



## The knowledge and practice of food safety and hygiene of cookery students in Turkey

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### ABSTRACT

The aim of this study was to assess the knowledge and practice of food safety and hygiene among students in university cookery programs in Turkey. A questionnaire was given to 82 cookery students in two vocational schools from two different universities. The results showed that although the students regarded the issues of food safety and personal hygiene as important, they had inadequate knowledge in these areas.

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### 1. Introduction

Each year, millions of people worldwide suffer from food-borne diseases and illnesses resulting from the consumption of contaminated food, which has become one of the most widespread public health problems in the contemporary world (Sanlier, 2009, 538). Analyses of food-borne disease notifications throughout the world have shown that the majority of outbreaks result from practice during food preparation in small food businesses, canteens, residential homes, and other places where food is prepared for human consumption (Seaman & Eves, 2006: 279).

In catering establishments mishandling of food plays a significant role in the occurrence of food-borne illness (Egan et al., 2007: 1180; Ehiri, Morris, & McEwen, 1997: 137). Improper food handling may be implicated in 97% of all food-borne illness associated with catering outlets (Egan et al., 2007: 1180). In Europe, approximately 22%, and in the USA 45%, of all food-borne illness has been traced to food eaten in catering establishments. In Ireland, approximately 50% of all food-borne illness has been traced to food eaten in catering establishments. This is broadly similar to the situation in England and Wales (54%) where it has been suggested that 1 in every 1500 catering operations will give rise to a notified case of food-borne illness every year (Bolton, Meally, Blair, McDowell, & Cowan, 2008: 291).

Besides, food safety remains a critical issue with outbreaks of food-borne illness resulting in substantial costs to individuals, the food industry, community health systems, and to the economy in general (Egan et al., 2007: 187).

### 2. The importance of this study

When reviewing related literature, we found that there are many studies about the knowledge and practices of food safety which was done on different groups (Bolton et al., 2008; Dewaal, 2003; Howells et al., 2008; Jevsnick, Hlebec, & Raspor, 2008b; Kramer & Scott, 2004; McCarthy et al., 2007; Omemu & Aderoju, 2008; Rao, Sudershan, Rao, Rao, & Polasa, 2007; Sanlier, 2009; Tokuç, Ekuklu, Berberoğlu, Bilge, & Dedeler, 2009; Waggoner, 2002; Walker, Pritchard, & Stephen, 2003). However we came across no studies which examined the knowledge and practice of food safety among students in university cookery programs. After graduating from these schools, the students will be working for catering establishments' kitchen department. Therefore, the students' knowledge and practices of food safety and hygiene are very important. This point increases the importance of this study.

### 3. Materials and methods

A questionnaire form, which can be found in the Appendix, was designed especially for our aim of examining student knowledge and practice of food safety and hygiene. Initially the questionnaire was pre-tested on 30 randomly selected students who were

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studying at the department of Hospitality Management in Balikesir University School of Tourism and Hotel Management, and who worked in the kitchens of various hotels. The questionnaire form was rearranged according to pre-test results and other recommendations (These pre-test results were not included in this study). The data were collected from cookery department students with the help of their instructors between 15 March and 9 April 2009.

The questionnaire form was designed by taking into consideration the studies conducted by Angelillo, Viggiani, Greco, and Rito (2001); Walker et al. (2003); Çakiroğlu and Uçar (2008); Tokuç et al. (2009); Sanlier (2009). The questionnaire form included four parts. In the first part, we attempted to determine the students' socio-demographic profiles with 3 questions. In the second part, 14 questions were given to the students to determine the level of their knowledge on food safety. They were asked to choose among "true", "false" or "do not know" as answers. The third part included 9 questions for determining the students' practices relating to safe food production. The students were asked to respond to 9 items, using the terms "agree", "have no idea" or "do not agree". In the last part, which was to assess the students' practice of personal hygiene, 4 items were rated using a 5-point likert scale, ranging from "always (1)" to "never (5)".

In Turkey, cookery education is given in 8 vocational schools. The students studying in these schools composed the area of our study. The curriculums of these schools are alike, and all of them aim firstly to educate and train students to meet the needs of catering establishments. The sample chosen in this study included students who were studying in cookery departments in the Vocational School of Mugla University and in the Vocational School of Afyon Kocatepe University. Out of 105 questionnaire forms sent to these two vocational schools, 86 were completed. This represents a high response rate of 90 percent. Four questionnaires were not taken into consideration because they were incomplete or the student had given contradictory answers. Consequently, 82 forms were evaluated in the study.

#### 4. Findings and discussion

Findings have been analysed under four sections: (1) socio-demographic profiles of students; (2) student knowledge about safe food production; (3) student practices in the production of safe food; and, (4) student practices in personal hygiene.

##### 4.1. Socio-demographic profile of students

As can be seen in Table 1, 91.4% of the respondents were male and 8.6% were female. Nearly half (48.8%) of the students were 19

**Table 1**  
Socio-demographic profile of students.

Socio-demographic variables	Frequency	Percentage
<i>Gender</i>		
Male	75	91.4
Female	7	8.6
Total	82	100
<i>Age</i>		
17	11	13.4
18	28	34.2
19	40	48.8
20 and above	3	3.6
Total	82	100
<i>Education level</i>		
First year	40	48.8
Second year	39	47.6
Extended year	3	3.6
Total	82	100

years old. As for the level of education, 48.8% of the students were in the first year of university and 47.6% were in the second year.

##### 4.2. Findings on student knowledge of safe food production

Frequency and percentage levels of the students' knowledge of safe food production are presented in Table 2. As this table indicates, almost all students (90.2%) agreed that disregarding the rules of food hygiene during food production causes food-borne disease. These findings are paralleled by a study conducted in hospitals by Tokuc et al. in 2009. In their study, staff working in the food and beverage departments of hospitals had the same knowledge as those in this study.

Another finding pertains to be conservation of hot ready-to-eat food. As stated in some studies (Angelillo et al., 2001; Omemu & Aderoju, 2008; Walker et al., 2003), the ideal temperature for conservation of hot ready-to-eat food needs to be approximately 60 °C. Our results showed that 48.8% of the students know the correct temperature for conservation. This finding is paralleled by a study carried out in United Kingdom by Walker et al. (2003; 243). They (2003; 243) found that less than half of the food handlers knew the correct temperature. Another study conducted in Slovenia by Jevsnick et al. (2008) also showed that only 56.9% of the respondents had correct information on this matter.

Fifty-six percent of the students knew that bacteria does not multiply at 90 °C. While a quarter of them (25.7%) had incorrect knowledge about the temperature at which bacteria multiply, 18.3% had no idea about it. Also, with respect to the item "only sick people carry bacteria which cause food poisoning" 28% failed to identify the statement as incorrect. And, 72% knew this subject.

In regard to the statement that "bacteria stop the multiplying process at human temperature," 70.8% correctly identified this as false, while 17.1% gave the wrong answer. Walker et al. (2003) also determined in their study that 76% of the food and beverage staff knew that bacteria continue to multiply at human temperature.

Foods should never be defrosted on the counter or in hot water as bacteria multiply rapidly between 40 and 140 °F (4–60 °C). There are three safe ways to defrost food: in the refrigerator (app. full day to thaw), in cold water (app. an hour by changing the water every 30 min), and in the microwave (Food Safety and Inspection Service, <http://www.fsis.usda.gov>). Yet, only about half of the students (53.7%) knew that meat should not be defrosted at room temperature. On the other hand, 29.3% did not know that raw and cooked food should be kept separately, even though according to Egan et al. (2007; 1180) keeping them together is the most prevalent cause of food poisoning.

Other findings of our study are that only 59.8% of the students knew that different kinds of meat cannot be diced together on the same cutting board, and that 35.4% were not aware that it is unsafe for meat and vegetables to be chopped up on the same cutting board.

Salmonella is one of the most important food-borne pathogens in the world (Tietjen & Fung, 1995; 53). In our study, 75.6% of the students knew that salmonella was a kind of bacterium which causes food poisoning. This result is similar to the findings of Ehiri et al. (1997). They indicated in their study that most of the people who took part in food hygiene education in Scotland knew about the salmonella bacterium.

Seventy-five point six percent of the students knew that food must not be served later than 2 h after its preparation. Unfortunately, however, this also means that nearly a quarter of them (22%) were ignorant of this danger. Also, 61% of the students thought that a staff involved in food production should have

**Table 2**  
Students' knowledge on safe food production.

	Answers given by students					
	True		False		Do not know	
	Freq.	%	Freq.	%	Freq.	%
Preparation of food disregarding hygiene rules causes food-borne illnesses	<b>74</b>	<b>90.2</b>	3	3.6	1	1.2
Improper heating of food causes food-borne illnesses	<b>73</b>	<b>89.0</b>	4	4.8	2	2.4
Hot ready-to-eat food should be conserved at 20 °C	25	30.5	<b>40</b>	<b>48.8</b>	14	17.1
Bacteria multiply at approximately 90 °C	21	25.7	<b>46</b>	<b>56.0</b>	15	18.3
Only sick people carry bacteria which causes food poisoning	23	28.0	<b>59</b>	<b>72.0</b>	–	–
Bacteria stops reproduction at human temperature (37 °C)	14	17.1	<b>58</b>	<b>70.8</b>	7	8.5
Frozen meat should be defrosted at room temperature	24	29.3	<b>44</b>	<b>53.7</b>	12	14.7
Refreezing defrosted food causes food-borne illnesses	<b>65</b>	<b>79.3</b>	14	17.1	–	–
Conserving cooked food and raw food together causes food-borne illnesses	<b>54</b>	<b>65.9</b>	24	29.3	6	–
Different kind of meat (red meat, chicken, fish, etc.) can be diced or chopped up on the same cutting board	29	35.4	<b>49</b>	<b>59.8</b>	3	3.6
Meat can be chopped up with vegetables on the same cutting board	26	31.7	<b>50</b>	<b>60.1</b>	1	1.2
Salmonella is a kind of bacterium which causes food poisoning	<b>62</b>	<b>75.6</b>	16	19.5	4	4.9
Food should be served no later than two hours after preparation	<b>60</b>	<b>73.2</b>	18	22.0	2	2.4
Food production staff should have health checkups every two years	50	61.0	<b>31</b>	<b>37.8</b>	–	–

\* The correct answers to items are given in bold type.

health checkups every two years, whereas in fact checkups are required twice a year.

#### 4.3. Findings on student practices in safe food production

These results are shown in Table 3. Of note is that almost all students (97.6%) showed a high level of attention to personal hygiene. Eighty-six point six per cent of the students were aware that hand or finger injuries can cause serious food-borne illnesses. This result was parallel to a 2009 study by Tokuc et al., where it was found that almost all (93.2%) of the food staffs in hospitals were aware of the danger in touching food with cut hands or fingers. The most striking result was offered by Angelillo et al. (2001) who found that 99% of food staffs did not touch food with cut hand or fingers.

One of the important rules in food production is that the food staff should wear caps, masks and gloves in order to prevent contamination. Most students (97.6%) stated that they wore all three during food production. Çakiroğlu and Uçar (2008) also found similar results in their study, where 82.9% of the staff wore caps, masks and gloves during food production.

Almost all of the students (95.2%) explained that they always kept their working area clean for safe food production. Additionally, 90.2% of them stated that they did not wear the same shoes and clothes both outside and inside of the food production area. Moreover most of the students (81.7%) explained that they did not touch raw food without wearing protective gloves.

Most of the students (84.2%) indicated that they did not wear jewellery during food production. Walker et al. (2003) also found that 97% of food staffs took off their jewellery before engaging in food production. In contrast, Azanza, Gatchalian, and Ortega (2000;

239) indicated in their study that only half of the street vendors (53.7%) in the Philippines knew that wearing accessories could cause bacterial contamination.

Eighty-nine percent of the students stated that they did not participate in food production when they had flu, cold or diarrhea. This indicates that they were aware, and that universities had successfully instructed them, that infections can be easily transmitted under such conditions.

#### 4.4. Findings on student practices of personal hygiene

Personal hygiene practice is extremely important to ensure safe food production. The results from questions pertaining to personal hygiene are presented in Table 4. There one can see that almost all of the students (98.8%) reported that they *always* washed their hands after using the toilet, which is vitally important to safe food production. Tokuç et al. (2009) found a similar result in their study, where 93.2% of the food staff washed their hands after using the toilet. Ninety-two point seven percent of the students also indicated that they *always* changed their uniform after food preparation.

In another finding on the subject of personal hygiene, 75.6% of the students said they *always* washed their hands after coughing or sneezing, while 12.2% said they *often* did so. In a study done by Ehiri et al. (1997), it was determined that 74% of the trainees receiving hygiene education had correct information relating to bacterial contamination resulting from coughing or sneezing.

The last item on personal hygiene asked how frequently students brushed their nails. Fifty percent responded that they *always* brushed their nails, whereas 24.4% answered that they often

**Table 3**  
Students' practices in safe food production.

	Agree		Have no idea		Not agree	
	Freq.	%	Freq.	%	Freq.	%
I pay attention to my personal hygiene because food safety is very important to the ready food sector	80	97.6	1	1.2	–	–
I care to use fresh raw materials in food production	76	92.7	–	–	5	6.1
I do not touch food when my hand or fingers are cut	71	86.6	3	3.6	4	4.8
I wear cap, masks and protective gloves during food production in order to prevent food-borne illnesses	80	97.6	–	–	2	2.4
I always keep my work area clean for safe food production	78	95.2	1	1.2	3	3.6
I do not wear the same shoes and clothes both outside and inside of the food production area	74	90.2	2	2.4	6	7.4
I do not touch raw food without wearing protective gloves	67	81.7	5	6.0	5	6.1
I do not wear jewellery (ring, earrings, etc.) during food production	69	84.2	4	4.8	9	11.0
If I get flu or catch cold or have diarrhea, etc. I do not participate in food production	73	89.0	–	–	7	8.6

**Table 4**  
Student practices in personal hygiene.

	Always		Often		Sometimes		Rarely		Never	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%
How often do you wash your hands after using toilet	81	98.8	1	1.2	–	–	–	–	–	–
How often do you change your uniform	76	92.7	6	7.3	–	–	–	–	–	–
How often do you wash your hands after coughing or sneezing	62	75.6	10	12.2	8	9.8	–	–	–	–
How often do you brush your nails	41	50.0	20	24.4	18	22.0	–	–	–	–

did so. On the other hand, 22.0% said that they *sometimes* brushed their nails. These results indicate that the students gave less attention to hygiene than to the other issues.

## 5. Conclusion

In this study, we sought to investigate the extent of student knowledge in safe food production. The results showed that students had poor knowledge in several regards, and that, on the other hand, they rightly considered the practices of personal hygiene to be important in food production.

The students educated in these schools will be the food production staff in the future; their level of education will have a positive or negative effect on the economy of the catering sector. To improve the education of students in cookery departments, there should be co-ordination between the needs of universities

and the catering sector. Intensive education about food safety should be given to the students in vocational schools.

Another important point in cookery education should be to make students aware of the impact that different practices in food production may have on the economy. Curriculums in vocational schools need to be established that include not only general knowledge of food production but also address the economic and socio-cultural consequences of that knowledge.

## 6. Limitations of this study and directions for future research

Like most of the other studies, this study has some limitations. Although this study was limited to the degree that it was restricted to two vocational schools, in future studies the sampling area can be extended, and the knowledge and practices of students from different universities can be compared. Another limitation might have arisen from the use of a questionnaire to assess the students'

## Appendix

### Section I

1-Gender?	<input type="checkbox"/> Male	<input type="checkbox"/> Female		
2-Age ?	<input type="checkbox"/> 17	<input type="checkbox"/> 18	<input type="checkbox"/> 19	<input type="checkbox"/> 20 and above
3-Educational level?	<input type="checkbox"/> First Year	<input type="checkbox"/> Second Year	<input type="checkbox"/> Extended Year	

### Section II

	True	False	Do not know
Preparation of food disregarding hygiene rules causes food-borne illnesses			
Improper heating of food causes food-borne illnesses			
Hot ready-to-eat food should be conserved at 20 °C			
Bacteria multiply at approximately 90 °C			
Only sick people carry bacteria which causes food poisoning			
Bacteria stops reproduction at human temperature (37 °C)			
Frozen meat should be defrosted at room temperature			
Refreezing defrosted food causes food-borne illnesses			
Conserving cooked food and raw food together causes food-borne illnesses			
Different kind of meat (red meat, chicken, fish, etc.) can be diced or chopped up on the same cutting board			
Meat can be chopped up with vegetables on the same cutting board			
Salmonella is a kind of bacterium which causes food poisoning			
Food should be served no later than two hours after preparation			
Food production staff should have health checkups every two years			

### Section III

	Agree	Have no idea	Not Agree
I pay attention to my personal hygiene because food safety is very important to the ready food sector			
I care to use fresh raw materials in food production			
I do not touch food when my hand or fingers are cut			
I wear cap, masks and protective gloves during food production in order to prevent food-borne illnesses			
I always keep my work area clean for safe food production			
I do not wear the same shoes and clothes both outside and inside of the food production area			
I do not touch raw food without wearing protective gloves			
I do not wear jewellery (ring, earrings, etc.) during food production			
If I get flue or catch cold or have diarrhea, etc. I do not participate in food production			

## Section IV

	Always	Often	Sometimes	Rarely	Never
How often do you wash your hands after using toilet					
How often do you change your uniform					
How often do you wash your hands after coughing or sneezing					
How often do you brush your nails					

knowledge and practices. In future studies, the observation method might be used to directly observe and note the students' practices in food hygiene. Finally, another study can be done on high school students in cookery programs in Turkey, as they also are the food production staff of the future.

## References

- Angelillo, F., Viggiani, N. M. A., Greco, R. M., & Rito, D. (2001). HACCP and food hygiene in hospital: knowledge, attitudes, and practices of food-services staff in Calabria, Italy. *Infection Control and Hospital Epidemiology*, 22(6), 1–7.
- Azanza, P. V., Gatchalian, C. F., & Ortega, M. P. (2000). Food safety knowledge and practices of street food vendors in a Philippines university campus. *International Journal of Food Science and Nutrition*, 51, 235–246.
- Bolton, D. J., Meally, A., Blair, I. S., McDowell, D. A., & Cowan, C. (2008). Food safety knowledge of head chefs and catering managers in Ireland. *Food Control*, 19, 291–300.
- Çakiroğlu, F. P., & Uçar, A. (2008). Employees' perception of hygiene in the catering industry in Ankara. *Food Control*, 19, 9–15.
- Dewaal, C. S. (2003). Safe food from a consumer perspective. *Food Control*, 14, 75–79.
- Egan, M. B., Raats, M. M., Grubb, S. M., Eves, A., Lumbers, M. L., Dean, M. S., & Adams, M. R. (2007). A review of food safety and food hygiene training studies in the commercial sector. *Food Control*, 18, 1180–1190.
- Ehiri, J. E., Morris, G. P., & McEwen, J. (1997). Evaluation of a food hygiene training course in Scotland. *Food Control*, 8(3), 137–143.
- Food Safety and Inspection Service, United States Department of Agriculture, Retrieved from [http://www.fsis.usda.gov/factsheets/Big\\_Thaw/index.asp](http://www.fsis.usda.gov/factsheets/Big_Thaw/index.asp) in 20.07.2010.
- Howells, A. D., Roberts, K. R., Shanklin, C. W., Pilling, V. K., Brannon, L. A., & Barrett, B. (2008). Restaurant employees' perceptions of barriers to three food safety practices. *American Dietetic Association*, 108(8), 1345–1349.
- Jevsnick, M., Hlebec, V., & Raspor, P. (2008). Food safety knowledge and practices among food handlers in Slovenia. *Food Control*, 18, 1107–1118.
- Kramer, J., & Scott, W. G. (2004). Food safety knowledge and practices in ready-to-eat food establishments. *International Journal of Environmental Health Research*, 14(5), 343–350.
- McCarthy, M., Brennan, M., Kelly, A. L., Ritson, C., De Boer, M., & Thompson, N. (2007). Who is at risk and what do they know? Segmenting a population on their food safety knowledge. *Food Quality and Preference*, 18, 205–217.
- Omemu, A. M., & Aderoju, S. T. (2008). Food safety knowledge and practices of street food vendors in the city of Abeokuta, Nigeria. *Food Control*, 19, 396–402.
- Rao, G. M. S., Sudershan, R. V., Rao, P., Rao, M. V. V., & Polasa, K. (2007). Food safety knowledge, attitudes and practices of mothers-findings from focus group studies in south India. *Appetite*, 49, 441–449.
- Sanlier, N. (2009). The knowledge and practice of food safety by young and adult consumers. *Food Control*, 20(6), 538–542.
- Seaman, P., & Eves, A. (2006). The management of food safety—the role of food hygiene training in the UK service sector. *Hospitality Management*, 25, 278–296.
- Tietjen, M., & Fung, Y. C. D. (1995). Salmonellae and food safety. *Critical Reviews in Microbiology*, 21(1), 53–83.
- Tokuç, B., Ekuklu, G., Berberoğlu, U., Bilge, E., & Dedeler, H. (2009). Knowledge, attitudes and self-reported practices of food service staff regarding food hygiene in Edirne, Turkey. *Food Control*, 20(1), 565–568.
- Waggoner, S. K. (2002). Food safety knowledge and practices of food recovery agency workers before and after food safety training, Texas Christian University. Master Thesis.
- Walker, E., Pritchard, C., & Stephen, F. (2003). Food handlers' hygiene knowledge in small food businesses. *Food Control*, 14, 339–343.