JOURNAL OF PURE AND APPLIED MICROBIOLOGY, December 2012. Vol. **6**(4), p. 1925-1932

Determination of the Level of Knowledge and Attitude of Supplier Companies' Managers and Employees about Food Safety

Bulent Celik[1], Nevin Sanlier[1]*, Sevcan Kaya[2], Ali Solunoglu[2] and Elif Sahbaz[2]

[1]Faculty of Health Science Department of Nutrition and Dietetics, Gazi University, Ankara, Turkey.
[2]Gazi University, Faculty of Tourism, 06830, Gölbasi, Ankara, Turkey.

(Received: 30 June 2012; accepted: 28 July 2012)

The purpose of this study is to determine the level of food safety knowledge and attitude of the managers and employees of the food suppliers that provides meat, poultry, fish, eggs, cereals, dried beans, etc. to catering companies. The research is based on a survey conducted with 319 supplier company employees. It is composed of 34 questions and applied via face-to-face interviews by researchers. As a result of the survey, it is found that the knowledge scores of the individuals are intermediate, and attitude scores are higher intermediate. In addition, the knowledge scores of the young employees and managers are significantly high. ($p<0.05$).A need for an effective and continuous training for food suppliers' employees about food and personal hygiene is emerged as a result of this research

Key words: Supplier company, Employees, Food safety knowledge, Attitude.

Food safety is an essential public healty issue for all countries. Foodborne diseases due to microbial pathogens, biotoxins and chemical contaminants in food represent serious threath to health of thousands of millions of people (FAO, WHO, 2008). According to WHO (WHO 2007, 2010) this problem has more impact on health and economy in developing countries and it has been reported that in 2005 alone 1.8 million people died from diarrheal diseases in the world. Food safety is a scientific discipline describing handling, preparation and storage of food in ways that prevent food borne illness (Satin, 2008) and requires proper handling from production through consumption (Brunh, Schutz, 1998).

Increase in the incidence of food-borne illness, arising production techniques with developing Technologies and unknown risks caused by them, increasing risk in food chains depending on the environmental risks, improving international trade, improving consumer awareness and changes in their preferances made food manufacturers and decision-makers more conscious and sensitive about food safety. (Dilekoglu, 2003; Varzakas *et al*. 2006). However, all kinds of hygiene and sanitation errors that arise both in individual and institutional food service establishments starting from the purchase of food

* To whom all correspondence should be addressed.
E-mail: nevintekgul@gmail.com

to the service are adversly affecting the quality of food. (Baþ, Yüksel, Çavuþoðlu, 2005; Þanlýer,2009). Food safety is an important notion in food industy. Food indusry workers' understanding of food safety procedures and recognization of potential factors are very important fort he prevention of food-borne diseases. (Clayton, Griffith, Price, Peters, 2002). Most foodborne illness in food sector are caused by one of three major foctors: cooking, holding, cooling or storing food at improper temperatures; cros-contamination from improper cleaning and sanitizing of equipment and utensils; and poor personel hygiene (Silver,2000).

Turkey is a developing country. Food-borne diseases are often seen in Turkey but they are not reporting in realistic numbers. Food industry not to pay enough attention to the hygiene because of the lower education level of staff in food industry. Of late years Europe starts to make effective provision against food borne illness and also starts to form legitimate institutions. Although this is such an important issue, there is no education program or legal responsibility in Turkey to enhance food safety knowledge and practices of purveyor workers consumers in any age group, or to ensure that this knowledge becomes part of their everyday practice (Sanlier, Konaklioglu, 2012). Learning about basic knowledge, practices and behavior of purveyor and workers is essential for he development of effective health education programs in Turkey.

METHODS

In this cross-sectional study, convenience sampling method is used for data collection and voluntary basis is taken into account while selecting the participants. Supplier managers and employees signed a voluntary participation form and filled in the questionnaires which adhered to declaration of Helsinki protocols (World Medical Association).

Sample

The sample of the study is composed of meat, poultry, fish, grain and dry bean suppliers located in Ankara. 400 questionnaires were distributed for this purpose but 332 forms returned (% 83 return rate). As a result of the data control which is done after the information obtained through the questionnaires transferred to computer media, 13 miss-filled forms are deducted from the scope of the research. Thus, remaining 107 employers and 212 employees form the total sample of 319 individuals. The research was made between January and April 2010.

Scale

A scale which consists of 34 questions and is prepared by a group of researchers is used to measure suppliers' knowledge and attitude about food safety. The scale consists of three sections. There are 4 questions (age, gender, education level and employment status) about demographics in the first section, 15 qestions related to food safety knowledge (true, no idea, false) and 15 questions (3-Likert) about attitude towards food safety (Appendix 1). A pilot study is employed with 30 people at the beginning of the research. After the pilot study, minor changes have been made in the questionnaire form. The survey is conducted with volunteers and completed in about 10 minutes. Reliability of the scale (Cronbach α) in attitude questions is found 0.74.

The knowledge scores of the individuals are calculated by giving "1" point to "true" answers and "0" points for "false" and "not idea" answers (Appendix 2). While calculating the attitude scores, "3" points are given to "always" option in positive questions, "2" to "sometimes" and "1" to "never". Reverse scoring is applied in negative questions, "always" rated "1" point, "sometimes" "2" and "never" "3" points. In this scale, food safety knowledge score is in 0-15 range, while attitude score range is from 15 to 45.

Statistical Analysis

Statistical analysis of the data was performed by Statistical Package for Social Sciences (SPSS) version 15 software (SPSS Inc., Chicago, IL, USA). Mean and standard deviation were used for presenting continuous variables (food safety knowledge and attitude), while frequencies and percentage values were used for categorical variables (gender, age, education level, employment status). Chi-Square (χ^2) test were used for comparison of categorical variables. For continous variables, student's t test were used to compare two groups, one-way anova for three or more groups and Tukey's multiple comparison test. P values of less than 0.05 were considered to be statistically significant.

RESULTS

Demographics of suppliers are given in Table.1. The majority of employers are men (%77.6) while this ratio is %49.1 for employees. The distribution of employers and employees by gender was statistically significant ($p < 0.01$). In the overall, majority of the suppliers is male %58.6. Almost half of the suppliers are in 18-25 range in terms of age group. (%48.6). Majority of employers is in 26-35 age group (%30.8). %24.3 of employers are older than 46 while this ratio decreases to %6.6 for employees. The employer and the employees' distribution according to age groups was statistically significant ($p < 0.01$). When the education of suppliers is analyzed, it is found out that the majority of people working as employers are graduated either from high school or university (%48.6 and %18.7 respectively). On the other hand, more than half of the employees are primary school graduates. (%60.4) The difference between education attainment rates was statistically significant ($p<0.01$).

Mean scores of food safety knowledge and attitude of suppliers are 8.76 ± 2.51 and 35.14 ± 4.04 respectively. In comparison to the scores that can be collected from the scale, suppliers' food safety knowledge score is average and attitude score is above average.

The representation of statistical comparison of suppliers' knowledge and attitude scores according to various demographic characteristics is given in Fig. 1. Male suppliers' average knowledge score is 8.87±2.58 and average attitude score is 4.93±4.16 while this values are 8.59±2.40 and 35.43±3.86 respectively for women. There is no statistically significant difference between genders in terms of scores ($p>0.05$). Food safety knowledge scores varies significantly according to age groups ($p<0.05$). Accordingly, the mean knowledge score of those who aged 36-45 (9.15±2.23) is higher than those who aged 46 or over. In terms of education levels, both knowledge and attitude scores of suppliers did not differ significantly. ($p>0.05$). Averages of food safety knowledge scores of employers abd employees are 9.28±2.37 and 8.49±2.54 respectively. There was no significant difference between mean scores of knowledge of the two groups ($p < 0.01$). Attitude scores of employers and employees are 35.58±4.03 and 34.92±4.02 respectively and there is no significant difference between these averages ($p>0.05$).

The result of this study shows that there is moderately significant relationship between food safety knowledge and attitude scores.($r=0.358$, $p<0.01$). Graphical representation of the relationship between knowledge and the attitude points given in Fig. 2.

Table 1. Demographic characteristic of suppliers

Demographic	Employers(n:107)		Employees(n:212)		Total(n:319)	
Characteristics	n	%	n	%	n	%
Gender						
Male	83	77.6	104	49.1	187	58.6
Female	24	22.4	108	50.9	132	41.4
p=0.000						
Age (years)						
18-25	23	21.5	103	48.6	126	39.5
26-35	33	30.8	65	30.7	98	30.7
36-45	25	23.4	30	14.2	55	17.2
46+	26	24.3	14	6.6	40	12.5
p=0.000						
Education Level						
Primary School	35	32.7	128	60.4	163	51.1
High School or equivalent	52	48.6	70	33.0	122	38.2
University	20	18.7	14	6.6	34	10.7
p=0.000						

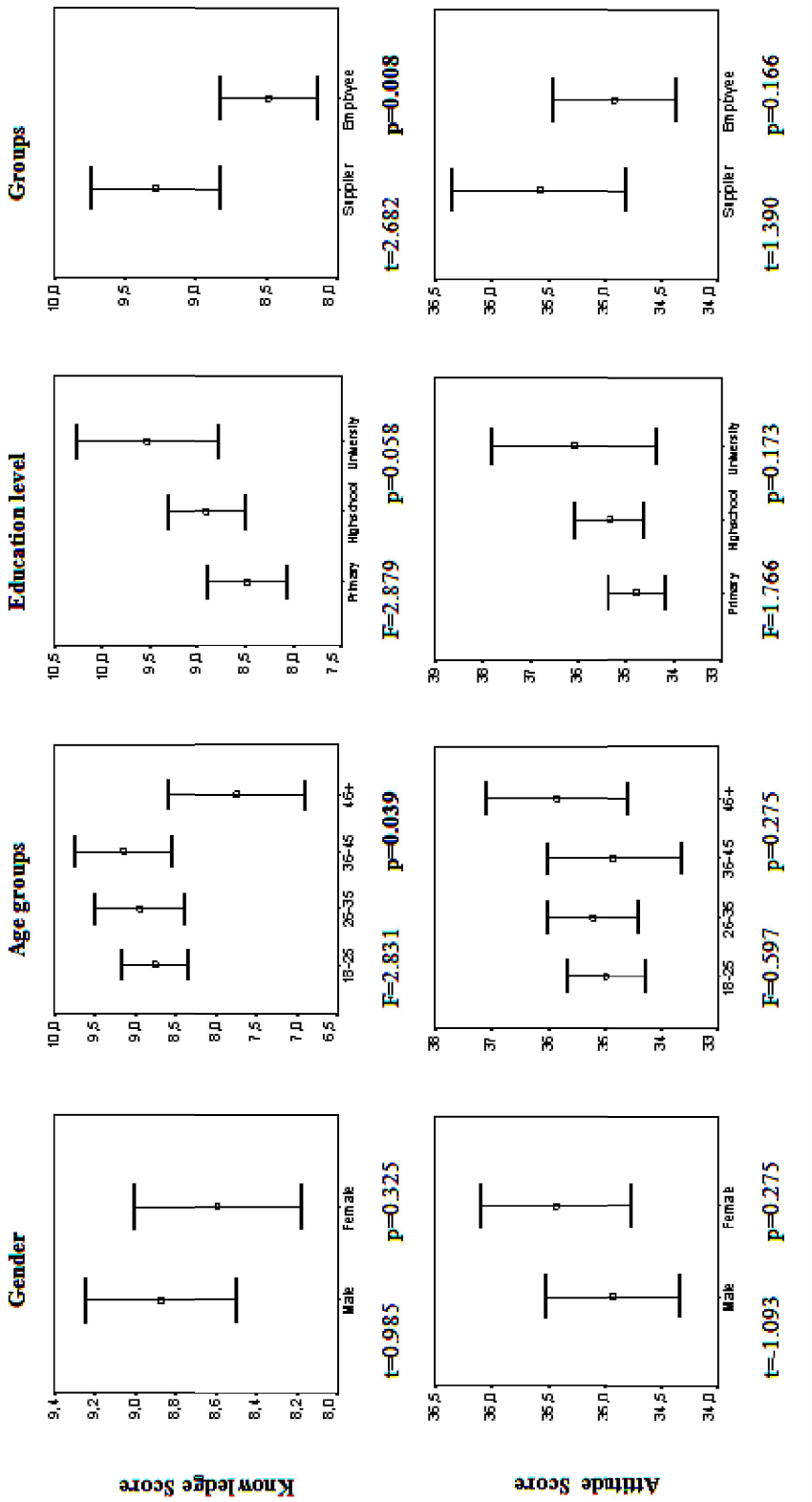

Fig. 1. Comparison of knowledge and attitude scores according to gender, age, education levels and groups (supplier and employee)

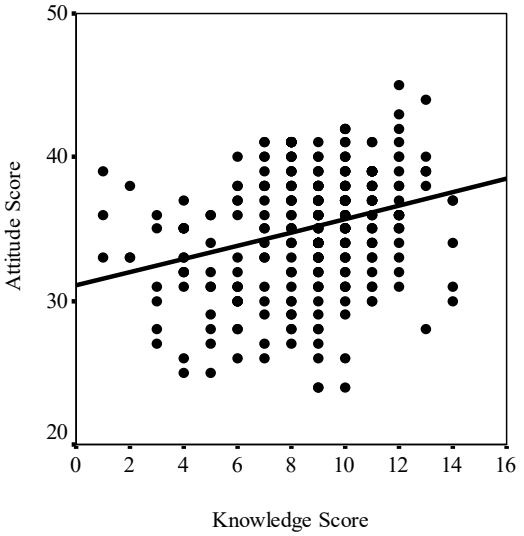

Fig. 2. The correlation between knowledge and attitude scores (n=319)

DISCUSSION

Although the public is increasingly concerned about food-related risks, the rise in food poisining cases suggests that people stil make decisions of food concumption, food storage and food preparation that are less ideal from a health and safety perspective (Mc Carthy *et al,* 2007). Inappropriate food safety knowledge, poor personal hygiene, improper food handling, inadequate raw materials and cooking, cross-contamination, unsuitable storage conditions and thawing can be accepted as main reasons for food-borne illnessess (WHO 2002; Sanlier, 2009; Sanlier, 2012). Food safety is very important in food industry. Food industry workers' understanding of food safety procedures and potential factors plays a very important role for prevention of food-borne diseases.(Clayton, Griffith, Price, Peters, 2002). In a study, food industry workers knowledge and attitude about microbial hazards, hygiene and safety rules are found to be lacking (Gomez-Nevez, Araujo, Ramos, 2009). In a study conducted on 109 enterprises in Turkey, only eight business enterprises applies HACCP system and most of the employees and employers have heat-time errors and inadequate hand-washing practices. (Bas, Ersun, Kivang, 2006). Shojaei ve ark. (2006)have found that employees of retailers have insufficient knowledge about both personal and food hygiene. Walker, Pritchard, Forsythe (2003) found that employees of small food businesses of England smell or taste the food to determine whether it is corrupt or not, and their hygiene knowledge is insufficient. Mccabe-Sellers and Beattie (2004) observed that the leading causes on the incidence of foodborne illnesses were failure to implement the following: hold and cool food properly, follow good personal hygiene, prevent cross-contamination, cook food to the correct internal temperatures, and procure food from safe sources. The result of these studies support our research findings.

Previous studies on food safety have demonstrated that the knowledge on food safety increases depending on age and practice, and women are more knowledge able than men on the issue of food safety. In addition, it has been determined that younger participants need more training on food safety than others do (Sanlier, 2009; Sanlier,2010). Thus, education level, age and gender affects the food safety knowledge. (Redmand, Grifith, 2003; Sanlier, 2009; Sanlier, 2010).

In another study, it observed that there is a lack of knowledge about food-borne diseases, hand washing habits, food purchasing, seperation of raw and cooked foods, cooking of foods, thawing and cooling frozen foods, and raw egg consumption and there is a need for education about food safety. (Surujial, Badrie, 2004). In a study conducted in Italy with 411 food industry employees, even though employees have positive attitude towards food safety, they are making errors in their working environment. (Angelilo, Viggiani, Greco, Rito, 2001).

Prevention of foodborne illness depends upon food production that is pathogen free, control of hazards during processing, foodborne illness surveillance, and safe food handling by food service workers and the public (Altekruse, Street, Fein, Levy, 1996). These studies indicated that food safety knowledge alone may not enough to ensure safe food handling practices like many other health-related behaviors, education and knowledge are only part of solution. The other factors that must be taken into account are perceived risk, perceived barriers and perceived self-efficacy. When evaluating perceived risk, two different ideas were being weighed. The first was the perception of

susceptibility, while the second is the perception of threat (Curtis, 2008). Wyatt (1979) conducted a study with food managers and oweness of food markets to evaluate knowledge and attitude regarding sanitation and food handling practices. Participants didn't demonstrate adequate knowledge on food contamination, temperature control, personal hygiene and food protection and their attitudes were identified as ambivalent.

The results of this study shows that both employers' and employees' level of knowledge and attitude about food safety is not sufficient. Although goverment, food industry and consumers have a joint responsibility about food safety, goverment has a bigger tasks with its legal regulations and guidance powers. (Sanlier *et al.* 2011; Sanlier, Konaklioglu, 2012). In addition to provide justice by maintaining social, political and economical stability, goverments should also constitute a peace providing environment. Educations about food safety that increases consumer awareness would be a driving force both for goverments to make effective and common food control and for producers and industrialists to produce safe food. to that improve consumer awareness. Studies agree that the topic that must be emphasized for food safety education and training should be based on the most common risk factors associated with foodborne illness. The result of our work shows that education about knowledge of food safety should be mandatory. The trainings should be repeated in certain intervals and controls should be continuous in order to convert the knowledge received from education toattitude and the attitude to behaviour.

Limitation of the study

Because of the population of this study consisted of purveyors and workers in central Ankara, the results should not be generalized to all sector, all ages, or to the entire country. Altough the reliability coefficient was found to be high, this research measured self-reported behaviors, which are prone to bias by the subjects.

ACKNOWLEDGEMENTS

I would like to thank the postgraduates who have made usefull contributions and have exerted their efforts in the collection of the study data, and to the purveyors and workers in sectors who have answered the questions honestly.

REFERENCES

1. Altekruse, S., Street, D., Fein, S., Levy, A. Consumer knowledge of foodborne microbial hazards and food-handling practices, *Journal of Food Protection,* 1996; **59**(3): 287-294.
2. Angelilo, I.F., Viggiani, N., Greco, R.M., Rito, D. HACCP and food hygiene in hospital: knowledge, attitudes and practices of food-service staff in Calabria, Italy, *Infection Control and Hospital Epidemiology*, 2001; **22**(6): 363-369
3. Baþ, M., Yüksel, M., Çavuþoðlu, T., Difficulities and Barriers for the Implementating of HACCP and Food Safety Systems in Food Businesses in Turkey, *Food Control,* 2005; **18**: 124-130
4. Bas, M., Ersun, S., Kivang, E. Implementation of HACCP and prerequisite programs in food businesses ýn Turkey, *Food Control*, 2006; **17**: 118-126
5. Bruhn, C. Schutz, H.G. Consumer Food Safety Knowledge and Practices, *Journal of Food Safety*, 1998; **19**(4):73-87
6. Clayton, D.A., Griffith, C.J., Price, P., Peters, C.A., Food Handless Beliefs and Self-Reported Practices *International Jounal Of Enviromental Health Research,* 2002; **12**:25-39
7. Curtis, R.J. Food Safety Knowledge of Undergraduate Students of California State University, Fullerton. Master of Public Health Theses, USA, 2008
8. Dölekoðlu, C.Ö. Gýdalarda Kalite Güvenlik Sistemleri, Tarýmsal Ekonomi Araþtýrma Enstitüsü Dergisi, 2003; 3.
9. Gomez-Neves, E., Araujo, E., Ramos, E. Cardoso, C.S. Food handling comparative analysis of general knowledge and practice in three relevant groups in Portugal, *Food Control,* 2007; **18**(6): 707-712
10. FAO, WHO Assuring food safety and quality: Guidelines for strengthening national food control systems. Joint FAO/WHO publication. 2008; Available at: http://www.who.int/foodsafety/publications/fsmanagement/guidelines foodcontrol/en/index.html.
11. McCabe-Sellers, B., Beattie, S. Food Safety:Emerging trends in foodborne illness surverllance and prevention. *Journal of the American Dietetic Association*, 2004; 104
12. Mccarthy, M., Brennan, M., Kelly, A.L., Ritson, C. De Boer, M., Thompson, N. Who is at risk and what do they know? Segmenting a

population on their food safety knowledge. Food Quality and Preference, 2007; **18**(2:) 205-217.
13. Redmond, E., Griffith, C.J. Consumer food handling in the home: A review of food safety studies. *Journal of Food Protection,* 2003; **66**: 130-161
14. Satin, M., Food Alert: The Ultimate Sourcebook for Food Safety, Facts on File, Inc., 2008; September, 2nd ed.
15. Shojae, H., Shooshtaripoor, J., Amiri, M. Efficacy of simple hand-washing in reduction of microbial hand contamination of Iranian food handless, *Food Research International*, 2006; **39**: 525-529
16. Silver, D. Top foodborne illness risk factors pinpointed restaurants & Institutions, 2000; **110**(28):118-119
17. Surujlal, M., Badrie, N. Household consumer food safety study in Trinidad, West Indies, *International Journal of Food Safety,* 2004; **3**: 8-14
18. Sanlier, N. The knowledge and practices of food safety by young and adult consumers. *Food Control,* 2009; **20**: 538-542
19. Þanlýer, N. Food safety knowledge and the safe food handling behaviours of female and male consumers, *Pakistan Journal of Medical Sciences,* 2010; **26**(3): 653-658
20. Sanlier, N., Dagdeviren, A., Çelik, B., Bilici, S., Abubakirova, A. Determing the knowledge of food safety and purchasing behavior of the consumers living in Turkey and Kazakhstan, *Africa Journal of Microbiology Researchi*, 2011; **5**(18): 2724-2732
21. Sanlier, N., Konaklioglu, E. Food safety knowledge, attitude and food handling practices of students. *British Food Journal*, 2012; **114**: 4.
22. Varzakas, T.H., Tsigarida, E.T., Apostolopoulas, C., Vassiliadou, D.K., Jukes, D., The Role of the Food Safety Authority in Greece-Implementation Strategies, *Food Control*, 2006; **17**: 957-965
23. Walker, E. Pritchard, C., Forsythe, S. Food handlers' hygiene knowledge in small food businesses, *Food Control,* 2003; **14**: 339-343.
24. WHO Food Safety and Foodborne Illness, World Health Organization, Geneva, Factsheet, 2002; 237
25. WHO Food Safety and food-borne illness. In.F.s.N. 2007; 237 (Ed)
26. WHOFood safety report, 2010; http://www.who.int/foodsafety/en
27. Wyatt, J.C. Concerns, experiences, attitudes and practices of food market managers regarding sanitation and safe food handling procedures, *Journal of Food Protection*, 1979; **42**: 555-560

Appendix 1. Food safety attitude questionnaire

Statements	Never	Sometimes	Always
1.	Wash my hands before preparing food with meat products		
2.	Before preparing food, I clean surfaces which I am going to use		
3.	I put the food residue to the refrigerator within 2 hours		
4.	I check expiration dates on food packages		
5.	I look to the tastes of foods to check whether they are safe or not		
6.	I eat the meat to cook thoroughly. Not use bloody (bright red) meat		
7.	I do not eat raw eggs or foods which containing raw eggs		
8.	After the purchase I put the refrigerator within 2 hours In a short time perishable food (frozen meat, etc.)		
9.	If necessary when I sort out frozen food under water, I pay attention to use saver bags or wrapped food in plastic		
10.	Put eggs in the fridge that I purchased after washing		
11.	When I removal from the refrigerator a cooked meal and then just keep heating process once more		
12.	I eat fruits and vegetables after washing		
13.	I get meat, poultry, fish and frozen food at the end of shopping		
14.	I eat the moldy food after throwing moldy parts		
15.	I keep eggs, milk, meat and meat products at room temperature		

Appendix 2. Food safety knowledge questionnaire

Statements		
1.	If you have swelling of canned boxes it is inconvenient to use	(T/F)
2.	Vegetable and fruit production required the use of pesticides	(T/F)
3.	Unopened pasteurized milk may be stored refrigerator temperature for up to three days	(T/F)
4.	If cutting boards, is to be used for foods such as meat and vegetables, cleaning it with aclean towel between procedures, prevents bacterial growth	(T/F)
5.	Raw chicken, fish and meat should not touch each other	(T/F)
6.	The bacteria in our hands can produce harmful toxins in foods	(T/F)
7.	Before contact with foods, keep our hands under cold running water is enough to get rid of bacteria on our hands	(T/F)
8.	In the Frozen foods all the bacteria which will cause the disease are killed	(T/F)
9.	Washing fruits and vegetables thoroughly before consuming is not important for food safety	(T/F)
10.	The expiration date is important for food so it should be taken at any time	(T/F)
11.	Food additives are used only in packaged foods	(T/F)
12.	All food additives are harmful to human health	(T/F)
13.	It is important for the places of manufacture and sale of food products have received safe food documents	(T/F)
14.	Where the places that food stuffs sold, conditions are (cleanliness and hygiene, etc.) important	(T/F)
15.	Raw foods and cooked foods should be kept separate	(T/F)