

Introduction

During the last three decades, Hazard Analysis Critical Control Points (HACCP) has been progressively introduced and applied for the benefit of food industry (**Panisello and Quantick, 2001**). The system can be considered as an efficient tool for both industry and health authorities to prevent food borne diseases if it is based on understanding and proper implementation, because it is not HACCP system itself which makes food safe, but its correct application (**Motarjemi and Käferstein, 1999**).

In food businesses, HACCP must be able to adapt to different working patterns in operation and often to unexpected variations in potential demand and workloads. Furthermore, the lack of financial resources, technical expertise, and small staff base only add to the difficulty in applying HACCP not just in retail and catering but also among smaller food manufacturers (**Jouve, 1994**).

Hazard Analysis Critical Control Points (HACCP) is a system of food safety management that in the last few decades has become an increasing part of national governments and international strategy to reduce the prevalence of food-borne diseases. There has been wide dissemination and scientific support of its principles. This is reflected in recommendation of HACCP by organizations such as the International Commission on Microbiological Specifications for Foods (**ICMSF**,

1988), and a Codex Alimentarius Commission (**Codex Alimentarius, 1993**) decision to recommend its use by both the food industry and regulatory authorities.

Potential barriers to the implementation of HACCP need to be identified and examined as an initial step in the development of any HACCP implementation strategy. These barriers vary from country to country or from sector to sector. Some may be due to internal factors in individual businesses, e.g. the level of knowledge or resources available to a business. Others may be due to external factors, such as the availability of government or industry support (**WHO, 1999**).

There are many issues imposing risk on food safety due to industrialization and mass production, emergence of longer and more complex food chains, fast food consumption, street vendors and growing international trade and tourism. Besides, long-term inflation and other economical causes; advertisements, growing eating out habits (fast foods, restaurant meals, etc.) are also the likely causes of food safety problems (**Abdalla, 2008a and Abdalla, 2008b**) Good Manufacturing Practices (GMP), Good Hygiene Practices (GHP), Hazard Analysis Critical Control Points (HACCP) control and production systems are used to ensure food safety. In addition, food safety systems are used simultaneously with Total Quality Management and should be implemented at every stage of food production “from farm to the fork” (**Bas, et al 2006**).

The use of hazard analysis critical control points (HACCP), based on the internationally accepted seven principles as promoted by the Codex Alimentarius Commission, is rapidly increasing in food businesses. The potential difficulties of applying HACCP in retail and catering businesses and smaller food manufacturers have been widely discussed.

A lack of financial resources and purchasing power, more complex food-handling practices, and lack of technical expertise and available personnel have all been cited as possible barriers to its practical experience and a review of food safety literature indicate that success in developing, installing, monitoring and verifying a successful HACCP system is dependent on a complex mix of managerial, organizational and technical hurdles. In coping with this set of interrelating factors, even the largest food companies, equipped with significant resources of money, technical expertise and management skills, may face a difficult challenge; the small and medium sized enterprises (SMEs) may feel that the difficulties of HACCP are potentially insurmountable **Route (2001)**.

The concepts of prerequisite program (PRP) and how it will benefit HACCP had been reported by **Wallace and Williams (2001)**. It has been recommended that before HACCP is utilized, a prerequisite program is needed (**Seward, 2000**). If the PRP are not used, there probably will be a waste of resources and money and might

cause more resistance for future utilization and HACCP system implementation. prerequisite program, which support HACCP plan, also called standard operating procedures (SOP), includes good personal hygiene (employee hygiene practice), cleaning and sanitation programs, proper facility-design, practices, equipment-maintenance and supplier selection and specific recall programs.

Many authors discuss barriers or hindrances which have impact to the effective implementation of HACCP in Small and Medium Enterprises (SMEs), (**Walker *et al.*, 2003, Vela and Fernández, 2003, Henroid and Sneed, 2004, Taylor and Taylor, 2004a, Taylor and Taylor, 2004b, Baş et al., 2006Hielm *et al.*, 2006**) among the key ones mentioned lack of expertise and perception of benefits, absence of legal requirements, various attitude barriers and financial constraints. According to **Hielm *et al.* (2006)** most difficulties were established in devising the own-checking plan / HACCP plan the most common answers were choosing the critical control points, committing the firm's entire workforce and organizing the documentation of monitored results. One of the major problems is that the food workers often lack interest and they often have a negative attitude toward food safety programs (**Griffith, 2000**).

The purpose of this study was to identify the main barriers and constraints in developing and implementing HACCP system in some food premises located in Al-ain City.

Chapter One

Literature Review

1.1 HACCP implementation in small companies

There is increasing evidence that whilst HACCP is widespread in large food operations its use is limited within small companies. This is reflected in recent studies in the UK and Europe which have found that small companies are less likely to invest in hygiene and food safety than larger companies and are less likely to have HACCP in place (**Mortlock et al., 1999**) Indeed, one study identified that for companies with less than 50 staff, HACCP implementation decreased proportionally as number of employees decreased (**Panisello et al., 1999**).

1.2 Background on HACCP System

In the 1960's, the Pillsbury Company in cooperation with the National Aeronautic and Space Administration (NASA) first constructed HACCP to describe the systematic approach to food safety. The goal of the programme was to come as close to 100% assurance as possible that the food produced for space use would not

be contaminated with bacteria or viral pathogens, toxins, chemicals or physical hazards that could cause an illness or injury (**Paniselloet al., 1999**).

In 1971, the HACCP concept was first presented at the first National Conference on Food Protection. During the 1970's and 1980's a number of the food companies requested information to help them establish their own HACCP programmes.

In 1985, USA National Academy of Sciences (NAS) recommended the HACCP system in the publication Evaluation of the role of microbiological criteria for food and food ingredients (**Paniselloet al., 1999**). The Advisory Committee on Microbiological Criteria for food developed material elaborated principles of this food safety and quality management system based on Nasr commendation and provided guidance for their application for food processing operations. HACCP was recommended in both food regulator and industry because it was the most effective and efficient means of assuring the safety of the food supply.

In 1990 the Codex Alimentarius Commission (CAC) on Food Hygiene started to prepare a draft guideline for the application of HACCP system. In the last ten years, HACCP has become widely used. It is now a legislative requirement in USA, Canada and EU-countries. Some countries such as Australia, New Zealand, Canada,

Japan, Egypt, South Africa, and many others have also adopted or are considering food safety control systems based on HACCP.

In Canada, the Quality Management Program (QMP) was established as a mandatory programme for food inspection in February 1992. It was based on HACCP principles. The QMP uses the principles of HACCP for ensuring safe food production, to provide a high level of assurance that fish and seafood products produced in Canada are safe and wholesome to eat **(CFIA 2001)**.

In 1995, The United State Food and Drug Administration (FDA) published final regulations that require processors of fish and fishery products to develop and implement HACCP systems for their operations including imported fish and fishery products. Those regulations became effective on December 18, 1997(FDA 1998).

The European Union has issued the Directive 91/493/EEC (22/7/1991)and the Directive 94/356/EC (20/5/1994), which requires all seafood processing establishments that export their products to EU market to carry out HACCP system called "Own check"**(Eong and Ngei 2000)**.

In the past five years, many Asian countries have implemented national HACCP programs for their fish processing industry in line with international trends. HACCP programs comply with the regulations of the importing countries especially the EU and USA **(Eong and Ngei 2000)**.

1.3 HACCP System

Codex Alimentarius stated that the HACCP system, which is science based and systematic, identifies specific hazards and measures for their control to ensure the safety of food. HACCP is a tool to assess hazards and establish control systems by focusing on prevention rather than relying mainly on end-product testing (Codex 1997).

HACCP systems are designed to prevent and control food safety hazards from the time a factory receives raw material through production to distribution to the consumer (NSHA 1997).

The HACCP approach is to control problems before they happen during processing and/or serving. Effective HACCP implementation is very important to avoid the adverse human health and economic consequences of food-borne illness or food borne injury.

There are seven discrete activities that are necessary to establish, implement and maintain a HACCP plan, and these are referred to as the 'seven principles' of HACCP. The following is a brief explanation taken from Hazards analysis and critical control point (HACCP) system and guidelines for its application, published by the Codex Alimentarius Commission in 1997.

1.3.1 Principle 1

Conduct a hazard analysis

Identify hazards and assess the risks associated with them at each step in the commodity system. Describe possible control measures.

1.3.2 Principle 2

Determine the Critical Control Points (CCPs)

A critical control point is a step at which control can be applied and is essential to prevent or eliminate a food safety hazard, or reduce it to an acceptable level.

1.2.3 Principle 3

Establish critical limits

Each control measure associated with a CCP must have an associated critical limit which separates the acceptable from the unacceptable control parameter.

1.3.4 Principle 4

Establish a monitoring system

Monitoring is the scheduled measurement or observation at a CCP to assess whether the step is under control, i.e. within the critical limit(s) specified in Principle 3.

1.3.5 Principle 5

Corrective action

Establish a procedure for corrective action, when monitoring at a CCP indicates a deviation from an established critical limit.

1.3.6 Principle 6

Verification

Establish procedures for verification to confirm the effectiveness of the HACCP plan. Such procedures include auditing of the HACCP plan to review deviations and product dispositions, and random sampling and checking to validate the whole plan.

1.3.7 Principle 7

Documentation

Establish documentation concerning all procedures and records appropriate to these principles and their application.

In this food safety and quality management system, potential hazards can be identified in processing of safe food, and where and when they are most likely to occur. Then necessary steps must be taken to prevent them from happening or to

correct them if they do occur. The hazard analysis steps are fundamental to the HACCP system. To establish a plan that effectively prevents food safety hazards it is crucial that all significant safety hazards and the measures to control them are identified (**NSHA 1997**).

As reviewed by the National Advisory Committee on Microbiological Criteria for foods (**NACMCF 1997**), the hazards are defined as a biological, chemical or physical agent that is reasonably likely to cause illness or injury in the absence of its control.

Examples of hazards consist of (**Limpus 1997**):

- Biological hazards, which include pathogenic microbes (bacteria, viruses, parasites), toxic plants and animals, and products of decomposition (histamine).
- Chemical hazards, which include natural toxins, pesticides, cleaning compounds, veterinary drug residues (antibiotics), heavy metals, and unapproved food and colour additives
- Physical hazard, which include bones, metal fragments, glass, stone that may cut the mouth, break teeth, cause choking, or perforate the alimentary tract.

Determining a critical control point (CCP) plays an important role in a HACCP program. CCP is defined as a step at which control can be applied and is

essential to prevent or eliminate a food-safety hazard or reduce it to an acceptable level **(NSHA 1997)**.

The CCPs are the points in the process where HACCP control activities will occur. The CCP should be under constant control by humans or by machines and the performance of the control step should be monitored and documented **(Lee and Hilderbrand 1992)**. The determination of a CCP in the HACCP system can be applied with a decision tree that can be a useful tool to identify CCP, but it is not mandatory element of HACCP **(NSHA1997)**.

The inspection of plants operating under HACCP plans differs from traditional inspection methods of food safety control. Traditional methods evaluate processing practices on the day or days of inspection. The approach of this food safety and quality management program allows regulators to look at what happens in the plant back in time by examining the firm's monitoring and corrective action records **(NACMCF, 1997)**.

1.4 Prerequisite Program for HACCP

HACCP cannot stand alone; it is a part of a larger system of control procedures. HACCP implementation depends on the competence of people who develop and operate it and the prerequisite programmes. Prerequisite programmes may impact on the safety of food; they also are concerned with ensuring that foods

are wholesome and suitable for consumption. Formal prerequisite programs are increasingly and successfully used to support the implementation of HACCP in food processing (**Wallace and William 2001**)

Some countries have already identified prerequisites. For example, in North America the US Department of Agriculture Food Safety Inspection Service required not only HACCP, but also Good Manufacturing Practice and Sanitation Standard Operation Procedures (SSOPs) (**NSHA 1997**). Similarly, the Food and Drug Administration required HACCP and the prerequisite of GMP as a specific requirement for seafood production. Many countries currently require GMP as a prerequisite before HACCP implementation. Pre-requisite programmes such as GAP (Good Agricultural Practices), GMP and GHP (Good Hygiene Practices) must be working effectively within a commodity system before HACCP is applied. If these pre-requisite programmes are not functioning effectively then the introduction of HACCP will be complicated, resulting in a cumbersome, over-documented system.

1.4.1 Good Manufacturing Practices

A GMP programme may cover (**NACMCF, 1997**):

1.4.1.1. Establishment Design and Facilities

The structure and location of a processing plant needs to be considered in relation to the nature of operations and risks associated with them. Food premises

should be designed to minimise possibilities of contamination of commodity or product.

- Design and layout should permit maintenance, cleaning and disinfection of the site to minimise airborne contamination.
- All surfaces that come into contact with food should be nontoxic, as well as being easy to maintain and clean in order to prevent any additional contamination.
- Suitable facilities should exist for temperature and humidity control, when required.
- Effective measures should exist to prevent access by pests

1.4.1.2. Control of Operation

Effective control measures should be in place to reduce the risk of contamination of the commodity or food supply such that it is safe and fit for purpose:

- Adequate time, temperature or humidity controls
- Food grade packaging
- Potable water supplies
- Maintenance of equipment

1.4.1.3. Maintenance and Sanitation

Procedures and work instructions should exist to demonstrate an adequate level of maintenance of an establishment as well as efficient practices for cleaning, waste management, and pest control. Overall, these operations will support the ongoing control of potential food hazards that may contaminate food.

1.4.1.4. Personnel Hygiene

Measures need to be in place to ensure that food handlers do not contaminate food. This objective can be attained by maintaining an appropriate level of personal cleanliness and following guidelines for personal hygiene.

1.4.1.5. Transportation

The method of transportation should be such that measures are taken to prevent any contamination or deterioration of the commodity. Commodities or product that need to be transported in certain environments should be appropriately controlled, e.g. chilled, frozen, or stored under specific humidity levels. Containers and conveyors used for transporting food need to be maintained in good condition and be easy to clean. Containers used for bulk transfer should be designated and marked specifically for food use only.

1.4.1.6. Training

All food handlers should be trained in personal hygiene, as well as in the specific operation with which they are working, to a level commensurate with their duties.

Food handlers should also be supervised by trained supervisors. An ongoing training programme for food handlers is paramount to the success of a FoodSafety Management System.

1.4.1.7. Product Information and Consumer Awareness

The end product should be accompanied by adequate information to ensure that personnel at the next stage in the food chain will handle, store, process, prepare and display the product safely. Since the consumer may be responsible for performing the ultimate control measure, the cooking of raw meat or fish, they should have all the relevant information required to carry out this step effectively.

All batches of food should be easily identified, by a batch or lot number, to allow traceability of the commodity if required.

In the prerequisite programmes, cleaning and sanitation plays an important role. When it is in place, HACCP can be more effective because it can be concentrated on the hazards associated with the food or processing and not on the processing plant environment. In some situation, it may reduce number of critical control points in HACCP plans (**Marriott 1997**).

1.5 The International Trade in Food

The present international trade in food has evolved over many centuries. No longer does it simply comprise commercial transactions that take place between buyers and sellers, but instead has become a complex operation that takes place at two levels. At the commercial level buyers and sellers negotiate and agree prices and product specifications, and at the compliance level governments of exporting and importing countries interact to ensure food products meet the statutory requirements of importing countries.

Each element of the operation has become extremely sophisticated. For example, from primitive beginnings, the production of food for both direct consumption and as a raw material for further processing has given rise to the important fields of agricultural, animal and marine sciences. Similarly, the now established science of food technology evolved from man's earliest attempts to process, preserve, store, and transport foods. As a result of these developments food production is scientifically based and it is possible to transport food over long distance to arrive at its destination in a wholesome condition.

Estimates of the size of world trade in food for human consumption vary considerably, but it is now very large with an annual value of between US\$400 and 500 billion. Products traded include processed and preserved foods of plant, animal

and marine origins as well as live animals, fresh fruits and vegetables, grains and beverages (**Brown et al., 1982**). An increasing number of countries, including developing countries, are becoming both importers and exporters of food, and the number is expected to increase.

Industrialized countries are large food trading nations both in terms of exports and imports. Developed countries are mostly net importers and import more in value than they export. On the other hand, developing countries are in general net exporters, exporting more in value than they import.

The international food export market is of great economic importance, to both developed and developing countries but particularly to developing countries such as Abu Dhabi. Not only does food trading earn hard currency, it also creates and provides work for many people at all links in the export chain.

In order to become successful food exporters, developing countries must produce commodities that consumers in other countries want and which meet the import requirements of those countries in which markets lie. This requires concerted action by producers, shippers and governments to meet basic food legislation requirements.

To implement their laws and regulations many of the most important importing countries established food control agencies whose principal task was, and

remains, to ensure that all domestically produced food and food imported complied with the law. Products that did not comply were quite often destroyed.

1.6 Constrains and barriers for HACCP

Lack of knowledge about HACCP and other food safety programs were identified as the main barriers for food safety in food businesses. Lack of prerequisite programs and inadequate physical condition of the facility were also identified as other barriers. Training programs, both basic food safety and HACCP to support implementation of prerequisite programs and HACCP in food businesses were suggested. **Muratet *al.*, (2007)**

Chapter Two

Materials and methods

2.1. Businesses

This survey was conducted from November 2009 to November 2010 involving 100 food businesses in Al-ain City, Abu Dubai. Assessments of the 100

food businesses were conducted over 12 months. Assessments were consisted of table (1), cold store services (10), processing and marinating premises (15), transporting companies (10), fish premises (25) and meat premises (40). Each food business was visited and conducting face to face interviews and administrating questionnaire.

Table (1) Types of food businesses

Type of food businesses	No.
Cold store	10
Processing and marinating premises	15
Transporting companies	10
Fish premises	25

Meat premises	40
Total	100

2.2. Questionnaire design

The questionnaire was prepared based on the previous survey conducted by Food Safety Authority of Ireland (**Food Safety Authority of Ireland, 2001**). Business managers were asked about their food safety management systems, implementing procedures, benefits of implementing a food safety management system and barriers of HACCP and food safety management systems. Part I included questions related to food businesses (such as number of employees and directors, implementation of HACCP systems, educational level of manager).

Part II included items related to benefits in having a food safety system like HACCP in place.

Part III consisted of items related to problems the managers encountered in implementing food safety and HACCP systems.

Part IV of the questionnaire consisted of items related to improving food safety in businesses. Part V included questions related to personal hygiene practices and procedures, including implementation of prerequisite programs such as good

manufacturing practices and hygiene procedures. Yes or no responses were given for each question.

Part VI included items related to knowledge of managers towards the HACCP systems. Each item was responded on a 3 point likert scale: agree, disagree and not sure. The questionnaire was piloted by researchers with random sample of six food business managers. Items were added to ensure adequate coverage of areas and rewritten to increase clarity based on recommendations of the pilot test groups.

2.3. Statistical analysis

All statistical analyses were conducted using SPSS for Windows (version 11.0, 2001, Chicago, IL). Frequencies were computed for all variables.

Chapter Three

Results

Demographic information related to characteristics of managers and their business is presented in Table 2. The majority of food businesses employed 10 or fewer (83%) employees. Many of the managers (47%) had high school education degree. Approximately less than half (46%) of the managers had been employed 6–15 years in some segment of the food businesses The majority of food businesses (71%) of the food handlers were between 31 and 50 years of age.

Table 2. Demographic characteristics of the food business and their directors

(n =100)

characteristics	No.
Number of employee	
10 or fewer	83
11–50	17
51 or more	0
Total	100
Implementation of HACCP system	
Implementation of HACCP system	6
Implementation of ISO	0
None of the above	94
Total	100
Managers of food businesses	
Age	
30 years and younger	13

31–50 years	71
Older than 51 years	16
Total	100
Educational level	
Graduate of primary school	13
Graduate of secondary school	28
Graduate of high school	47
Graduate of college	12
Total	100
Years in food service	
5 years or fewer	6
6–15 years	46
16–25 years	37
26 years or more	11

Total	100
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Table (3) indicated the food safety practices implemented in food businesses. Taking and recording end-point temperature of all foods was the practice that only 12% of food business managers always implemented. In addition, only 5% of food business managers reported sending food product samples to a laboratory for bacterial testing. Sanitizer concentration usually was not checked in food businesses (81%). A few managers reported those developing procedures for storing food (18%), personal hygiene (23%) and, cleaning and disinfection (16%). Most of the managers (97%) did not send swabs of food production equipment and counters to determine bacterial count to the laboratory for testing bacterial contamination.

Table 3. Food safety practices implemented in food businesses ($n = 100$)

Food safety practices	<i>n</i> (%)
Take and record end-point temperatures of all cooked foods	
Always/daily	12
Sometimes	27
Never	61
Total	100

Take and record temperature of food on the serving line	
Always/daily	12
Sometimes	41
Never	47
Total	100
Check concentration of sanitizing solutions	
Always/daily	7
Sometimes	12
Never	81
Total	100
Take and record food temperature upon receiving	
Always/daily	25
Sometimes	45
Never	30

Total	100
All equipment and cutting boards are sanitized between uses	
Always/daily	13
Sometimes	41
Never	46
Total	100
Take and record refrigerator/freezer units temperature	
Always/daily	15
Sometimes	27
Never	58
Total	100
Developed food storage procedures	
Yes	18
No	82

Developed personnel hygiene procedures	
Yes	23
No	77
Developed cleaning and disinfestations procedures	
Yes	16
No	84
Send food product samples to a laboratory for bacterial testing	
Yes	5
No	95
Take swabs of food production equipment and counters to determine bacterial count	
Yes	3
No	97

As shown in table 4, for managers to improve themselves approximately 53% suggested always being aware of new improvements. Also 95 % of managers said they should Implement basic hygiene procedures. About 84% suggest giving more training to keep everyone aware, 99% will make sure only good products are brought.

Table 4. Managers suggestions of how they could help themselves to improve food safety in their businesses (*n* =100)

Responses	<i>n</i> (%)
Always being aware of new improvement	53
Implementing basic hygiene procedures	95
Carrying out routine checks	81
Give more training to keep everyone aware	84
Follow HACCP system	23
Have seminars and lectures for staff	30

Responses	<i>n</i> (%)
Avoid cross contamination	85
Make sure only good products are brought	99
Controlling temperature	65
Simple guidelines	53
Less staff turn over	87

In table 5, 94% of the respondents were lack of prerequisite programs of food safety. In addition, lack of knowledge about HACCP (91%), lack of time (43%) and staff turnover (87%). Also lack of management (25%),lack physical condition (35%), and employee motivation (73%).These managers were needed terminology, simple guidelines, paper work and supporting from authorities.

Table 5. Barriers identified by managers to implementing food safety management systems (*n* = 100)

Barriers identified	<i>n</i> (%)
Lack of prerequisite programs	94

Barriers identified	<i>n</i> (%)
Lack of knowledge about HACCP	91
Cost	89
Time	43
Staff turn-over	87
Lack of management	25
Lack of physical conditions	35
Lack of employee motivation	73
Complicated terminology	92
Need for simple guidelines	89
Volume of paperwork	77
Lack of personnel training	85
Not enough support from the authorities	79

Managers were asked about different statements related to the difficulties of implementing HACCP and a food safety management system (Table 6). Most of the respondent agreed with the statement relating to the need for more checks by the authorities. A lack of knowledge about HACCP and other food safety management systems was also identified as the main barrier to its implementation (65%). In addition, 36 % agreed that a source of information about HACCP/food safety management systems was inadequate.

**Table 6. Statements relating to barriers to food safety management systems
(n = 100)**

Statements	Agree n (%)	Disagree n(%)	Not sure n (%)
Lack of knowledge about HACCP/food safety management systems	67	12	21
HACCP/food safety management systems is too complicated	65	10	25

Statements	Agree <i>n</i> (%)	Disagree <i>n</i>(%)	Not sure <i>n</i> (%)
Food safety is not really a business priority	23	70	7
I do not have the time for food safety issues	8	74	18
I cannot see the benefits of HACCP/food safety management systems	16	64	20
Inadequate sources about HACCP/food safety management systems	36	20	44
It costs too much to have a proper food safety system in place	28	22	50
There should be more food safety checks by the authorities	80	15	5

Statements	Agree <i>n</i> (%)	Disagree <i>n</i>(%)	Not sure <i>n</i> (%)
Food safety is not really a major priority	7	90	3
There no real incentive for having a HACCP/food safety management systems	10	45	45

Chapter Four

Discussions

During the last three decades, HACCP has been progressively introduced and applied for the benefit of food industry (**Panisello and Quantick, 2001**). The system can be considered as an efficient tool for both industry and health authorities to prevent food borne diseases if it is based on understanding and proper implementation, because it is not HACCP system itself which makes food safe, but its correct application (**Motarjemi and Käferstein, 1999**). In food businesses, HACCP must be able to adapt to different working patterns in operation and often

to unexpected variations in potential demand and workloads. Furthermore, the lack of financial resources, technical expertise, and small staff base only add to the difficulty in applying HACCP not just in retail and catering but also among smaller food manufacturers (**Jouve, 1994**).

There is a big confusion between prerequisite programs and HACCP plan, their relations and how they should be managed. This gets worse because there is a lack of specific hazard analysis. Reasons for this misunderstanding are located on negative guideline factors and lack of understanding, being difficult to say which barrier takes place first (**Vela & Fernandez, 2003**).

One reviewer reported four broad groupings of barriers to HACCP implementation, that HACCP is of “questionable appropriateness” to the firm, the scale of change required to achieve implementation, low priority given to enhancement of food safety controls, and financial constraints these were in agreement with this study (**Herath and Henson, 2010**).

In this study, food safety practices are reported not to be implemented in many food businesses. Only 26% of the managers indicated that they had written standard operating procedures for cleaning and disinfection equipment and facilities. On the contrary, reported that prerequisite activities scored satisfactory with the exception of cleaning and disinfection in UK food businesses (**Walker 2003**). The

main barrier to implementing a HACCP based food safety management system was the lack of prerequisite programs, lack of knowledge, inadequate resources related to HACCP, cost and time. The problems of implementing HACCP in Turkey food businesses have been named as inadequate equipment and physical conditions of the facility (**Bas *et al.*, 2006**).

Well designed and structured premises with well-designed and, reliable equipment, will help in protecting ingredients and food products, maintaining hygienic conditions, improving cleanliness and cleaning effectiveness and controlling pest infestations. The design and layout of factories and equipment is also important to eliminate, prevent or control hazards (e.g. temperature- or pressure-controlled areas) and reduce the amount of CCPs by effective control of the plant environment. However, food premises with congested and un hygienically designed food preparation rooms are frequently found (**Hasçıçek *et al.*, 2004**).

Time and money have been identified as obstacles in implementing HACCP. **Giampaoliet *al.*,(2002)** found that foodservice directors positively agreed on the benefits of certification and continuing education related to food safety. In our study, time and money were identified as the greatest barriers to improve food safety. Similar problems have been reported by other authors (**Mortlock *et al.*, 1999; Panisello *et al.*, 1999; Panisello and Quantick, 2001;Ward, 2001**).

Managers seemed to find it difficult to make their employees understand the importance of hazard analysis and why particular operations had to be monitored and controlled.

Several studies have examined barriers to HACCP implementation in food businesses. **Hwang *et al.*, (2001)** found that Indiana school foodservice managers identified time to establish a HACCP program, time to run the program, and labor costs as being the three biggest obstacles. In addition, “lack of training funds, time to get used to running the HACCP program, and union problems” were other identified obstacles. **Giampaoli *et al.*, (2002)** conducted a national study and found three types of barriers: resource management, employee motivation, and employee confidence.

Employees are nervous about taking food safety certification examinations and often are not comfortable with the change needed for implementation of a program like HACCP. **Youn and Sneed (2002)** identified employee and resource barriers in a national study of school foodservice directors. Lack of employee training was the biggest employee barrier and lack of financial resources to devote to food safety was the biggest resource barrier. In our study, the other barrier to implement a HACCP based food safety management system was the lack of employee motivation and turnover of employees. Employee motivation was also the

predominant problem associated with HACCP implementation, alongside record-keeping and process management. More specifically, the need for staff retaining and the lack of staff motivation were considered as key issues influencing the HACCP implementation process in food processing facilities. At the same time, however, one of the major benefits from having implemented HACCP was increased awareness among staff of food hygiene/safety issues; in turn this enhanced the motivation of staff to maintain enhanced food safety controls (**Henson, 2002**). In addition, **Panisello and Quantick (2001)** identified constant turnover of employees as a barrier to the proper implementation of the HACCP system, as employees need time and training in order to fully comprehend and use the system. Furthermore, the workforce in this industry varies from the very young to those who have worked in this sector for years. Some in the latter category could not see the necessity of having a system like HACCP in place, so it was not considered important and no effort was made to understand it.

The food business directors were in agreement that employee training is the biggest barrier. Majority of food business directors agreed that employees needed more training to improve food safety practices in our study. This finding was consistent with the findings of **Giampaoli et al., 2002; Hwang et al., 2001; Sneed and White (1993)**.

Hwang *et al.* (2001) also found that the availability of sanitation training had a positive relationship to implementing HACCP. Ideally, training courses should be developed specifically for groups of personnel depending on their level of technical expertise and their degree of responsibility in the overall HACCP process.

This would allow employees to apply HACCP principles to their particular situation in the process line (**Panisello and Quantick, 2001**).

The **Codex Alimentarius, 1993** and **NACMCF, 1998** guidelines also recognize that the need for training of personnel in the industry is essential for the effective implementation of HACCP. Whereas, the findings of this study indicated that a significant number of employees in food businesses have not received basic food hygiene training. Owners often enter the industry with little or no previous food knowledge or hygiene training. This, the lack of structured channels of food safety communication, and the need to prepare often quite large quantities of food in advance, contribute to the relatively large proportion of food-borne illness outbreaks attributed to catering establishments (**Griffith, 2000**).

Recommendations & Conclusions

Conclusions

There are many issues imposing risk on food safety due to industrialization and mass production, emergence of longer and more complex food chains, fast food consumption, street vendors and growing international trade and tourism. Besides, long-term inflation and other economical causes; advertisements, growing eating out habits (fast foods, restaurant meals, etc.) are also the likely causes of food safety problems in the world. HACCP is becoming more widely accepted throughout the food businesses in world. Its successful implementation, however, requires an understanding of its principles and commitment to it through all levels in the workforce. The results of this study highlight the experiences of those implementing and operating HACCP in the food businesses, and identify a number of key issues acting as barriers to HACCP implementation in food businesses. One of the major problems is that the food workers do not often have an interest in and they often

have a negative attitude toward food safety programs. Lack of knowledge about HACCP and other food safety programs were identified as the main barriers for food safety in food businesses. Lack of prerequisite programs and inadequate physical conditions of facility were also identified as the other main barriers. Developing and implementing written standard operating procedures in food businesses are one of the first steps to build effective HACCP and other food safety systems in Al – Ain City. However, the findings of this study indicated that most of managerial staff and basic food handlers have not received basic food hygiene training. As a conclusion, since most food business managers presently have limited understanding of the HACCP and other food safety management systems strategy, there is necessity that the regulatory authority in Al – Ain City clarifies the goals of the strategy, and provides effective information to ensure uniformity in the application of food safety principles.

Recommendations

1. Training is highlighted as areas of concern for marketing HACCP within these industry sectors.
2. The Government must do some new regulations, increase food safety training and should be provided for all food-service staff before they begin to work.
3. Food safety is based on information gathering, analysis, scientific recommendations, control, residue monitoring and early warning system.
4. One prerequisite program is training, and recent changes mean that all AI – Ain food businesses must now provide food hygiene training commensurate with the work activities of their staff.
5. One of the major problems is that the food workers often lack of interest and they often have a negative attitude toward food safety programs.
6. Since most food business directors presently have limited understanding of the prerequisite programs and HACCP strategy, and of the procedures to

implement it, it is necessary that the regulatory authority clarifies the goals of the strategy, and provides effective information to ensure uniformity in the application of its principles.

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