be put on meticulous hand-washing by health inspectors.

Among violations of hygiene principles (Table 4) forgetting to wash hands after using a toilet is, according to most employees (93.2%), the biggest risk factor for food safety. Food safety can also be compromised by using inappropriate utensils (67.5%) and by inconsistent temperature control in cooling units (57.6%). According to Lues and Van Tonder (2007) coliforms were present on 40% of food handler’s hands and on 26% of aprons (of those 32% exceeded the target value of <2.5 cfu cm^{-2} with regard to hands and 8% with regard to aprons). However, as shown in previous studies of food handlers’ beliefs and self-reported practices (Clayton et al., 2002), food handlers were aware of the food safety behaviors they should be carrying out, but 63% of respondents admitted that they did not always carry out these behaviors. Food handlers also reported carrying out food safety practices, particularly hand-washing, much more frequently than they actually implemented them (Manning & Snider, 1993). This suggest that food handlers could be carrying out food safety practices less frequently than the self-reported data implies (Clayton et al., 2002). Shojaei et al. (2006) cited that many authors emphasized that hands of food handlers are an important vehicle of food cross-contamination and that improved personal hygiene and scrupulous hand-washing would lead to the basic control of faeces-to-hand-to-mouth spread of potentially pathogenic transient microorganisms.

Table 3
Employees’ opinion toward food safety

Statements	N ^a	Mean ^b	SD
1. I have to make sure that prepared food is safe for customers/consumers	389	4.93	0.347
2. My important responsibility is following all food safety principles	384	4.95	0.314
3. My handling with foodstuffs does not affect food safety	372	3.38	1.867
4. It is important that I constantly educate myself about food safety	381	4.82	0.569
5. Foodbourne disease is more dangerous for vulnerable groups of people (e.g. children, older people, and pregnant women)	375	4.31	1.325
6. HACCP system certificate enables me to get a promotion at work	351	2.38	1.688
7. If conditions prohibit me from following food safety principles, I’m obliged to notify my supervisors	374	4.75	0.731
8. I believe that other employees, dealing with food, respect good hygiene practise principles	370	4.48	0.837
9. All conditions that enable me to do my job according to food safety principles are ensured	376	4.26	0.967

^a Number of respondents.

^b Average of the rankings given to the opinion by the respondents. Opinions were ranked from 1 (not at all) to 5 (very much).

Table 4
Violations of hygiene principles that would compromise food safety according to employees

Choose 3 inappropriate hygienic principles that would, in your opinion, compromise food safety the most, $N = 389$	Select (%)	Not select (%)
1. Not checking the quantity of delivered foodstuffs	6.5	93.5
2. Wearing jewellery when handling foodstuffs	38.4	61.6
3. Washing the working clothes at home	8.3	91.7
4. Forgetting to check baits for rodents	16.4	83.6
5. Using inappropriate utensils	67.5	32.5
6. Chewing at work	9.1	90.9
7. Forgetting to wash hands after using a toilet	93.2	6.8
8. Forgetting to check temperature in cooling units	57.6	42.4

Among eight offered answers to the question: “What is least important for food safety?” more than a half of respondents (55.1%) chose “Checking the quantity of delivered foodstuffs”. Other answers were chosen less frequently (checking the date of expiration (12.4%), checking the concentration of cleaning detergents (12.1%), ensuring all work conditions (7.0%), record keeping (5.4%), following personal hygiene principles (4.6%); measuring internal temperature to check doneness of cooked foods (3.2%), measuring air temperature in cooling units (0.3%). Results pointed out those spheres, which are usually neglected. Employees understand a food safety in a restricted sense. This ascertainment could be a good starting-point for a preparation of educational programs, which should comprise rich, picturesque and detailed explanation of those previously mentioned areas that are obviously not so important to employees. Walker and Jones (2002) established that the main ineffectiveness of utilizing hazards and problems of monitoring temperatures (especially at cooking) and cross-contamination resulted from poor cleaning practices. The survey conducted by Walker et al. (2003b) indicated that poor results (60%) for the implementation of HACCP in SMEs in UK centered on temperature control and record keeping.

How employees grade attitudes of their co-workers regarding food safety principles, is shown in Table 5. High average values (Table 5) show, that employees consider their co-workers attitude towards food hygiene requirements very positive (all average values are higher than 4). However, average values according to groups of employees differ ($p < 0.05$) regarding all task, except tasks No. 6 and 7 (Table 5). C grade their co-workers more positive than P in

tasks No. 1, 4, 5, 8, 9, 10, 11 and more negative than R in tasks No. 2, 3. P grades their co-workers less positive than R and C regarding tasks No. 4, 8, 9.

The results of previous study (Jevšnik, Tivadar, & Hlebec, 2004) also attest to the fact that the quality of the relationship that workers have with their superiors and co-workers is a highly important factor of their job satisfaction. Thus, each company must find its own mechanisms for creating a positive and encouraging working atmosphere.

3.4. Comparative analysis of responses to “Employees work satisfaction” questions

With a question in Table 6 we tried to measure general mood of employees in a company. Between groups there are statistically significant differences in average values of statements No. 1 ($p = 0.42$), 5 ($p = 0.000$), 6 ($p = 0.000$), 9 ($p = 0.005$) and 10 ($p = 0.007$). Significantly more R ($p = 0.49$) than P agree with statement 1. Significantly less C than R ($p = 0.013$) and P ($p = 0.000$) would leave the company if offered a better pay and more interesting work. With statement No. 5 and 6 agreed significantly less R ($p = 0.001$) than P and C. Significantly more C would again choose the same profession than R ($p = 0.033$) and P (0.007).

The main barriers to carrying out food safety actions, identified by Clayton et al. (2002) were time constraints and lack of staff; in addition respondents also expressed the need for better design of the workspace, more resources and a recognition of problems by management. Barriers identified by school foodservice directors include employee acceptance, attitude and motivation of employees, training

Table 5
Opinion of employees regarding attitude towards hygiene of their co-workers, when dealing with foodstuffs

With numbers from 1–5 grade attitude of your co-workers	N^a	Mean ^b	SD
1. They do their job according to food safety requirements	359	4.52	0.739
2. They fill out the required forms carefully and regularly	360	4.59	0.674
3. They frequently carry out required temperature measurements	351	4.72	0.597
4. They always thoroughly wash their hands after using the toilet	358	4.82	0.515
5. They frequently clean their working space	362	4.68	0.628
6. They always use clean utensils	360	4.75	0.509
7. They check the dates of expiration regularly	359	4.74	0.573
8. They are careful not to cause cross-contamination	355	4.63	0.675
9. They report all health problems to their superiors	339	4.36	1.038
10. They follow good hygiene practice principles	355	4.70	0.590
11. All conditions are fulfilled in order for them to follow good hygiene practise principles	355	4.39	0.890

^a Number of respondents.

^b Average of the rankings given to the opinion by the respondents. Opinions were ranked from 1 (not at all) to 5 (most likely).

Table 6
General mood of employees in a company

With numbers from 1 to 5 evaluate whether you find these statements true or not true	N^a	Mean ^b	SD
1. If I chose the same profession again, I would definitely choose to work in the same company that I'm employed in now	325	4.09	1.221
2. When I have a personal problem that is upsetting me, I talk to my co-workers about it	360	2.74	1.468
3. When I have a personal problem that is upsetting me, I talk to my supervisors about it	356	2.71	1.580
4. I always do my job according to written or agreed rules	361	4.61	0.645
5. I would leave the company if offered a better pay elsewhere	330	3.09	1.660
6. I would leave the company if offered a more interesting job elsewhere	326	2.91	1.613
7. I will work in the same company until I retire	301	4.11	1.273
8. I often compete with co-workers	352	1.75	1.232
9. If I had a chance to choose my profession again, I would choose the same	311	3.29	1.620
10. I find work that I do at the present interesting	360	2.56	1.648

^a Number of respondents.

^b Average of the rankings given to the opinion by the respondents. Opinions were ranked from 1 (not at all) to 5 (very much).

and education of employees about food safety and HACCP, comfort level of employees with food safety issues, and time constraints among food service directors to implement HACCP (Giampaoli, Sneed, Cluskey, & Koenig, 2002). Roberts and Sneed (2003) suggests that assigning responsibility for food safety to specific employees increases the number of food safety practices implemented in restaurants. Success in implementing and maintaining a HACCP program depends on how its four basic pillars (commitment, education and training, availability of resources and external pressure) are prioritised and organised in a company (Panisello & Quantick, 2001).

Opinion of employees about co-workers (Table 7) differs according to groups of employees ($p < 0.05$) in all statements, except statements 1 and 5. Comparison of average values of different groups showed that C have the most positive opinion about their co-workers, regarding all statements in Table 7. They are followed by R, while P have the most negative opinion of co-workers.

Comparison of differences in average values between groups showed that P do not have worse relationship with their co-workers ($p = 0.001$), that they are in their way ($p = 0.014$) and that they receive less help from them ($p = 0.001$) than C. P also believe that co-workers ignore them more ($p < 0.02$), are more selfish ($p < 0.01$) and stand up for them less often ($p < 0.05$) that employees in groups C and R. However, R are in worse relations with their co-workers ($p = 0.003$) and receive less help from them ($p = 0.002$) than C.

It was established that workers which performed better hygiene practice are more satisfied with interpersonal relationship in the workplace in general, which includes relations with supervisors as well as relations with co-workers (Jevšnik et al., 2004).

Average opinion of employees about their supervisors (Table 8) differs according to groups of employees ($p = 0.000$) in statements 1–7 and 9 and ($p < 0.05$) in statements 8, 10 and 11. Average value comparison between different groups showed, that C think better of their supervisors in statements from 1 to 4, 7 and 12, than other

Table 7
Respondents opinion about co-workers

With numbers 1–5 evaluates your relationship with co-workers	N ^a	Mean ^b	SD
1. Co-workers obstruct me while I'm working	347	1.42	0.972
2. I'm in a friendly relationship with my co-workers	345	4.37	0.857
3. Co-workers ignore me	344	1.42	0.941
4. I get along with my co-workers well	347	4.48	0.765
5. I do not have any contacts with my co-workers	338	2.22	1.614
6. Co-workers are selfish	340	1.74	1.175
7. Co-workers stand up for me	321	3.85	1.143
8. I do not care about my co-workers	327	2.14	1.563
9. Co-workers help me	356	4.26	0.958

^a Number of respondents.

^b Average of the rankings given to the opinion by the respondents. Opinions were ranked from 1 (not at all) to 5 (very much).

Table 8
Respondents opinion about their supervisors

With numbers from 1 to 5 evaluate your relationship with the supervisor	N ^a	Mean ^b	SD
1. Supervisor awards me for a well done job	322	3.20	1.484
2. I learn a lot from my supervisor	338	3.96	1.148
3. Supervisor is good at organising work	332	4.05	1.125
4. Supervisor is fair	327	4.02	1.102
5. Supervisor follows developments in our profession	329	4.36	0.900
6. Supervisor fulfils all his promises	319	4.11	1.033
7. Supervisor takes my suggestions and opinions into consideration	324	3.96	1.046
8. Supervisor is familiar with what I do	328	4.39	0.867
9. Supervisor encourages me at work	329	4.13	1.072
10. Supervisor is making an effort so that I can do my work well	327	4.39	0.878
11. I have no contact with my supervisor	332	2.66	1.709
12. Supervisor does not notice me	319	2.56	1.694

^a Number of respondents.

^b Average of the rankings given to the opinion by the respondents. Opinions were ranked from 1 (not at all) to 5 (very much).

two groups. In statements 5, 6, 8, 9, 10 and 11 R have a better opinion than C and P. In comparison to average differences between groups, P have worse opinion ($p < 0.05$) about supervisors (statements 1–9). In comparison to P, R expressed better opinion ($p < 0.05$) about their supervisors in statements 10 and 11.

The senior management team clearly needs to be fully supportive of a HACCP program if it is to be successful. Senior managers need to grasp both the importance of HACCP to the organization and the immediate and long-term resource issues involved in implementing a HACCP

Table 9
Employees' evaluation of work satisfaction and motivation

With numbers 1–5 evaluate how strongly you are personally satisfied with ...	N ^a	Mean ^b	SD
1. ... your job	353	4.05	0.929
2. ... promotion possibilities	315	3.33	1.316
3. ... supervisor's appreciation of your work	320	3.64	1.200
4. ... benefits provided by the company	324	3.64	1.139
5. ... interpersonal relations at work	340	4.11	0.906
6. ... your position at work	334	4.01	1.003
7. ... relations between you and your supervisor	325	4.10	0.924
8. ... working conditions	337	3.74	1.015
9. ... taken measures for health and safety at work	336	3.88	1.068
10. ... education and training organised in the company	335	4.01	1.051
11. ... evaluation of your work by supervisors	306	3.73	1.178
12. ... the pay	328	3.01	1.292

^a Number of respondents.

^b Average of the rankings given to the opinion by the respondents. Opinions were ranked from 1 (not at all) to 5 (very much).

program. This is not always a straightforward task. Motivation can be a problem in small and larger food companies. Wallace (2001) stressed that particularly in SMEs HACCP can initially be viewed as bureaucratic burden imposed from outside, rather than as an essential tool in the management of product safety.

Employees' evaluation of work satisfaction and motivation (Table 9) is on average statistically different ($p < 0.01$) in all groups, regarding all statements. Comparison of average values in groups showed, that C rank all elements of satisfaction and motivation higher (with exception of statement 10, where a higher average is contributed to R) than the rest two groups. The lowest average values were evident in P, who are most unsatisfied with their pay and promotion possibilities. On average, R are most satisfied with education and training, organised in the company. When comparing differences between groups, P expressed less satisfaction ($p < 0.01$) in statements 1, 2, 3, 4, 6, 7, 8, 11 and 12, that C and R. C expressed more satisfaction than P and R in statements 5, 6, 9 and 12. R are significantly more satisfied in statements 1, 2, 3, 4, 6, 7, 8, 10, 11 and 12, than P.

In implementing the HACCP system, managers or owners should take care not to give workers the mistaken impression that this would add meaningless chores to their work-load. As many authors have established, workers believe that they will now have to deal excessively with paper work and with an increasing amount of documentation. Admittedly, they do need precise and clear instructions on what to do. These, however, should be kept to a minimum amount necessary and written in such a way that workers would understand them. Also, they should be able to comment upon them and their opinion would have to be taken into consideration by their superiors which would in turn also strengthen their affiliation to the company. The superiors must therefore develop strategies for measuring work efficiency, assessing employees' comments and the system of rewarding. Financial reward on its own does not guarantee higher work satisfaction and affiliation to the company in the long run. To a worker, an important motivational force might be the mere fact that he or she is being noticed. The prevailing attitude in food companies is often prioritising the fulfilment of the production norm. Therefore, looking for factors that might have contributed to the production norm not being fulfilled is frequently avoided. Mortimore (2001) mentioned that is harder to develop a HACCP system in the absence of management commitment. Prerequisite hygiene programs are an essential partner to the HACCP system and management commitment is needed for these to be embedded in the heart of the business. McAloon (2001) suggested that continuing commitment to food safety need incentives. He also recommended assign responsibility for HACCP implementation to a senior company person to get food safety into the culture of the company. MacAuslan (2005) cited that the hospitality training foundation and learn purple identified that motivation, evaluation, leadership and training were key

management skills missing in small businesses. It is important to introduce a basic management module to supervisors and managers, especially in small businesses.

To achieve the final goals that meet the safety, quality, quantity and price expectations of costumers, food companies need to set three output criteria: productivity, satisfaction and revitalisation. Satisfaction refers to the overall positive feelings people have about an organisation, whether as an employee, customer, supplier or regulator. Revitalisation refers to the ability to take care of tomorrow's problems as well as those of today by renewing the strategies, resources, technology and skills required for future success (Coffey, Cook, & Hunsaker, 1994).

4. Conclusion

Strict performance of working procedures in accordance with HACCP system principles and food hygiene is essential for food related diseases prevention and efficient safe food assurance. To achieve this purpose two basic conditions: (1) suitable working environment from the hygienic–technical point of view and (2) motivated, satisfied and qualified personnel must be assured. It is interesting that many understand HACCP system as a novelty, when in fact it is about more complete approach to food safety assurance as stated by Ehiri et al. (1995). HACCP system assures more structured surveillance over determined hazards as was the case with the usual classic type of surveillance. Hazards and corrective actions are not something new. What is new is how separate activities and procedures are logically ranged. The approach is multidisciplinary. It requires personal responsibility, document and record control and rapid action when non-conformities are discovered. It enables traceability as well. Its greatest ability lies in responding to changes as well as in enabling continuous checking and efficiency confirmation. It brings changes in thinking, organizing, managing, education and training at all levels, from employers to employees (Likar & Jevšnik, 2004; Likar, Bauer, & Jevšnik, 2001). The system becomes efficient when understandable to employees and when the responsible ones perform their duties. Then the requirements of the system are not considered as irrational, unnecessary and additional burden, but as desire for continuous improvement of one's own work. That is why the training from top management to all employees is crucial for food safety. The fact that a person is and will be responsible for HACCP implementation and further control calls for an in-depth analysis and understanding of individual's reaction to received information (Jevšnik et al., 2006). Bryan (1988) predicted that in the future the number of HACCP principles would increase from seven to ten or more. The ninth HACCP principle, according to him, would be education and training, which is now being incorporated into the existing principles or other related guidelines. If routine-work employees do not understand the significance of hazards associated with food safety well

enough, this may hinder a successful implementation of preventive and control actions.

Legislative changes in 2004 demand that now all food premises must provide food hygiene training appropriate for the work activities of their staff (Regulation, 2004). The results of our study showed as well that training carried out by company experts and by supervisors directly in working place is the most efficient one. Mortlock et al. (2000) suggested that it is also important to recognise that while formal training might ensure greater consistency and quality (Manning, 1994), improper training could present a greater risk to food safety than no training at all. In a study by Cohen et al. (2001) they analyzed the impact of an in-house food sanitation training program on the performance of a catering company. They concluded that for fully effective sanitation program, it must be taken into consideration the different environments and circumstances in which the departments operate. It is very important that those performing a training have suitable food safety knowledge as well as skills in pedagogical–andragogical field. Those people have to be competent experts in their field so that adequate knowledge and skills can be passed on to the employees. A problem lies in SMEs, where owners of a company are usually at the same time responsible persons for food safety programs, which includes training as well. Because lack of time or poor knowledge such trainings are not carried out as intended by the law. The results of our study show poor knowledge about microbiological hazards and their control among employees in retail, catering and food production units. MacAuslan (2003) stressed the importance on helping managers to understand what is expected of them, and giving them a support in managing effective food hygiene. He pointed out that too much reliance has been placed upon certificates and not enough on the competence. According to his opinion this is defined as the ability of an individual to demonstrate the activities within their workplace, or to function to the standards expected in a food business.

The purpose of internal surveillance is to identify specific hazards in particular company and then to establish a strategy of efficient control or successive elimination of hazards. Owners or managers must besides equal economic growth of a company take care of human resource management as well. A positive motivational atmosphere in working environment significantly contributes to higher productivity, employees' loyalty and to general good feeling in workplace. The results of work satisfaction elements carry important messages for companies' management. In the three studied food units food production employees are the least satisfied in workplace and the most satisfied ones are employees in catering. A low score of employees in food production units regarding their opinion and suggestion consideration, rewarding for good work, wages, work conditions and promotion possibility must be stressed out. All that weakens motivation and satisfaction in workplace as well as reduce a number of those, who perform their work well. Food safety assurance stands

between two strong poles, which have to be balanced to achieve global food safety. The first pole is system requirements, namely flexible, faultless, which requires in forms of strategies, not directives. The second pole is work performance and a person in all his uniqueness; his knowledge, qualification, working in a group and consciousness. A company's management should be aware that a quality and safe products is a result of an immediate performer, who should be paid full of many-sided attention to.

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