International Food Research Journal 21(2): 673-676 (2014)
Journal homepage: *http://www.ifrj.upm.edu.my*

Hygienic quality of food stuff in catering services and restaurants in Iran

[1*]Mahmoudi, R., [2]Norian, R., [3]Pajohi Alamoti M. R. and [1]Kiyani, R.

[1]*Department of Food Hygiene and Aquatics, Faculty of Veterinary Medicine, University of Tabriz, Tabriz, Iran*
[2]*Laboratory of Food Quality Control and Drug Residue, Veterinary Medicine Office, Qazvin province, Iran*
[3]*Department of Food Hygiene, Faculty of Para-Veterinary Science, Bu-Ali Sina University, Iran*

Article history

Received: 17 June 2013
Received in revised form: 19 October 2013
Accepted: 21 October 2013

Keywords

Food Stuff
Hygienic quality
Qazvin Province
Iran

Abstract

Hygienic quality of food (microbial and chemical quality) is very important to public health. This study was aimed to determine the microbial contamination and chemical quality of prepared food including cooked meat, cooked rice, cooked kebab, roast chicken and cooked fish in catering services and restaurants in Qazvin province from Iran. Randomly 200 food stuff samples were collected from the catering services and urban restaurants and consequently analyzed according to American public health association (APHA) and food and drug administration (FDA) standard methods. In addition, the chemical quality and outward status of food were assessed. The findings indicated that level of fat and moisture had not significant difference between same samples in various locations. Nevertheless, Coked Kebab samples had the highest of fat level at the sampling locations (5.12 ± 1.23% and 5.92 ± 0.93%), The highest and lowest levels for moisture content amounts were observed in restaurants cooked meat and kebab samples. Microbial analysis showed that the meat and fish had the highest total count (TC) and Coli forms count (6.12 ± 0.99 and 4.91 ± 0.37 Log cfu/g respectively) ($P < 0.05$). None of samples were contaminated with *Salmonella* spp., *Escherichia coli* and *Staphylococcus aureus*. Improving methods for cooking and food processing, avoid of the secondary bacterial contaminations, continuous monitoring in food processing can be great importance as preventive measures of food contamination.

Introduction

Food safety and food-borne infections are important public health concern worldwide and most of the pathogens resulting in food-borne diseases are zoonotic (Busani *et al*., 2006). These pathogens, though, usually cause self-limiting gastroenteritis, complications may occur, resulting in more severity (Zhao *et al*., 2001). Staphylococcus aureus is one of the most common agents in bacterial food poisoning outbreaks (Adwan *et al*., 2005) and symptoms of staphylococcal food intoxication generally occur one to six hours after the food is ingested and the common symptoms are nausea, vomiting, abdominal cramps, and diarrhea. Poultry, meat and egg products could be the common sources of *S. aureus*, posing a potential health risk. In developing countries, incidence rate of food borne diseases is approximately 916 cases per 100000 populations. Considering reports of WHO, economic loss posed by salmonellosis could be estimated about one billion dollar with medical and productivity costs taken into account (Pereira *et al.*, 2009; Scallan *et al*., 2011). Total aerobic bacteria, enterobacteriaceae, coliforms, and *Escherichia coli* are used as indicators of poor microbiological quality of food particularly face contamination (Abu-Ruwaida *et al.*, 1994; Capita *et al*., 2002). During the cleaning process most of these microorganisms are eliminated, but subsequent contamination is possible at any stage of the production process (Mead, 2000; Kozacinski, *et al*., 2006). Food products such as meat and protein foods due to favorable conditions for bacterial growth are in high risk foods, Thus, assessment of the chemical quality these food products is very important to improve health of consumers (Jay, 2006). Therefore, it is important to prevent the hazards and to provide a safe and wholesome product for human consumption. According to existence large number of catering services and restaurants in Qazvin province, it seems necessary to examine hygienic quality (microbial contamination and chemical properties) of food stuff in the locations.

Material and Methods

In this study, food samples included cooked meat, cooked rice, cooked kebab, roast chicken and cooked fish that randomly were collected from catering services and restaurants located in Qazvin, Iran. Sampling was taken from main dishes before serving by consumers. The samples put into in sterile plastic containers and carried to the laboratory in

*Corresponding author.
Email: *mahmodi@tabrizu.ac.ir*
Tel: +98 (0) 411 6378743; Fax: +98 (0) 411 6378743

refrigerated box at 4°C. Microbial and chemical assays were carried out based on standard methods and randomized sampling, standards of institute of standards and industrial research of Iran (ISIRI No. 815, 194, 9263 and 1-8923, ISIRI, 2009).

First, samples were homogenized in a stomacher 400 (Interscience, Saint-Nom-La- Breteche, France) and diluted with peptone water 1%. Then each of samples was tested on selective culture media for total count (TC), coliforms count, *E. coli* count, *S. aureus* count and presence of *Salmonella* spp. based on the American Public Health Association (APHA) (Vanderzant and Splittstoesser, 2005). Fat content and moisture level were assayed according to the ISIRI and food and drug administration (FDA). All statistical analyses were performed using SPSS17 software. All experiments were conducted in triplicate. Level of significance was considered at $P < 0.05$.

Results

Chemical and microbial quality of food samples are presented in Tables 1and 2. Coked Kebab samples had the highest of fat level at the sampling locations (5.12 ± 1.23% and 5.92 ± 0.93%) and the lowest fat content was found in roast chicken (1.35 ± 0.27% and 1.10 ± 0.45%). The amount of various foods fat content was not significant difference at the sampling locations. The highest and lowest levels for moisture content amounts were observed in Restaurants cooked meat and kebab samples (Table1).

The TC, coliforms count and pathogenic bacteria (*Salmonella*, *S. aureus* and *E. coli*) are shown in Table 2. Cooked meat samples collected from restaurant had the highest mean TC (6.12 ± 0.99 Log cfu/g) and restaurants kebab samples had the lowest mean count (4.16 ± 0.38 Log cfu/g). Coliforms count was highest in restaurant kebab samples (4.91 ± 0.37 Log cfu/g) and lowest in restaurant cooked fish samples (3.16 ± 0.67 Log cfu/g). TC had significant difference between coked kebab and meat samples at the sampling locations; also coliforms count had significant difference in kebab and fish samples at the sampling location (Table 2). Pathogenic bacteria were not detected in the investigated samples (Table 2). Coli forms count in all samples was more than standard levels (100 cfu/g).

Discussion

Food poisoning is a major health problem in developing countries which is caused by consuming food contaminated with pathogenic bacteria (WHO, 2008). In this study, the chemical composition and microbiological quality of food were studied in catering services and restaurants of Qazvin province, Iran. Based on the results, amount of fat and moisture in the food did not have significant differences at the sampling locations. According to the ISIRI guidelines, acceptable fat level in kebab is 20% (Tavakol and Riazipour, 2008) showing the coherence of our finding with the acceptable standard. The finding showed that cooked meat and kebab had the highest TC and coli forms count with 6.12 and 4.91 Log cfu/g; respectively ($P < 0.05$). This may be attributed to primary crude material, food manipulation by personnel, serving conditions or inappropriate cooking processes (Vanderzant and Splittstoesser, 2005). In addition, cooking temperature and heating distribution in the food could be considered as another influencing factor in food contamination. Pathogenic bacteria counts showed that none of the samples had contamination. These findings are in accordance with a study conducted in Argentina (Soriano *et al*., 2000) which showed similar findings regarding TC and Coli forms in rice and mince stew samples. The result of TC and coliform count on kebab showed that contamination was 3.22×10^3 cfu/g and 1.69×10^3 cfu/g; respectively, which was higher than our results. Insufficient heat, after-cooking secondary contamination, inappropriate preparation and contaminated masher could be effective in food contamination (Nemati *et al.*, 2008), also a significant difference was observed in not only kebab and meat TC samples of the sampling locations -i.e.samples from traditional food production centers showed higher values compared to restaurants; but also coliforms counts of kebab and fish samples at the sampling locations (the restaurants showed higher values compared to traditional food production and distribution). This finding was also previously

Table 1. Chemical analysis of the served food at different locations

Served foods	Restaurants		Catering services	
	Moisture (%)	Fat (%)	Moisture (%)	Fat (%)
Rice	38.23±1.98	2.98±0.86	39.03±2.18	2.28±0.36
Kebab	29.12±2.87	5.12±1.23	30.09±2.17	5.92±0.93
Roast chicken	39.67±3.23	1.35±0.27	38.17±3.23	1.10±0.45
Meat	65.76±2.03	4.98±0.34	63.64±2.83	4.21±0.14

Table 2. Microbial count of served food at different locations (Log cfu/g)

Served foods	Sampling locations	Microbial analysis				
		TC	Coliforms	*Salmonella spp.*	*S. aureus*	*E.coli*
Rice	R	4.96 ± 0.28	3.57 ± 0.33	*	*	*
	C	5.04 ± 0.87	3.84 ± 0.90	*	*	*
Kebab	R	4.16 ± 0.38	4.91 ± 0.37	*	*	*
	C	5.40 ± 0.60	3.49 ± 1.10	*	*	*
Roast chicken	R	5.12 ± 0.68	3.52 ± 0.11	*	*	*
	C	4.92 ± 0.89	3.41 ± 0.91	*	*	*
Meat	R	6.12 ± 0.99	3.78 ± 0.77	*	*	*
	C	4.68 ± 0.77	3.74 ± 0.70	*	*	*
Fish	R	4.94 ± 1.26	4.24 ± 1.14	*	*	*
	C	5.08 ± 0.87	3.16 ± 0.67	*	*	*

R: Restaurant, C: Catering services, *: not detection

observed in another study performed by Tavakoli *et al.* (2009) in evaluating the bacterial, chemical property and sensory quality of cooked food with traditional and modern equipment. They stated that high cooking temperature is effective in reducing the contamination level; however, the quantity of vitamin B1 and B2 in addition to the organoleptic characteristics may decrease as a result of high cooking temperature (Tavakoli *et al.*, 2007). After all, the food cooking temperature is an important factor; as some studies have shown that bacterial growth may begin only within two hours after cooking (Reglier, 2005). Therefore, preventive measures to avoid secondary contamination should be considered in such stages. Due to high contamination of food samples in this study, a variety of bacteria could exist in them, especially Bacillus cereus which could stay alive even in high temperatures particularly in rice (Nichols *et al*., 1999; Little *et al*., 2002). Rice contamination could be affected by primary sources, agricultural productions, storage steps and preparation conditions (Malakootian *et al*., 2001). Considering the lack of *S. aureus* in collected samples, hypothesis of contamination by human practice becomes unlikely (Alipour *et al*., 2011). Pathogenic bacteria such as *S. aurous*, *Salmonella* and *E. coli* and other species of enterobacteriaceae, could decrease during the preparation of crude material, the heating process (high heating such as pasteurization or use of cold) and adding preservative materials (Hoseinzadeh *et al*., 2012). Results showed that the microbial contaminations in all food samples analyzed required preventive considerations. In addition, crude material should be considered for microbial quality tests before preparation for cooking. Moreover, results of this survey could be used to inform restaurant managers, policy makers and people about the foods' quality and safety regarding to microbiological contamination and chemical composition.

References

Abu-Ruwaida, A. S., Sawaya, W. N., Dashti, B. H., Murard, M. and Al-Othman, H. A. 1994. Microbiological quality of broilers during processing in a modern commercial slaughterhouse in Kuwait. Journal of Food Protection 57: 887-892.

Adwan, G., Shanab, B. A. and Adwan, K. 2005. Enterotoxigenic *Staphylococcus aureus* in raw milk in the North of Palestine, Turkish Journal Biology 29: 229-232.

Alipour, V., Rezaei, L., Moalemi, K. and Eghbali, M. 2011. Microbial Quality of Hand-Made Fresh Fruit Juice in BandarAbbas Shopping Centers, Iran. Iranian Journal Health Environment 4(1): 115-24.

Busani, L., Scavia, G., Luzzi, I. and Caprioli, A. 2006. Laboratory surveillance for prevention and control of foodborne zoonoses, Annali dell'Istituto Superiore di Sanita 42: 401-404.

Capita, R., Alonso-Calleja, C., Garcia-Arias, M. T., Moreno, B. and Del Camino Garcia- Fernandez, M. 2002. Methods to detect the occurrence of various indicator bacteria on the surface of retail poultry in Spain. Journal of Food Science 67: 765-771.

Fang, T., Wang T. and Hung, M. 2003. Microbiological quality of 18 degrees C ready-to-eat food products sold in Taiwan. International Journal Food Microbiology 80(3): 241-50.

Hoseinzadeh, E., Faghih, M. A., Roshanaei, G., Shokoohi, R. and Mohammadi, H. 2012. Chemical Composition and Microbiological Quality of the Central Restaurant Food of Hamedan University of Medical Sciences. Thrita Journal Medicine Science 1(3): 101-105.

Jay, I. M. 2006. Modern food microbiology. 6st ed. Chapman and Hall publication: New York.

Kozacinski, L., Hadziosmanovic, M. and Zdolec, N. 2006. Microbiological quality of poultry meat on Croatian market. Veterinarski Arhiv 76: 305-313.

Little, C. L., Barnes, J. and Mitchell, R. T. 2002. Microbiological quality of takeaway cooked rice and chicken sandwiches: effectiveness of food hygiene training of the management. Journal Communication Disease Public Health 5: 289– 98.

Malakootian, M., Yaghmaeian, K., Meserghani, M., Mahvi, A. H. and Danesh-pajouh, M. 2001. Determination of Pb,Cd,Cr and Ni concentration in Imported Indian Rice to Iran. Iranian Journal of Health Environment 4(1): 77-84.

Mead, G. C., 2000. Fresh and Further-Processed Poultry. In Lund, B. M., Baird-Parker, T. C. and Gould, G. W. (Eds.), the microbiological safety and quality of food, p. 453-457. Gaithersburg: Aspen.

Nemati, M., GHorbanpour-Hrazavieh, S. V. and Hoseini, M. 2008. Chemical Composition and Microbiological Quality of the Bonab Kabab sold in Tabriz Market. Journal Food Safety 28: 315–23.

Nichols, G. L., Little, C. L., Mithani, V. and de-Louvois, J. 1999. The microbiological quality of cooked rice from restaurants and take-away premises in the United Kingdom. Journal Food Protection 62: 877-82.

Pereira, K., Schmidt, F., Guaraldo, A., Franco, R., Dias, V. and Passos, L. 2009. Diseasen as a foodborne illness. Journal Food Protection 72: 441-6.

Razavilar, V. 2010. Pathogenic bacteria in food. 3nd ed. Tehran: Tehran University Publication.

Reglier, H. 2005. Evalution of the quality of hospital foods from the kitchen to the patients. Journal Hospital Infection 59(2): 131-40.

Scallan, E., Hoekstra, R. M., Angulo, F. J., Tauxe, R.V., Widdowson, M. A. and Roy, S. L. 2011. Foodborne illness acquired in the United States - major pathogens. Journal Emergency Infection Disease 17: 7-15.

Serap, K., Ismail, Y., Mehmet, D. and Hasan, Y. 2003. Chemical composition and microbiological quality of the doner kebabs sold in Tekirdag market. Journal Food Control 14: 469-74.

Soriano, J., Rico, H., Molto, J. and Manes J. 2000. Microbial evaluation of Spanish potato omelet and cooked meat samples in University restaurants. Journal Food Protection 63(9): 1273-6.

Tavakoli, H. and Riazipour, M. 2008. Microbial quality of cooked meat foods in Tehran Universities Restaurants. Pakistanian Journal Medicine Science 24(4): 595-601.

Tavakoli, H. R., Karimi-Zarchi, A. A. and Izadi, M. 2007. A Survey on Bacterial Contamination of Consumpted Foods in Belonging Centers of Baqiyatallah University of Medical sciences. Journal Military Medicine 9(2): 89-95.

Tavakoli, H. R., Sofiabadi, G., Frajzadeh, D., Rafati, H. and Karimi-Zarchi, A. A. 2007. Comparative evaluation of bacteriological, chemical and organoleptic quality of cooked foods with traditional and modern equipment. Iranian Journal of Military Medicine 11(3): 165-70.

Vanderzant, C. and Splittstoesser, D. 2005. Compendium of methods for the microbiological examinations of foods, p. 249-254. Washington: American Public Health Association (APHA) Publications.

World Health Organization 2008. Food borne disease outbreaks: guidelines for investigation and control. WHO Library Cataloguing-in-Publication Data; [updated 2008; cited]; Available from: *http://www.who.int/ foodsafety/publications/foodborne_disease/ fdbmanual/en/index. Html.*

Zhao, C., Ge, B., Villena, J. D., Sudler, R. and Yeh, E. 2001. Prevalence of *Campylobacter* spp., *Escherichia coli* and *Salmonella* in retail chicken, Turkey, pork and beef from the Greater Washington area. Applied Environment Microbiology 67: 5431-5436.