World Journal of Dairy & Food Sciences 8 (2): 131-139, 2013
ISSN 1817-308X

DOI: 10.5829/idosi.wjdfs.2013.8.2.1125

Microbiological Hazards During Preparation of Some Ready to Eat Meals and Their Control Measures

[1]A.M. Emam, [1]E.Z. Ashour and [2]M.A. Abd El-Fattah

[1]Department of Hotel Studies, High Pharaohs Institute of Tourism and Hotels-Ministry of Higher Education, Egypt
[2]Faculty of Tourism and Hotel Management, Helwan University and Food Safety and HACCP Master Trainer in Egyptian Tourism Federation, The Egyptian Ministry of Tourism, Egypt

Abstract: Proceeding of the utmost importance that we all attach to upgrade the quality of hotels and restaurants, as a results of spread of food culture among the pioneers of restaurants in terms of food safety and disease transmission through food, as well as an abundance of information on the various international quality systems involved in food safety, the research focuses on the safety of some ready to eat meals during the preparation in terms of microbiological and so in one of the major hotels in Sharm El Sheikh town-Egypt. The research study was focused in different manufacturing processes for each meal of Chicken Pane, Rice with Nuts and A La Rouse Salad (mixed vegetables salad with mayonnaise), the standards control and monitoring procedures necessary during the preparation of tested meals were evaluated during investigation. The microbiological criteria were used for integrity of the tested meals were as follows, the aerobic bacteria, yeasts and fungi, coliform bacteria*, E. coli, Staphylococcus aureus* and *Salmonella* sp. Results showed that microbiological analysis of the final product of all tested meals were free of *Salmonella* sp. while the all results for total aerobic bacteria for Chicken Pane, Rice with Nuts and A La Rouse Salad were $2x10^1$, $2x10^3$ and $4.5x10^3$ cfu/g, respectively and the other results for the rest of analysis were $<10^1$ cfu/g for all meals, on the other hand, counting of fungi and yeast in A La Rouse Salad was 1.5×10^3 cfu/g. From these results it is clear that meals under test have high quality microbiological analysis, where the results obtained less than the allowable food presence of the organization in terms of microbiological standards. In the same time it could be confirmed that the tested meals under our investigation were produced under good hygiene requirements with the application of hazard analysis critical control points (HACCP) system as a means to control the quality and safety of food and the application of different quality systems in this hotel effective.

Key words: Catering services · Food safety · HACCP · Microbiological food quality

INTRODUCTION

Food safety is one of the most important aspects in foodservice operations but usually receives the smallest amount of visibility and attention [1]. However, the need to ensure food safety has caused a lot of public concerns. It has been suggested that the food should be safe from harmful substances from farm to fork. Since foodservice is the last or almost the last steps of food preparation; it guards the final linkage of food safety for the public in the operational food chain. Thus, it is very important to maintain safety of the food that is served by the foodservice areas [2]. Catering establishments have been frequently associated with outbreaks of food poisoning. There are microbiological hazards and risks associated with preparation and storage of foods throughout all links of the food chain from production to consumption. If these hazards are not controlled, food borne illness can occur and shelf-life of products will be shortened and spoilage can result [3]. The main risks incurred in the preparation of ready-cooked meals involve their contamination from raw ingredients and from the hands of

Corresponding Author: E. Z. Ashour, Hotel Studies Department, High Pharaohs Institute of Tourism and Hotels–Ministry of Higher Education, Egypt.

catering staff, from direct or indirect contact with contaminated work surfaces, as well as from the growth of bacteria caused by rises in temperature during the preparation and storage [4]. Improper practices responsible for microbial food borne illnesses have been well documented by Egan *et al.* [5] and typically involve; cross-contamination of raw and cooked food, inadequate cooking and storage at inappropriate temperatures. Food handlers may also be asymptomatic carriers of food poisoning organisms. Several authors have identified the relative importance of different food handling practices; there is general agreement that good overall levels of knowledge of food safety among food handlers and the effective application of such knowledge in food handling practices are essential in ensuring the consistent production of safe food in restaurant operations [6]. More procedures must be taken during the processing and by monitoring the processing procedures with a HACCP system that has been proven to be a more acceptable procedure. Food safety programs of the past tend to correct the hazard conditions after they have happened. The HACCP approach is to control problems before they happen during processing and/or serving [7]. The microbiological quality of hot meals and salads sampled at the meal serving units of a military hospital in Ankara-Turkey, manufacturing/distributing practices, level of personnel hygiene and cross-contamination precautions should be improved in the kitchen/serving units. In addition, it was also evident that the Turkish Food Code needed new legal revisions [8]. Microbiological testing is an important mechanism for collecting information used in developing and implementing an HACCP plan [9]. Hotel clients expect the high level of quality standards during the food preparation and are ready to pay slightly higher prices for meals if the risk of food borne illness is reduced [10]. This is particularly essential due to the consumers seeking that the hotels meet not only the basic quality standards but also the added quality standards such as food safety [11]. Therefore the aim of this study was to determine the microbiological quality, according to HACCP principles through the preparation of some food meals at one of the hotels in Sharm El Sheikh town, Egypt to assure the safety of meals served to consumers.

MATERIALS AND METHODS

Preparing Steps of Tested Meals: Chicken Pane meal, Rice with Nuts and A La Rouse Salad were illustrated in Fig.1-3. During manufacturing of Chicken Pane meal. It is prepared by frying skinless boneless chicken breast after mixed with flavored sauce (spices, salt and onion juice) and covered with egg, flour and crumb bread powder. The temperature measured for samples holding in the refrigerator was between (+1°C and +5°C) and their pH value was between (4.81 and 4.98). Refrigerated pane were grilling on the coal and decorating with parsley and lemon. Rice with Nuts meal is prepared from; rice, water, oil or butter, burning sugar to give brown color, flavor sauce, salt, spices and nuts (almond, hazelnuts and raisins). Rice were reached 100°C during cooking and served at temperature above 68°C. Leftover rice were held all the day in the hot holding unit at temperature range of 56°C to 64°C, while prepared nuts were held at ambient temperature (16°C to 24°C) all the day and were added to rice before reheating meal to serve consumers. Rice decorating with nuts meals after reheating were at temperature 68°C (core temperature). A La Rouse Salad is a salad prepared from frozen cooked mixed vegetable (beans, pea and carrot), spices, salt and mayonnaise. During preparing this salad frozen cooked vegetables was boiled with water after added salt and spices, then it was filtrated, cooled to room temperature, situated in the fridge for minimum 20 minutes and then it was mixed with mayonnaise and holding in refrigerator at temperature range of (+1°C to +5°C) until serve (maximum for 24 hours). Mayonnaise was ready made.

Inspections and Samples Collection: During the period of 2012-2013 an inspection was undertaken on the kitchen of the catering establishment. The inspection involved the collection of samples from foods (raw materials, during processing steps and from final products). Different food samples were examined for aerobic colony bacterial count, yeast and mold counts, total coliform counts, *Escherichia coli* count, *Staphylococcus aureus* count and presence of Salmonella. All previous tests used to reflect the microbiological quality of the foods. The different separate triplicate samples from raw materials, ingredients, during different processing steps and final products of selected meals during the tested period were selected randomly, put into sterile plastic bags and quickly transported to the laboratory in an insulated and refrigerated box. An aliquot of 10 g or ml of each food sample was homogenized in 90 ml of sterile diluents (0.1% peptone water) with a Stomacher (Seward, Model 400, England) for 30 Sec. Serial dilutions were prepared in peptone water and 1ml aliquots were plated in each specific medium and incubated at different temperatures as listed in Table 1. The method used for

Table 1: Media and incubation conditions used for microbiological analysis.

	Incubation		
Microbiological analysis	Time(h)	Temp (°C)	Growth medium
Total aerobic bacterial count	48	37	Plate count agar
Yeast and mold count	72 to 120	25	Potato dextrose agar
Total coliforms	48	37	MacConkey agar
E. coli	24	44	MacConkey agar
Staphylococcus aureas	48	37	Baird parker agar
Salmonella spp.			
Pre-enrichment	24	37	Buffer peptone water
Selective enrichment	24	42	Tetrathionate broth
Isolation	24 to 48	37	Bismuth sulfite agar

isolation of Salmonella was carried out according to the method of system HACCP [12]. Twenty five-g or ml from each sample was pre-enrichment in 225ml of buffer peptone water and was incubated at 37°C for 16 to 24h. For selective enrichment, 1ml of peptone broth was transferred to 9 ml each of tetrathionat broth and was incubated at 37°C for 24h. From each selective enrichment broth a 5-mm loopfull was streaked on selective plates of bismuth sulfite agar and incubated at 37°C for 24h.

Application of HACCP System: In this study, three meals were selected for investigation, the first one was "Chicken Pane meal" which consist of frozen skinless boneless chicken breast, flavored sauce (spices, salt and onion) eggs, crumb bread powder and flour, Frying oil (cotton seed oil), parsley and lemon. The second one was "Rice with Nuts meal" that contains rice, water, oil or butter, burning sugar, flavor sauce, salt, spices, almond, flour, hazelnuts and raisins. The third one "A La Rouse Salad" that contain frozen cooked mixed vegetable (beans, pea, and carrot), spices, and mayonnaise (salt, vinegar, maize oil, mustard and eggs). According to the NACMCF [13], HACCP system was applied in establishment based in the following seven principles: 1) Conduct a hazard analyses. 2) Identify the critical control points (CCPs). 3) Establish critical limits for preventive measures associated with each identified CCP. 4) Establish CCP monitoring requirements. 5) Establish corrective actions to be taken when monitoring indicates then a deviation from an established critical limit. 6) Establish verification procedures. 7) Establish record-keeping and documentation procedures. The studied meals are summarized with reference to CCPs and their monitoring on the HACCP worksheet for Chicken Pane meal, Rice with Nuts and A La Rouse Salad.

RESULTS AND DISCUSSION

Inspection of the Establishment: During inspection the establishment, there are no week points identified in the prerequisite programs for establishing HACCP system and also during the process of preparation and storage of foods. Beumer [14] suggested that, in foodservice establishments inspection alone is not sufficient to guarantee food safety and that to solve the problem it is necessary to train foodhandlers in food microbiology and hygiene and in the implementation of the HACCP system. According to USDA [15] there are two types of hazards in catering sectors: 1) ones specific to the preparation of the food, such as improper cooking for the specific type of food (beef, chicken, eggs, etc.) and 2) nonspecific ones that affect all foods, such as poor personal hygiene. Specific hazards are controlled by identifying Critical Control Points (CCPs) and implementing measures to control the occurrence or introduction of those hazards. Nonspecific hazards are controlled by developing and implementing Standards operation practices (SOPs).

Hazard Analysis and HACCP Control Chart of Manufacturing Meals: Typical preparation, associated hazards and critical control point of Chicken Pane meal are illustrated in flow diagram in Fig. 1. The possibilities of contamination, survival of contaminants and growth of microorganisms are analyzed in process reviews. Sources of contamination are workers who handle foods and utensils that the foods contact as well as the raw foods. We noticed from the Table 2 that the aerobic colony count found Cutting parsley, Chicken breast, Egg, Spices, Flavored sauce (onion juice, salt, spices), Chicken breast treatment with flavored sauce, Chicken breast treatment with flavored sauce and covered with flour and Crumb bread powder and Skinless boneless chicken breast after frying were $8.5x10^3$, $1.8x10^2$, $2.5x\ 10^2$, $2.8x10^2$, $3.0x10^2$, $4.1x10^3$, $8.8x10^3$ and $2.0x10^1$ cfu/g, respectively. Salmonella was not detected in chicken breast and after treatment with flavored sauce and covered with flour and crumb bread powder. But the results cleared that Coliforms count, *E. coli and S. aureus* were detected during cutting parsley in a count $3.0x10^2$, $2x10^1$ and $1.0x10^1$ cfu/g, respectively and $<10^1$ cfu/g chicken breast after frying and holding. The total colony count and psychotropic bacteria counts decreased during frying chicken due to the effect of heating [16]. But, the contamination may be occurring during decorating frying chicken breast with parsley and lemon.

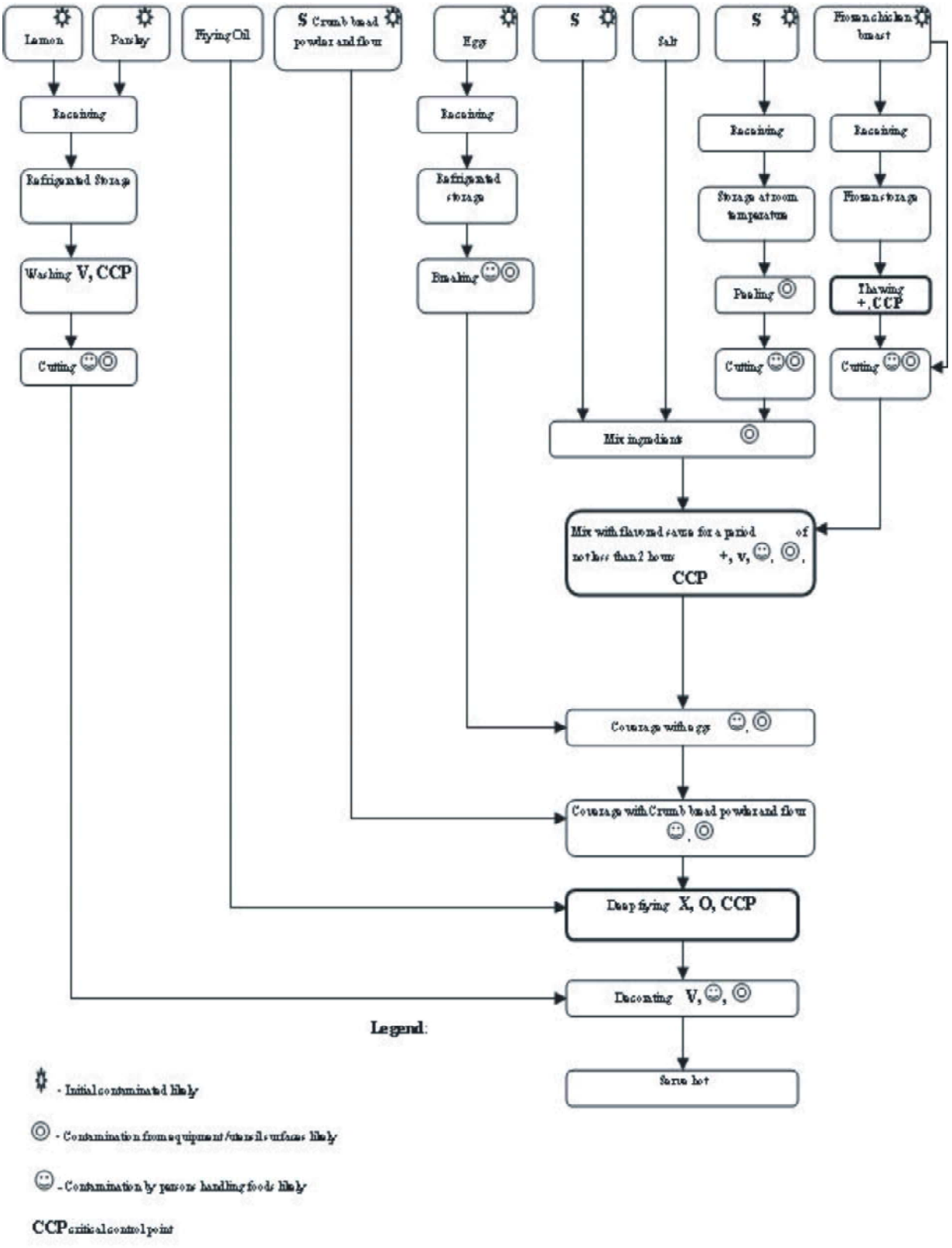

Fig. 1: Flow diagram of preparation of Chicken Pane meal.

Table 2: Microbiological analysis of Chicken Pane meal.

	Microbiological analysis (cfu/g)					
Sample	A.C.C	Y&M.C	*E. coli*	Coliform	*S. aureus*	*Salmonella*
Cutting parsley	$8.5x10^3$	$2.7x10^2$	$2x10^1$	$3.0x10^2$	$1.0x10^1$	-
Chicken breast	$1.8x10^2$	$<10^1$	$<10^1$	$<10^1$	$<10^1$	-
Egg	$2.5x\ 10^2$	$5.2x\ 10^2$	$<10^1$	$<10^1$	$<10^1$	-
Spices	$2.8x10^2$	$1.5x10^2$	$<10^1$	$<10^1$	$<10^1$	-
Flavored sauce (onion juice,salt, spices)	$3.0x10^2$	$2.0x10^1$	$1x10^1$	$3.5x10^1$	$<10^1$	-
Chicken breast treatment with flavored sauce	$4.1x10^3$	$3.5x10^1$	$1x10^1$	$5.0x10^1$	$<10^1$	-
Chicken breast treatment with flavored sauce and covered with flour and Crumb bread powder	$8.8x10^3$	$1.5x10^3$	$5x10^1$	$8.2x10^1$	$1.5x10^1$	-
Skinless boneless chicken breast after frying	$2.0x10^1$	$<10^1$	$<10^1$	$<10^1$	$<10^1$	-

A.C.C: aerobic colony count, Y&M.C: yeast and mold count, Salmonella was detected (+ or -)
Appendixe: A.C.C. = $<10^4$ & *E.coli* = <20 & *S.aureus* = <20 & coliform = <100 & *Salmonella* sp. = (-) [17]

Table 3: HACCP worksheet for critical control points of preparing of Chicken Pane meal.

Critical control Point (CCP)	Hazard	Control measures	Critical limit	Monitoring frequency/ Documentation	Corrective action
1. Preparing of cutting parsley	Biological Physical	Standards operation practices (SOPs)	Good hygiene practice (GHP) and Good manufacturing practice (GMP)	Visual inspection of washing and cutting operations to ensure GHP and GMP during preparing.	Removed unwashed vegetables and washed immediately.
	Chemical				Effective cleaning (procedures and practices), select ingredients
2. Thawing frozen Skinless boneless chicken breast	Biological	Temperature/ time control	Core temperature < 5°C 24 hours or less time between thawing and cooking,	Check core and surface temperature of the food at least twice per day Check thawing time	Investigate temperature / time Discard the food if the surface temperature has reached 10°C or higher
3. Mix chicken boned breast with flavored sauce for a period not less than 2 hours	Biological	Temperature/ time control	Core temperature < 5 °C 24 hours or less time between thawing and Cooking	Check core and surface temperature of the food at least twice per day (preferably at a busy time of the day) Check thawing time	Investigate temperature and evaluate risk Discard the food if the surface temperature has reached 10°C or Higher
4. Cooking (frying chicken thighs)	Biological Chemical	Core Temperature Control Temperature Heating time	75°C or higher (core temperature) Temperature =180°C Avoid intermittent	Check temperature Check temperature Check heating time Visual checks	Continue cooking until core temperature is achieved Investigate temperature/ time abuse and evaluate risk Discard food if contamination Occurs
	Physical	Removing foreign Material	Removing foreign Material		

Table 4: Microbiological analysis of Rice with Nuts meals.

	Microbiological analysis (cfu/g)*					
Sample	A.C.C	Y&M.C	*E. coli*	Coliform	*S. aureus*	Salmonella
Spices	$2.8x10^2$	$1.5x10^2$	$<10^1$	$<10^1$	$<10^1$	-
Nuts used in decorate rice	$2.5x10^2$	$3.5x10^2$	$<10^1$	$0.5x10^1$	$<10^1$	-
Rice during hot holding	$1.1x10^2$	$0x10^2$	$<10^1$	$<10^1$	$<10^1$	-
Rice with Nuts meal	$2.0x10^3$	$<10^1$	$<10^1$	$<10^1$	$<10^1$	-

A.C.C: aerobic colony count, Y&M.C: yeast and mold count, Salmonella was detected (+ or -)
Appendixe: A.C.C. = $<10^4$ & *E.coli* = <20 & *S.aureus* = <20 & coliform = <100 & *Salmonella* sp. = (-) [17]

According to Hospitality Institute of Technology and Management [18] reducing the pH values by adding vinegar or lemon juice and holding mixed products at temperature <5°C will prevent the growth of mesophilic bacterial pathogens. According to Bolton and Maunsell [19] *L. monocytogenes and Y. entercolitica*, which may be present in a low percentage of restaurant chillers, will grow and multiply if the temperature are >5°C. Chill temperatures will prevent the growth of mesophilic bacterial pathogens such as *Salmonella, Shigella, E. coli* and *Clostridium perfringens* and psychrotrophs such as *Listeria monocytogenes* will grow only relatively slowly. Soriano *et al.* [20] suggested that, *E. coli* can be used as an appropriate marker to assess the bacteriological safety of raw foods. Table 3 summarized the different principles of HACCP system, which could be a guideline for application HACCP system as a food safety tool in the preparing Chicken Pane meals.

Hazard Analysis and HACCP Control Chart of Manufacturing Rice with Nuts Meal: Typical preparation of Rice with Nuts meal, associated hazards and critical control point are illustrated in Fig. 2. The possibilities of contamination, survival of contaminants and growth of microorganisms are analyzed in process reviews. Data in Table 4 summarized the microbiological profiles. It can be

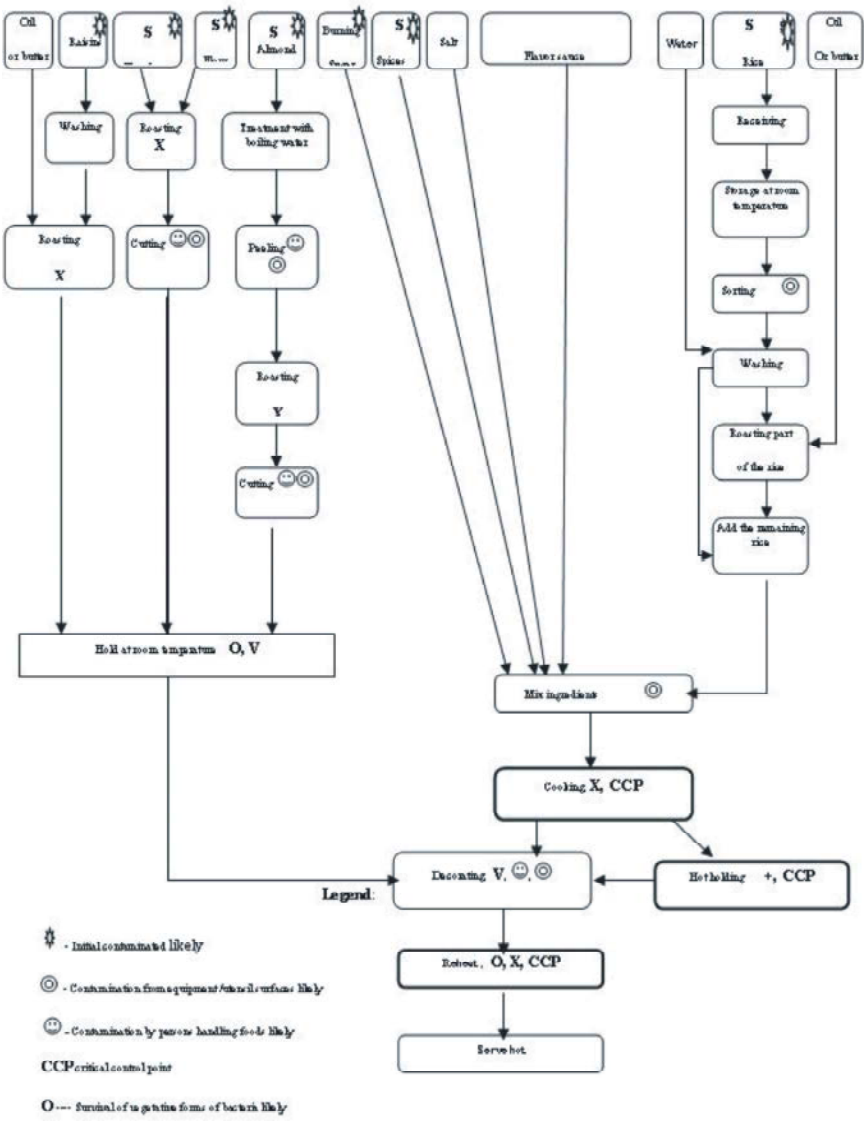

Fig. 2: Flow diagram of preparation of Rice with Nuts meal.

seen from the table that the aerobic colony count found in spices, nuts used in decorate rice, rice during hot holding and rice with nuts meal during serving were $2.8x10^2$, $2.5x10^2$, $1.1x10^2$ and $2.0x10^3$cfu/g, respectively. Mold and yeast were$1.5x10^2$, $3.5x10^2$, $0.0x10^2$ and $<10^1$ cfu/g, respectively. Salmonella was not detected in any tested samples. Coliform bacteria were found in spices, nuts used in decorate rice and in Rice with Nuts meal during serving, the count were $<10^1$, $0.5x10^1$, $<10^1$ and $<10^1$cfu/g, respectively. *E.coli* was not detected in any samples analyzed. *S.aureus* was not detected in any samples. During cooking, rice reached 100°C for more than 10 minute. Such time/temperature exposures would be expected to kill large numbers of vegetative pathogenic bacteria. Type of hazards and control measures that should be used to control identified hazards are illustrated in Table 5.

Hazard Analysis and HACCP Control chart of Manufacturing A La Rouse Salad: A La Rouse Salad preparation, associated hazards and critical control point are illustrated in flow diagram in Fig. 3. The possibilities of contamination, survival of contaminants and growth of microorganisms are analyzed in process reviews. Data in Table 6 summarized the microbiological profiles of A La Rouse Salad and its ingredients during preparing. It could be observed that, microbiological load of frozen vegetables had been increased during preparing, whereas

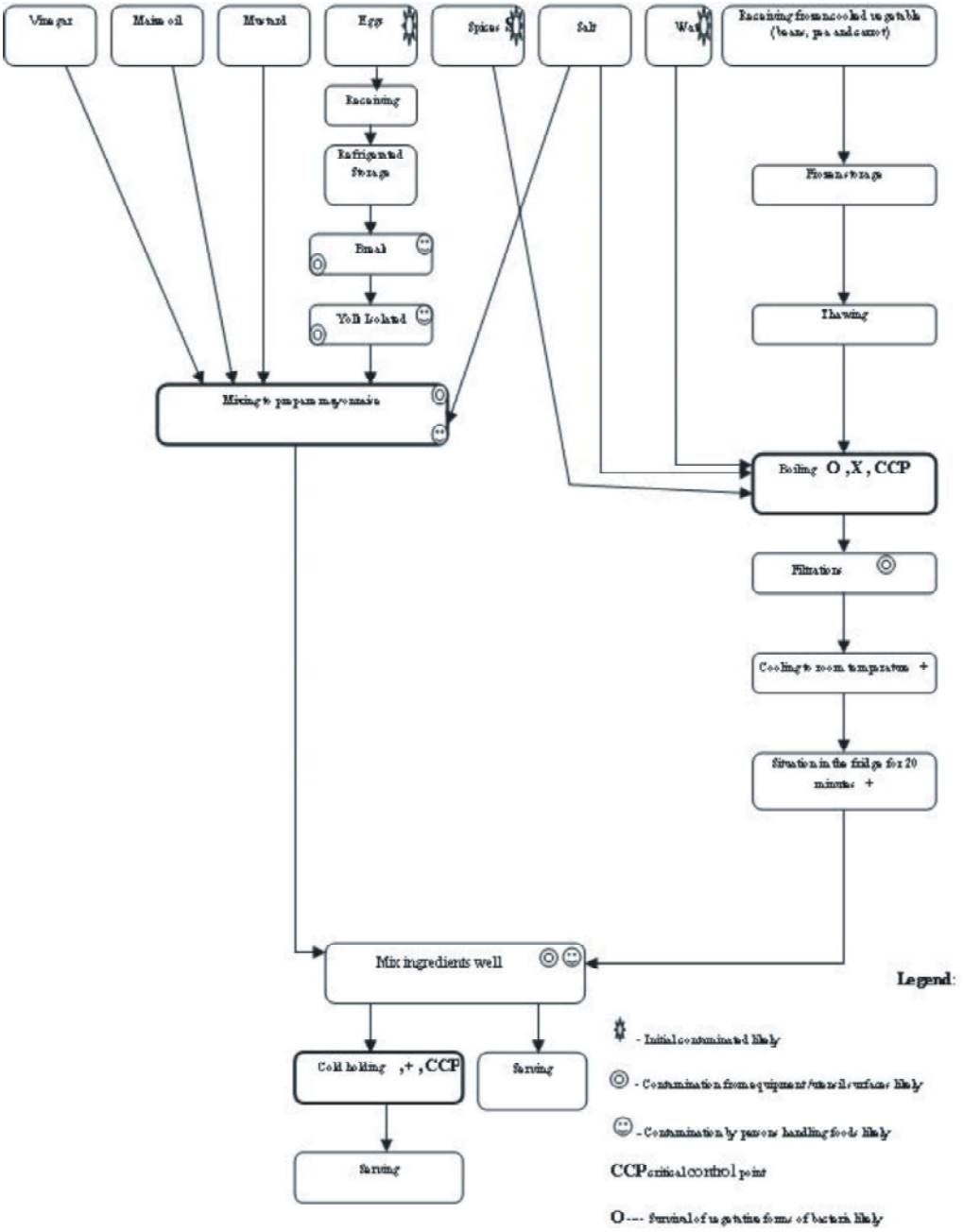

Fig. 3: Flow diagram of preparation of A La Rouse Salad.

Table 5: HACCP worksheet for critical control points of preparing of Rice with Nuts meal.

Critical control Point (CCP)	Hazard	Control measures	Critical limit	Monitoring frequency/ Documentation	Corrective action
1. Cooking rice	Biological	Temperature/ time Control	100°C (core temperature) for 30 minutes	Check core temperature and Check time	Correct the temperature and the time of cooking operation
2. Hot holding of rice	Biological	Temperature control	Core temperature 63°C or higher	Check core temperature at least once per hour	Increase the temperature of the hot holding device Discard the food if contamination was occurred
3. Reheating rice after decorate with nuts	Biological	Temperature/ time Control	Core temperature ≥ 70°C Serve within 30 min or less	Check temperature Check serving time	Continue heating until the critical limit temperature is reached. Discard the food if contamination was occurred

Table 6: Microbiological analysis of A La Rouse Salad.

	Microbiological analysis (cfu/g)					
Sample	A.C.C	Y&M.C	*E. coli*	Coliform	*S. aureus*	*Salmonella*
Frozen cooked vegetables	$2.2x10^2$	$5.6x10^2$	$<10^1$	$1.6x10^1$	$<10^1$	-
Egg	$2.5x10^2$	$5.2x\ 10^2$	$<10^1$	$<10^1$	$<10^1$	-
Spices	$2.8x10^2$	$1.5x10^2$	$<10^1$	$<10^1$	$<10^1$	-
Mayonnaise	$1.1x10^2$	$4.5x10^2$	$<10^1$	$<10^1$	$<10^1$	-
A La Rouse Salad	$4.5x10^3$	$1.5x10^3$	$<10^1$	$1x10^1$	$<10^1$	-

A.C.C: aerobic colony count, Y&M.C: yeast and mold count, Salmonella was detected (+ or -)

Appendixe: A.C.C. = $<10^4$ & *E.coli* = <20 & *S.aureus* = <20 & coliform = <100 & *Salmonella* sp. = (-) [17]

Table 7: HACCP worksheet for critical control points of preparing of A La Rouse Salad.

Critical control Point (CCP)	Hazard	Control measures	Critical limit	Monitoring frequency/ Documentation	Corrective action
1. Boiling thawed vegetables	Biological	Temperature/ time Control	Boiling at 100°C for >10minute	Check boiling temperature Check boiling time	Continue heating until temperature/ time is achieved
2.Prepare mayonnaises	Biological	pH / time control	pH of mayonnaise must be less than 4.1 Hold for 2 days at room temperature before used	Check pH of the mayonnaise Check holding time	Add Vinegar to reduce pH less than 4.1 hold for 2 days at room temperature before it is used
3. Cold holding of vegetables salad with mayonnaise	Biological	temperature control Time control	Core Ta =4°C Serve with = 24 hours	Check the core and surface temperature of the food Check time of serving	Re-chill (if the surface Ta of the salad has not reached 10°C or higher), discard the salads (if the surface temperature of the salad has reached 10°C or higher), discard salads after 24 hours of preparing

Ta: temperature, t: time

aerobic colony counts was increased from $2.2x10^2$cfu/g to $4.5x10^3$cfu/g for frozen cooked vegetables and A La Rouse Salad respectively. Salmonella was not detected in any tested samples. Mayonnaise samples were reported having *E. coli* count < 10^1 cfu/g, coliform < 10^1 and *S. aureus* count were $<10^1$ cfu/g. In ready-made mayonnaise, the final pH values measured ranged between 3.98 and 4.94. These values were suitable for bacterial growth and to be critical to food safety. It could be recommended according to Hospitality Institute of Technology and Management [18] when mayonnaise is made with raw ingredients such as eggs, the final pH (acidity) of the mixed product must be below 4.1. The acid (vinegar or lemon juice) is used to inactivate any Salmonella from raw eggs that may get into the mayonnaise. It could be recommended that the pH of mayonnaise must be less than 4.1 because Salmonella will multiply down to this level of acidity. In order to allow destruction of Salmonella, the mayonnaise or other acidified food must be held for 2 days at room temperature before it is used (in closed can under vacuum). If the mayonnaise is held in the refrigerator, it can take from 2 to 3 weeks for the same destruction of Salmonella, because the acid does not work as quickly. During manufacturing A La Rouse Salad, type of hazards and control measures that should be used to control identified hazards are illustrated in Table 7.

CONCLUSION

Generally, according to the results of the microbiological analysis for judging the quality of meals under testing, it could be concluded that, the tested meals under our investigation were free from microbial pathogenesis and that all the results show that the meals were prepared and processed under hygiene requirement e.g. Good Hygiene Practice (GHP) and Good Manufacturing Practice (GMP). In the same time, HACCP system could be used as food safety tools for controlling different hazards especially microbiological hazards during different processing steps of ready to eat meals.

REFERENCES

1. Manask, A.M., 2002. The Complete Guide to Food Service in Cultural Institutions. New York: John Wiley & Sons, pp: 5-35.
2. Sun Yi-Mei and H.W. Ockerman, 2005. A review of the needs and current applications of hazard analysis and critical control point (HACCP) system in foodservice areas. Food Control, 16: 325-332.
3. Bryan, F.L., P. TeufelS Riaz, S. Roohi, F. Qadar and Z.R. Malik, 1992. Hazards and critical control points of street-vending operations in a mountain resort town in Pakistan. Journal of Food Protection, 55(9): 701-707.

4. Christensen, S., 1989. HACCP approach in catering. International Symposium. World Association of Veterinary Food Hygienists Stockholm, 2-7 July 1989. Proceedings. Uppsala, 1990. pp: 210-217.
5. Egan, M.B., M.M. Raats, S.M. Grubb, A. Eves, M.L. Lumbers, M.S. Dean and M.R. Adams, 2007. A review of food safety and food hygiene training studies in the commercial sector. Food Control, 18: 1180-1190.
6. Bolton, D.J., A. Meally, I.S. Blair, D.A.M. Dowell and C. Cowan, 2008. Food safety knowledge of head chefs and catering managers in Ireland. Food Control, 19: 291-300.
7. McSwane, D., N. Rue and R. Linton, 2003. Essentials of Food Safety and Sanitation (3rd Ed.). New Jersey: Pearson Education, pp: 169-196.
8. Aycicek, H., S. Belgin and C. Serdar, 2004. Assessment of the microbiological quality of meals sampled at the meal serving units of a military hospital in Ankara, Turkey. Food Control, 15: 379-384.
9. Kvenberg, J.E. and D.J. Schwalm, 2000. Use of microbial data for hazard Analysis and critical control point verification-Food and Drug Administration Perspective. Food Protection, 63 6): 810-814.
10. Sneed, J. and C. Strohbehn, 2008. Trends impacting food safety in retail foodservice: implications for dietetics practice. Journal of American Dietetics Association, 108(7): 1170-1177.
11. Bech Serrat, J.M. 2011. Quality of hotel service and consumer perception, A European contract law approach. Tourism Management, 32(2): 277-287.
12. ISO, (International Standards Organization) 2002. ISO 6579. Microbiology. General guidance on methods for the detection of salmonella. International Standards Organization, Geneva, Switzerland
13. NACMCF, (National Advisory Committee on Microbiological Criteria for Foods), 1992. Hazard analysis critical control point System. J. Food Microbial., 16: 1-23.
14. Beumer, R.R., T. Vrouwenvelder and E. Brinkman, 1994. Application of HACCP in airline catering, Food Control, 5: 205-209.
15. USDA, (United States Department of Agriculture), 2005. Guidance for School Food Authorities: Developing a School Food Safety Program Based on the Process Approach to HACCP Principles, USDA, Food and Nutrition Service. http://www. fns. usda.gov/cnd/cnla beling/food-safety / haccp guidance.pdf.
16. Wally, F.A.A., 2002. Studies on quality attributes of some semi fried chicken products during frozen storage. Ph.D. Food Science and Technology. Faculty of Agriculture, Cairo University.
17. Gilbert, R.J., J. Louvois, T. Donovan, C. Little, K. Nye, C.D. Ribeiro, J. Richards, D. Roberts and F.J. Bolton, 2000. Guidelines for the microbiological quality of some ready-to-eat foods sampled at the point of sale. Commun. Dis. Public Health, 3: 163-167.
18. Hospitality Institute of Technology and Management, 2006. Food safety hazards and controls for the home food preparer. http://www.hi-tm.com
19. Bolton, D.J. and B. Maunsell, 2004. Guidelines for Food Safety Control in European Restaurants. The Food Safety Department, Teagasc-The National Food Centre, Ashtown, Dublin 15, Republic of Ireland. http://www.uma.pt/ jcmarques/ docs/ haccp/ EU Guidefood safety. pdf.
20. Soriano, J.M., H. Rico, J.C. Molto and J. Manes, 2002. Effect of introduction of HACCP on the microbiological quality of some restaurant meals. Food Control, 13: 253-261.