



## Study on the hygiene knowledge of food handlers working in small and medium-sized companies in western Romania

Călin Jianu<sup>a,\*</sup>, Codruța Chiș<sup>b</sup>

<sup>a</sup> Faculty of Food Processing Technologies, Banat's University of Agricultural Sciences and Veterinary Medicine, Calea Aradului 119, 300645 Timișoara, Romania

<sup>b</sup> Department of Exact Sciences, Banat's University of Agricultural Sciences and Veterinary Medicine, Calea Aradului 119, 300645 Timișoara, Romania

### ARTICLE INFO

#### Article history:

Received 31 May 2011

Received in revised form

30 December 2011

Accepted 7 January 2012

#### Keywords:

HACCP

Food hygiene

Food handlers

Knowledge

Romania

### ABSTRACT

The purpose of this study was to evaluate the hygiene knowledge of food handlers of small and medium-sized companies in western Romania (the counties of Timis, Caras-Severin, Arad). 198 food handlers participated in this study, from the meat industry, dairy, bakery, catering, retail. The data were collected through self-administered questionnaires distributed during 2010, their drafting and development being based on the requirements of Romanian and European legislation in the field of food hygiene. The mean value of hygiene knowledge of the food handlers was 63.2% with a standard deviation (SD) of 17.6%. The level of knowledge was influenced by the level of education ( $p = 0.011$ ) and the field of activity of the respondents ( $p = 0.000$ ). The study reveals gaps related to microbiological risks, cross-contamination and temperature control, demonstrating the need for the retraining of food handlers. At the same time the findings underline the need to assess and improve the training programs used in the Romanian food sector.

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### 1. Introduction

The HACCP system was designed to prevent unwanted effects caused by food poisoning and ensure high food safety for consumers. Its principles were detailed in the Codex Alimentarius guidelines (CAC/1997). EU food law has incorporated these principles in the early 1990s, through Directive 93/43/EEC on the hygiene of foodstuffs (OJL175/19.07.1993), updated and enhanced by EU Regulation 852/2004 (OJL139/30.04.2004). In 2005, Romania in the course of her EU accession process integrated European legislative requirements on the hygiene of foodstuffs by HG 924/2005 (MO 804/05.09.2005), implementing and maintaining a HACCP system (Hazard Analysis and Critical Control Points) becoming mandatory for all food businesses. With EU accession on 1 January 2007, the requirements of Regulation (EU) 852/2004 (OJL139/30.04.2004) became compulsory for all Romanian food businesses.

A report published by the European Food Safety Authority (EFSA, 2010) shows that a total of 5332 outbreaks of food poisoning were reported in the European Union in 2008, causing 45,622 human cases, 6230 hospitalizations and 32 deaths. The report indicates amongst the main factors responsible for generating outbreaks of food poisoning contamination or improper handling,

inadequate heat treatment, the use of contaminated unprocessed ingredients, incorrect application of the time/temperature relation in food storage and infected food handlers (FH). These factors are based mainly on low knowledge and inadequate hygiene practices among FH and demonstrate the risk factor represented by humans in the context of food safety.

Training FH in the field of food hygiene is a legal requirement in the EU, Regulation (EC) no. 852/2004 (OJL139/30.04.2004) requiring that FH who handle foodstuffs be supervised and trained in the field of food hygiene according to the activity they perform. However more recent studies conducted in England, Ireland, Portugal, Slovenia and Turkey have shown that the level of knowledge, attitudes and practices of FH must be improved (Baş, Ersun, & Kivanç, 2006; Bolton, Meally, Blair, McDowell, & Cowan, 2008; Gomes-Neves, Araújo, Ramos, & Cardoso, 2007; Jevšnik, Hlebec, & Raspor, 2008; Tokuç, Ekuklu, Berberoğlu, Bilge, & Dedeler, 2009; Walker, Pritchard, & Forsythe, 2003).

In most cases the low level of knowledge and inadequate food practices are based on insufficient training of FH. One of the reasons of not providing complete training programs for food personnel is the cost and risk of investment loss due to high staff turnover, especially in small and medium-sized enterprises (SMEs) (Yapp & Fairman, 2006). Even when the employer agrees to invest in education and professional training, the results are far from satisfactory. Several studies have shown that increasing the level of knowledge through training does not necessarily lead to changes in

\* Corresponding author. Tel.: +40 722632199.

E-mail address: [calin.jianu@gmail.com](mailto:calin.jianu@gmail.com) (C. Jianu).

the attitude and behavior of FH (Angelillo, Viggiani, Rizzo, & Bianco, 2000; Clayton, Griffith, Price, & Peters, 2002; Ehiri, Morris, & McEwen, 1997).

There are several reasons for the lack of impact of the proposed training programs, especially at the SMEs level, such as low educational level of the staff (Çakıroğlu & Uçar, 2008), staff turnover (Burch & Sawyer, 1991), high level of seasonal staff (Travis, 1986) and poor motivation due to low salaries and status at work (Rennie, 1994).

In Romania training FH in the field of food hygiene is a legal obligation, “proof of training and acquirement of fundamental knowledge of hygiene is represented by a certificate... with a validity of two years, after which training should be repeated”, according to the MS Order no. 331/1999 (MO 276/16.06.1999).

Based on data known to us, to date in Romania there have been no studies conducted to assess the knowledge and practices of FH. The purpose of this study is to determine the level of knowledge of the FH in SMEs in western Romania and provide baseline data to assess further the effectiveness of training programs used in the Romanian food sector.

## 2. Materials and methods

### 2.1. Structuring the questionnaire

A self-administered questionnaire was developed for this study, structured into 21 questions with 5 or 6 response options, including the option “do not know” to reduce the possibility of selecting the correct answer by chance. In addition, 5 questions were included to determine the demographic characteristics of the surveyed FH (level of education, age, gender, professional experience and field of activity).

The questions were designed to determine the level of knowledge about food poisoning (5 questions), cross-contamination and sanitation (6 questions), time and temperature control (4 questions), personal hygiene (6 questions). The questionnaire was accompanied by simple completion instructions concerning the purpose of the study and that participation is confidential.

### 2.2. Businesses participating in the study and the submission of the questionnaire

46 small and medium-sized companies in western Romania (the counties of Timiş, Caraş-Severin, Arad) were contacted for the study; the authors having no legal right to enter the food premises invited to the study, in this situation the degree of cooperation of the managers was essential. The consent for participation was received from 33 of the companies contacted (ca. 72%). Companies participating in the study came from the meat industry (4), dairy (3), bakery (3), catering (8), retail (15) and have implemented a HACCP system in accordance with the requirements of Regulation (EU) no. 852/2004 (OJL139/30.04.2004).

The questionnaires were mailed to the HACCP team leaders of the companies surveyed, they distributed the materials to the FH, monitored the evaluation process and subsequently returned the completed questionnaires for analysis.

Of the 262 questionnaires distributed 211 were returned, of which 13 questionnaires were not considered due to insufficient completion, the remaining 198 questionnaires (75.5%) were processed.

The reliability of the questionnaire used in the study was verified by a pilot study in which 15 questionnaires were distributed. Based on the comments collected several questions from the final questionnaire were modified to improve clarity. These questionnaires were not processed in the final study.

### 2.3. Statistical analysis

The statistical analysis of the results obtained from processing the questionnaires was performed using SPSS® (SPSS Inc., Chicago, IL, version 13.0). The statistical significance level was considered  $\alpha = 0.05$  (95% confidence level). The average and standard deviation of correct answers were calculated. Differences between the proportions of correct answers according to the demographic characteristics of the FH were analyzed using the one-way ANOVA test and a post-hoc analysis (LSD). To check for the existence of an association between right answers and the membership of the FH under study (P, R and C) the analysis of cross tabulations and the chi-square test ( $\chi^2$ ) were applied.

## 3. Results

### 3.1. The characteristics of the participants

The demographic information of the FH participating in the study are presented in Table 1.

### 3.2. Comparative analysis of the food handlers' knowledge

The mean values within the categories of variables, namely gender, age, education, professional experience and field of activity are shown in Table 2.

#### 3.2.1. Gender

The analysis of the group in terms of gender revealed no significant differences between the percentage of correct answers obtained by the two categories ( $F = 0.607$ ,  $p = 0.437$ ).

#### 3.2.2. Age

In terms of age, statistical analysis revealed no significant differences between the percentage of correct answers obtained in relation to the intervals considered ( $F = 1.733$ ,  $p = 0.129$ ). The age group 31–40 years has the highest percentage of correct answers.

#### 3.2.3. Level of education

In terms of education level, four levels of education were considered: primary, gymnasium, secondary and university, significant differences being obtained ( $F = 3.779$ ,  $p = 0.011$ ). In relation to the percentage of responses significant differences were

**Table 1**

The demographic characteristics of the group of surveyed food handlers ( $N = 198$ ).

Demographic characteristics	Category	Percentage (%)	N <sup>a</sup>
Gender	Male	53.5	106
	Female	46.4	92
Age	≤20 years	8.6	17
	21–30 years	25.2	50
	31–40 years	39.9	79
	41–50 years	15.6	31
	51–60 years	7.6	15
	≥61 years	3.0	6
Level of education	Primary studies	14.6	29
	Gymnasium studies	29.3	58
	High school studies	47.5	94
	University studies	8.6	17
Professional experience	<10 years	61.6	122
	≥10 years	38.3	76
Field of activity	Production (P)	53.0	105
	Retail (R)	26.2	52
	Catering (C)	20.7	41

<sup>a</sup> Number of respondents.

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