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**Department of Applied Human Nutrition
Mount Saint Vincent University
Halifax, Nova Scotia**

**A Critical Assessment of the Development Process for a HACCP
Implementation Manual for a Healthcare Foodservice Operation -
The Dartmouth General Hospital**

By

Lesley Erin Corbett

**A Thesis submitted in partial fulfillment of the requirements for the degree of
Master of Science in Applied Human Nutrition
October 2001**

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**Mount Saint Vincent University
Department of Applied Human Nutrition**

**A Critical Assessment of the Development Process for a HACCP
Implementation Manual for a Healthcare Foodservice Operation at
the Dartmouth General Hospital**

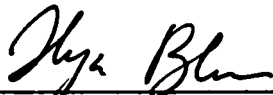
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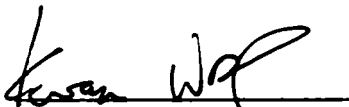
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Dedication

To all students who have the courage to follow 'the road less traveled by.'

Abstract

The use of a food safety program in a healthcare foodservice operation is instrumental in safeguarding the health and welfare of patients, their families and staff from foodborne illness. The Hazard Analysis Critical Control Point (HACCP) system has become the most widely accepted program for controlling food safety. HACCP was designed by the food industry; however implementation of a HACCP program is relatively new to the foodservice industry.

Objectives: To assess the HACCP readiness of the six sites comprising the Central Regional Health Board (CRHB), now known as the Capital District Health Authority (CDHA); to assess the food safety knowledge and practice of foodservice employees; to develop a HACCP implementation manual and HACCP education and training materials for the pilot site – Dartmouth General Hospital; to determine the relevance of the change management approach to HACCP implementation.

Subjects There were five managers who participated in the study. A total of 78 questionnaires were distributed throughout the CDHA; 35 were completed and returned yielding a 45% response rate.

Experimental method: Semi-structured interviews were conducted with the managers of each foodservice operation, followed by an on-site audit of each facility according to HACCP prerequisite guidelines. A practice and knowledge questionnaire was developed and administered to the foodservice staff of CDHA to determine their current food safety knowledge and practices.

Findings & statistical significance: All sites were investigated on a site-by-site basis, and there were inadequacies detected in each area of the HACCP prerequisite programs. If HACCP certification were sought at the point in time when the on-site audit was conducted, no site would have satisfied the requirements. There was no formal sanitation program in place at any facility of the CDHA, nor was there a policy on training and/or retraining of employees in terms of food safety, hygiene and sanitation. There was no significant difference between both average practice and average knowledge scores at each site. Ninety-seven percent of respondents had completed the provincially recognized safe food-handling course. There were HACCP implementation tools developed to help ease the transition into a HACCP compliant establishment.

Conclusions & implications: Based on the findings of this study, there needs to be an in-depth review of each site's prerequisite programs, as they comprise 70% of an effective HACCP program. There also needs to be a sanitation program developed and implemented to protect against areas of contamination that may not be corrected or prevented by a HACCP program. The change management approach involves introducing a substantial change in the working environment of employees; therefore education, training and employee input are essential keys to success and compliance of the program. The more they participate, the more pride they will have in their HACCP program, therefore making the transition easier.

Acknowledgements

I wish to extend a sincere thank you to all site managers, Lynn Campbell, Don Smith, Myrna Fahie, and Larry Horton for welcoming me into your facilities, for feeding me and for your participation in the development of the HACCP manual. Thank you to all the food service staff at CDHA who also participated in this research project. Your input, insight and enthusiasm are greatly appreciated. Thank you to Katie, Sam and Ann (Supervisors at Dartmouth General Hospital). I could always count on you to supply answers to my numerous questions. Lastly, a huge hug for Jane Pryor, who not only guided me through the manual development process, but also allowed me to pursue my dietetic internship at DGH. Jane, the encouragement, support and motivation you shared with me over nachos and beer was tremendous, it also kept me sane and focused through all this!! THANK YOU!!

Thank you to my thesis advisor, Linda Mann, who listened with patience, and encouraged me through every facet of the thesis write up. I could not have done this without your insight, dedication and experience. Thank you to Ilya Blum, my favorite statistician, and to Kwan Wong, for your invaluable food production knowledge and experience. Thanks to Nicole Gardiner and SERCA Foodservice for the opportunity to participate in the National Restaurant Association's ServSafe® course. The ServSafe® certification was perhaps my most valuable research tool involved in the development of the HACCP manual. Thank you to Gary Moulton of the Department of Agriculture and Fisheries for clarifying some of my confusion over regulatory bodies and explaining the many agencies involved in food safety.

A special thanks to my family (mom, dad, Kris, and David) who provided me with support and advice and reminded me that nothing is gained without sacrifice. Thanks to my friends, Tracy, Patti-Ann, Heidi, Sonya, Sue, Morven, Graeme and Mark who listened to me agonize about the whole process. A very special thanks and best wishes to Wendy, Liz, and Ang, who are also writing a thesis and who can both support and sympathize with me. Thanks to Tina, for catching on quickly that my recurrent trips to the GAP were procrastination tactics, and thanks for backing out. Thanks to my friends Jennifer, Jenn, Marion and Diane at the QEII, I thoroughly enjoyed working with you all.

Special thanks to Larry for your patience, understanding and your unique way with words, when I thought I would rather iron my shoe laces than work on my thesis. Thanks for making me realize I could do it even when I was skeptical of myself. Love ya big!

Final thanks to my running buddies Traci, Katherine, Jan, Gail, and Joy who helped me forget about school, motivated me through our many runs and kept me laughing. Running truly is the best way to refresh from the monotony of writing a thesis ☺

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1.0 Introduction

1.1 Statement of the Research Focus

To determine the HACCP implementation needs of the Central Regional Health Board (CRHB) now part of the Capital District Health Authority (CDHA); and to develop an implementation manual for the Dartmouth General Hospital (DGH) based on this needs analysis, applying the change management/action research approach to the HACCP program requirements.

1.2 Practical Importance of The Study

In Nova Scotia in 1981, 18 people died and 41 others were ill after they had consumed contaminated coleslaw; in Quebec in 1986, 46 people were taken ill because they had eaten BBQ chicken bought at a supermarket in Montreal (The Educational Foundation of the National Restaurant Association, 1997). A Swiss outbreak of listeriosis in 1987 resulted in 31 deaths and 122 people becoming ill as a result of consuming raw milk and cheese (Jay, 1992). In Montreal and Toronto in 1997, 21 people suffered from shigellosis, a foodborne infection that was linked to Le Commensal, a vegetarian restaurant chain (Naval, 1998). Data published by the Centers for Disease Control and Prevention in 1999 suggest that 5000 deaths, 76 million illnesses and 325,000 hospitalizations are caused each year in the United States by foodborne illness (Scheule, 2000).

Despite the above statistics, the actual occurrence of foodborne illness is difficult to track simply because it is not always reported to health officials. Health Canada estimates that of the two million cases of foodborne illness contracted annually in Canada, only 10% are ever reported (Naval, 1998). Many people experience a bout of food poisoning, but because symptoms such as nausea and vomiting, cramps and diarrhea often don't occur until days after the contaminated food is eaten, many believe they are suffering from the "24- hour flu." Furthermore, consumers often misbelieve that foodborne illness involves certain characteristics but not others; therefore they may systematically misdiagnose foodborne illness when it is not present, yet fail to recognize foodborne illness when it is

present. Such a miscalculation could cause them to discount the personal risk from foodborne illness and fail to engage in safe food-handling and consumption behaviors (Fein, Jordon-Lin & Levy, 1995).

Determining the source of the illness is also problematic since there are many causes including bacteria, viruses, parasites and moulds, and each classification has different incubation periods and symptoms. Therefore, it is extremely complex to pinpoint the exact source of the illness without mass numbers of people experiencing similar symptoms.

Poor food safety standards cost the foodservice industry untold thousands in lost revenues, are professionally embarrassing and put people's health at risk (Freeborn, 2000). A single outbreak of foodborne illness can cost a foodservice operation anywhere from \$15,000 to \$75,000 in legal fees, medical claims, lost employee wages, cleaning and sanitizing, discarded food supplies and lost income due to negative publicity and/or being shut down (Naval, 1998). A Vancouver restaurant left hollandaise type sauces at room temperature too long and faced a staphylococcal outbreak in the 1970s. The restaurant not only lost \$165,000 worth of business, it also paid \$885,000 to a customer who became a quadriplegic as a result of the illness (Naval, 1996).

Successful foodservice operators must understand the importance of food safety and their responsibility in guaranteeing the health and safety of their patients, customers and employees. The development of the HACCP implementation manual for the Dartmouth

General Hospital (DGH) will have direct benefits to that facility. The change management approach to HACCP implementation will have relevance to other healthcare foodservice operations in Nova Scotia and Canada planning to adopt a HACCP program.

Canadian provinces such as British Columbia and Ontario have already legislated HACCP as a measure to ensure the safety of the food supply. Effective July 1, 2000, British Columbia's legislation requires mandatory training for foodservice establishments and a food safety program based upon HACCP principles (Freeborne, 2000). The DGH foodservice department aspires to establish an approach to HACCP implementation for healthcare foodservice before the Nova Scotia Department of Agriculture and Fisheries' Public Health Inspectors mandate HACCP implementation.

A HACCP implementation manual involves the development of HACCP prerequisite programs, harmonization of standardized recipes, record keeping tools, monitoring and verification documentation, and employee training that can be used throughout the whole Capital District Health Authority (CDHA). The manual will also aid in ensuring the quality and safety of the food served to patients, customers and employees, as well as promoting the food safety reputation of the hospital.

DGH will be prepared for the government regulatory requirements they will be facing in the future. Furthermore, the foodservice employees will experience an increase in morale and pride through their participation in setting the standard for HACCP implementation for healthcare facilities in Nova Scotia.

1.3 Theoretical Importance of the Study

Canadians spend approximately \$25 billion annually for food and beverage outside the home, and the foodservice industry is a major sector of the economy, employing approximately 650,000 Canadians (Canadian Restaurant and Foodservices Associated, 1993). Consumer expectations about food quality and safety have grown, prompting foodservice operators to seek systems and programs that will both bolster consumer confidence and improve food safety (Riswadkar, 2000). Both the National Restaurant Association and the American Dietetic Association have identified ensuring safe food as a critical competency and a responsibility for foodservice directors and managers (Scheule, 2000). The insurance of safe food practices will yield a good return on investment through lower costs, improved quality and customer satisfaction, which will foster repeat business (Freeborn, 2000).

Implementation of a Hazard Analysis Critical Control Point (HACCP) program will enable foodservice operators to monitor food safety. HACCP focuses on identifying and preventing hazards that could cause foodborne illnesses rather than relying on spot-checks of manufacturing processes and random sampling of finished food products to ensure safety (Sperber, 1991).

Implementing a HACCP program in an existing foodservice operation is similar to introducing a planned change in any organization. Planned change is an intentional, goal-oriented activity that seeks to alter employee behavior and improve the ability of the organization to adapt to changes in its' environment (Robbins, 1998). Implementing a

HACCP program involves making modifications to the elements of a specific foodservice operation, including the structure, technology, physical setting and personnel.

Action research is a change process based on the systematic collection of data. Once that information is compiled and analyzed, a change is introduced based on the findings. The development of a HACCP implementation manual according to the change management theory incorporates both action research and the HACCP principles as its' foundation.

Developing a HACCP implementation manual using this approach will enable each component of the organization to be examined, problems identified and changes incorporated that will facilitate the HACCP implementation transition. This thesis develops a broader perspective on HACCP implementation considering the organizational behavior theory.

1.4 Definition of Key Terms

Definitions adapted from the National Advisory Committee on Microbiological Criteria For Foods, 1998.

Control Point - any step at which biological, chemical, or physical factors can be controlled.

Corrective Action - procedures followed when a deviation occurs.

Critical Control Point - a step at which control can be applied, and is essential to prevent or eliminate a food safety hazard or to reduce it to an acceptable level.

Critical Limit - a maximum and/or minimum value to which a biological, chemical, or physical parameter must be controlled at a CCP to prevent, eliminate, or reduce to an acceptable level the occurrence of a food safety hazard.

Capital District Health Authority (CDHA) –was created in the Province of Nova Scotia in 2000. CHDA provides core health services to 395,000 residents (or 40 percent of the population of Nova Scotia) and tertiary and quaternary acute care services to residents of Atlantic Canada. There are 8500 staff employed within the employer organizations of the CDHA: The Nova Scotia Hospital, the Queen Elizabeth II Health Sciences Center, and the facilities of the former Central Region Health Board (CRHB).

Capital Health District – is one of nine health districts in Nova Scotia and consists of the Halifax Regional Municipality and the western portion of Hants County in Nova Scotia.

Central Region Health Board (CRHB) –is one of four regional health boards created in the Province of Nova Scotia in 1994 (now replaced by CDHA). Geographically, CRHB consisted of Halifax Regional Municipality, Municipality of West Hants, the Towns of Windsor and Hantsport, and a small portion of the Municipality of East Hants. CRHB provided community-based health services to 370, 000 residents. Facilities within the CRHB include the Dartmouth General Hospital, Eastern Shore Memorial Hospital/Duncan MacMillan Nursing Home, Hants Community Hospital/Haliburton Place, Musquodoboit Valley Memorial Hospital/Braeside Nursing Home, and Twin Oaks Memorial Hospital/Birches Continuing Care Center (Central Region Health Board Policies and Procedures Manual).

Full-Time Equivalent (FTE) – Minimum number of employees needed to staff the operation

Hazardous Analysis Critical Control Points (HACCP) - a systematic approach to the identification, evaluation, and control of food safety hazards.

HACCP Plan - written document that is based on the principles of HACCP and that delineates the procedures to be followed.

HACCP System - the result of the implementation of the HACCP plan.

Hazard - a biological, chemical, or physical agent that is reasonably likely to cause illness or injury in the absence of its' control.

Hazard Analysis - the process of collecting and evaluating information on hazards associated with the food under consideration to decide which are significant and must be addressed in the HACCP plan.

Maintenance for Equipment and Interior Building - notes any repairs made to equipment, air circulators, refrigerators, fans or any interior building repairs

Sanitation Checklist - verifies that all equipment and food contact surfaces are cleaned properly. Performed at the end of each production day.

Water Potability - notes all of the water quality checks performed

Verification – those activities, other than monitoring, that determine the validity of the HACCP plan and that the system is operating according to the plan.

1.5 The Objectives

Incorporating the change management elements using the action research approach allows for an in-depth analysis of each foodservice operation. It determines the HACCP readiness of each site and identifies deficiencies that require further development, enrichment and intensification.

1. To *diagnose* or gather information regarding the current program needs for CDHA in terms of structure, technology, physical setting and personnel.
 - a). *Structure* includes redefining job descriptions, revising job routines, implementing new policies and procedures to increase standardization, and developing standard operating procedures.
 - b). *Technology* encompasses change in the general functioning, methods and equipment used. For the purpose of this study technology also includes the types of record keeping documents, standardized recipes, the identification of critical control points, critical limits and corrective actions that are incorporated into the daily routines at the facility.
 - c). *Physical setting* involves altering the physical layout and spacing of the foodservice facility. This also pertains to the location of the receiving dock in relation to the kitchen and storage areas, lighting, location of washrooms and locker rooms, and ventilation systems.

- d). ***Personnel*** involves changes to employee knowledge and practice in terms of food handling, food safety, WHMIS training, and also includes alterations in staff morale, attitude and behavior.
- 2). ***Analyze*** what needs to be accomplished to meet HACCP prerequisite programs by performing a gap analysis to identify what needs to be done in terms of structure, physical setting, technology and personnel to satisfy HACCP guidelines.
- 3). To develop the HACCP ***implementation*** manual and HACCP training materials for the pilot site - DGH. This will help familiarize them with the HACCP program, terms, recipes, and technology.
- 4). To provide ongoing ***feedback*** to management and staff and to involve them in the development of the HACCP implementation manual for DGH use.
- 5). To develop ***evaluation tools*** for the management of DGH.
- 6). To determine the relevance of the change management approach to HACCP implementation.

2.0 Review of Relevant Literature

2.1 What is HACCP?

HACCP is an abbreviation for Hazardous Analysis Critical Control Point system. It is a systematic approach to food safety and sanitation (King, 1992) and is the preferred system to produce or prepare safe food (van Schothorst, 1997). HACCP is designed as a preventative maintenance program, in which a variety of threats to an operation's food supply are identified. HACCP can be considered to be a part of a Total Quality Management (TQM) program; however, it is only the component concerned with food safety; it has its' own rules, standards and guidelines that are specific to food safety and sanitation (Spears, 1995).

The application of the HACCP system to food safety control is based on the premise that potential food hazards and faulty practices can be detected at an early stage, leading to measures to prevent or reduce risks to the health of consumers or to relieve the economic burden on the food trade due to spoilage or recall of marketed items (Ehiri & Morris, 1996). HACCP is applicable to any type of foodservice facility with imposing risks. It is designed to prevent identified hazards from occurring in specified menu items (Setiabuhdi, Theis & Norback, 1997).

2.2 What are its' Origins?

HACCP was originally developed as a microbiological safety system for food manufacturers and processors. The Pillsbury Company, as a management tool to assure the production of safe products for the National Aeronautics and Space Administration (NASA), pioneered HACCP. NASA wanted to guarantee the safety of the foods astronauts would be consuming in space.

When NASA and the Pillsbury Company joined forces, it was realized that even when large numbers of finished product samples were tested, a relatively high percentage of potentially hazardous products could still be detected (Microbiology and Food Safety Committee of the National Food Processors Association, 1992). Pillsbury then introduced HACCP. HACCP almost eliminates the need for finished product sampling and testing by identifying the safety concerns inherent in the product and devising preventative measures which can be monitored in order to control the process. HACCP eliminates microbiological, chemical and physical hazards by *anticipation* and *prevention*, rather than *inspection* (Microbiology and Food Safety Committee of the National Food Processors Association, 1992).

2.3 HACCP and Foodborne Illness

The majority of foodborne disease outbreaks have been associated with high-protein foods of animal origin, such as meat, poultry and eggs (Giamalva, Redfern, & Bailey,

1998). These are designated as potentially hazardous foods that require extra attention during food handling, and are repeatedly reported as a vehicle for foodborne illness. Foods such as roast beef, poultry, pork products, Mexican style foods, Chinese foods, potato salad, cream-filled pastries, shrimp, tuna salad, ground meat, and egg salad are most frequently reported by consumers as the cause of foodborne illness outbreaks (Bryan, November 1990).

Jay (1992) presented foodborne illness vehicles that observed a number of food associations. Of 220 outbreaks of Salmonellosis, 26% were traced to roast beef, 14% to turkey and 11% to pork. Of the 98 outbreaks of Botulism, 13% were traced back to peppers and pepper sauce and 9% to asparagus and beans; while the 98 outbreaks of Scromboid poisoning were 99.9% traced to mahi-mahi, tuna and blue fish.

Investigations of outbreaks of foodborne diseases arising from foods prepared in foodservice establishments show that certain practices/operations frequently contribute to causation (Bryan, July 1990). The ten most contributory factors with percentage of occurrence identified included: improper cooling (leaving cooked foods at room temperature and/or storing foods in large containers in refrigerators), 56%; lapse of 12 or more hours between preparation and consumption, 31%; infected employees handling food, 24%; inadequate reheating, 20%; improper hot holding, 16%; contaminated raw food/ingredients, 9%; foods from unsafe sources, 6%; improper cleaning of equipment/utensils, 6%; cross-contamination, 5%; and inadequate cooking, 4% (Bryan, July 1990 & Bryan, 1988).

Temperature control accounts for two main sources of foodborne illness: improper holding temperature and inadequate cooking. However, temperature control plays a key role throughout the entire flow of food, from receiving, storage, preparation and cooking to serving, holding, cooling and reheating (Hernandez, August 1999). Analysis of the causes of foodborne illness has formed the basis of the HACCP system. Temperature abuse (leading to multiplication), undercooking (leading to survival), and cross contamination have been recognized as important factors to control (van Schothorst, 1997). Also important to note is the globalization of food trade which means that food can become contaminated in one country and cause outbreaks of foodborne illness in another (Sanders, 1999).

2.4 HACCP Prerequisite Programs

The National Advisory Committee on Microbiological Criteria for Foods (1998) insists that the production of safe food requires that a HACCP plan be built on a solid foundation of prerequisite programs. Each segment of the food industry must provide the conditions necessary to guarantee the safety of the food produced. Such conditions are considered to be a prerequisite to the development and implementation of an effective HACCP system.

Prerequisite programs must provide the basic environmental and operating conditions that are necessary for the production of safe, wholesome food (National Advisory Committee on Microbiological Criteria for Foods, 1998). Prerequisite programs should be assessed

during the design and implementation of each HACCP plan and they should be documented and regularly audited. Furthermore, they should be established and managed separately from the HACCP plan.

Common prerequisite programs (National Advisory Committee on Microbiological Criteria for Foods, 1998) may include but are not limited to: facilities, supplier control, specifications, production equipment, cleaning and sanitation, personal hygiene, education and training, chemical control, pest control, recipes, and receiving, storage, and shipping.

2.5 Benefits of HACCP

Ehiri and Morris (1992 & 1995) stated that perhaps the single most important advantage of the HACCP system is the increased food safety consciousness that is likely to be promoted among foodservice operators by incorporating food safety into every stage of food operation. Furthermore, an operational HACCP system can constitute sufficient demonstration that due diligence has been taken to prevent the occurrence of particular hazards. A HACCP plan that is properly designed and implemented will significantly reduce the chances of microbiological, chemical, or physical hazards from reaching the consumer (Microbiology and Food Safety Committee of the National Food Processors Association (NFPA), 1992). This system will enable the foodservice operator to reduce the risk of consumer complaints and potential liability.

HACCP is designed to control and eliminate the factors that cause foodborne illness. HACCP includes personal hygiene, and it reduces the risk of foodborne illness among staff by eliminating self-infection. HACCP is also an educational system. It will assist in teaching employees about food storage, temperature, personal hygiene and food handling (Howes, 1991).

When combined with proper equipment and facilities, a knowledgeable workforce, and effective standard operating procedures, the HACCP approach can provide foodservice establishments with a comprehensive food safety system (McSwane and Linton, 2000).

An effective HACCP program also improves food quality and decreases waste due to poor food handling.

2.6 Limitations of HACCP

An important limitation to the development and implementation of HACCP programs include the inability to directly link the program's impact to public health. Since the focus of a HACCP program is to reduce the incidences of foodborne human disease, the ideal yardstick of its' effectiveness is a measurable reduction in the number of cases of foodborne illness (Buchanan & Whiting, 1998). However, it is often difficult to determine both the cause and number of incidents.

The basis of a HACCP program is to reduce the levels of risk of foodborne pathogens to acceptable levels. The concern is how to apply 'acceptable levels' to the public when

there is often a lack of reporting of foodborne illness, making it extremely difficult to determine what acceptable levels include (Buchanan & Whiting, 1998).

Furthermore, HACCP plans must be product, plant, and even production-line specific. Generic HACCP plans are insufficient because they cannot deal with the characteristics of individual foodservice operations. Two facilities may produce the same recipes and products; however, it is unlikely to expect that both operations would have the same geographical location, ingredient sources, facilities' layout, equipment and processes (Buchanan & Whiting, 1998). Not only should each HACCP food safety program be tailored to the needs of the individual foodservice establishment, it should also fit the resources and constraints of the establishment that is implementing it (McSwane & Linton, 2000).

Another HACCP system shortcoming includes the control of foodborne pathogens on raw agricultural products that can enter a foodservice operation without being detected. Buchanan & Whiting (1998) stated that the production of foods that are marketed raw typically lack a definitive lethal step that can be relied on to eliminate microbiological risks.

Perhaps the most fundamental flaw in the development and implementation of a HACCP program is that it often targets the wrong audience. The program is directed towards the managers, who in turn are directed to pass the information on to employees. However, if managers are to train staff with the same materials they learned with, it will not ensure

the critical behavior changes that are necessary at the front-line levels of the foodservice operation (Hernandez, September, 1999).

Racial diversity of employees and the various levels of education are important factors managers must consider when training foodservice staff. Approaches for educating foodservice employees include the use of posters and pictures of proper and improper methods of food handling, storage and preparation, as well as the use of video and hands-on training. Time spent on training should be focused on explaining what HACCP is, what are the HACCP principles and terminology, and less time on where HACCP originated and how it came about in the food industry (Worsfold, 1998).

The Microbiology and Food Safety Committee of the National Food Processors Association (1992) found that a common problem resulting in unsuccessful attempts to implement HACCP has been the identification of too many points in the process considered to be critical control points (CCPs) where control 'must' be exercised and critical limits must be met in order to produce a safe product

Perhaps the biggest flaw in the research is the lack of data available pertaining to HACCP implementation at the foodservice operation level. There is some research but it is primarily at the manufacturing and the mass production level. There are no empirical studies evaluating HACCP implementation at conventional foodservice operations. Spears (1995) indicates that the difficulty in using HACCP models in some foodservice

operations lies in the fact that they were designed primarily for the evaluation of large production batches.

Ehiri & Morris (1995) identified an unfortunate tendency for foodservice operators to view HACCP implementation as a program to be 'contracted out to outside consultants.' This results in an outside influence establishing a HACCP program but the end result is that they are not there to see the continual program through, they implement it and then their work is done, leaving it up to the foodservice operators to ensure its' success or failure.

This is the logic behind having a qualified change agent coupled with the action research approach to implementing change. The change agent can be an outside person, or someone involved in the foodservice operation, who directly involves the foodservice staff not only to decrease the amount of resistance encountered, but also to ensure that staff participate as much as possible because it is the staff who will embrace the program and ensure that it does not erode overtime.

2.7 HACCP Legislation

The HACCP concept has been around in the food manufacturing industry for some time, and some governments see the implementation of HACCP as preventative medicine for food safety issues (King, 1992). Some countries are beginning to respond to calls for the application of HACCP throughout the food chain. In the USA, the food code released by

the Food and Drug Administration in 1993 now requires food regulation programs to be based on the principles of HACCP (Ehiri & Morris, 1996). In Canada, the Department of Fisheries and Oceans (DFO), Agriculture Canada (AC), and Health Canada (HC) all have agreed to establish health and safety food inspection standards based on the seven principles (steps) of HACCP (FSEP, 1993).

Naval (1996) explores HACCP legislation across Canada. In British Columbia, regulations require every food service operator be trained in food safety, with the principles based on HACCP. Food handler certification has been required for supervisors and operators with five or more employees in Alberta since 1985. A certified staff member must also be present during all shifts. Food safety certification has been mandatory in Saskatchewan since 1988, while in Manitoba and Ontario HACCP is mandatory for food inspectors and food service employees. In Quebec, New Brunswick, Nova Scotia, PEI, and Newfoundland and Labrador, HACCP training is not mandatory, but programs are available.

According to Ehiri & Morris (1996) incorporating HACCP into food legislation of countries in both developing and developed countries calls for political commitment to its' wider implementation. However, if legislation is to achieve the desired results, it will have to be supported by adequate educational programs. Legislation is required, but on its' own it cannot yield the desired results. Increased reliance has to be placed on the compliance of food handlers, managers of foodservice establishments, consumers and

others educated in what needs to be accomplished to achieve food safety (Kaferstein & Abdussalam, 1999).

The control of food contamination and foodborne illness should be addressed as a global problem. The surveillance of foodborne diseases should become a global activity; individual components of which should operate effectively at country level while regional programs should provide the coordination (Kaferstein & Abdussalam, 1999). Improved coordination and cooperation are needed between government sectors and between governments, industry, consumers and nongovernmental organizations.

2.8 Summary

When combined with proper equipment and facilities, a knowledgeable workforce, and sound standard operating procedures (SOPs), the HACCP approach can provide food establishments with a comprehensive food safety system.

“In order to have a successful food safety plan, you must focus on having an infrastructure in place to embrace the program so it does not erode over time. A good management system will ensure an effective food safety plan, now and for longer term (Hernandez, June 1999, p. 86).”

3.0 The Theoretical Framework

3.1 Introduction

The theoretical frameworks applied to this study are change management, which encompasses action research, and the seven principles of HACCP. The focus is to assess the HACCP readiness of six foodservice operations using the diagnosis, analysis, feedback, action, and evaluation stages of action research, keeping in mind the elements of change management, including structure, technology, physical setting and personnel.

HACCP is about management – managing people, recipes, food and the food production process (Bundy, 2000). The change management theory expands on the concept of management by taking into consideration the structure, technology, setting and personnel.

The HACCP implementation manual involves the examination and interaction of all elements encompassed by the change management theory. Furthermore, this approach enables each component of the organization to be examined, problems identified and changes incorporated that will facilitate the HACCP implementation transition.

3.2 HACCP

Research refers to the seven steps (or principles) for HACCP implementation (National Advisory Committee on Microbiological Criteria for Foods, 1998; King, 1992; Sperber,

1991; Ehiri & Morris, 1995; and McSwane & Linton, 2000). Briefly, the seven steps include:

1). Assess hazards and risks associated with raw materials and ingredients, processing, preparation, storing, holding and consumption of the food. Involves assessing hazards at each step in the flow of food and developing procedures to lower the risk for each. The most common hazards are microbiological, such as viruses, bacteria, and parasites. Other hazards include chemical, which can be classified as either naturally occurring or added; or physical, which are those most commonly reported because they are often visible to the customers, including hair, glass, animal waste, dirt or other particles (King, 1992).

2). Determine the critical control points (CCPs) required to control the identified hazards. Hernandez (September, 1999) identified Critical Control Points (CCPs) as the areas where food safety can breakdown and includes the steps that must be performed correctly every time to ensure that the food served is safe. They are any point or procedure in a specific food system where loss of control may result in an unacceptable health risk.

3). Establish the critical limits that must be met at each identified CCP. Critical limits are control procedures and standards that apply to each critical control point. They describe the difference between the safe and unsafe product at the CCPs. A critical limit must be known as the absolute tolerance or safety limit of the CCP. For example, the

critical control point is cooking and the critical limit of a beef patty would include minimum internal temperature and time needed to kill the most heat-resistant bacteria based on the thickness of the patty, the patty's composition, and oven humidity. If food has not met its' critical limit, procedures need to be in place so that food is either served safely or destroyed.

4). Establish procedures to monitor the control of the critical control points.

Monitoring is the most important step in a food safety plan. There are a variety of ways to monitor critical control points, including analyzing the foods that require extra care and following those foods through the receiving, storage, preparation and serving procedures to pinpoint potential problems. If it is revealed that those foods do not meet the set limits, then procedures must be put in place to correct the situation (Hernandez, September 1999). Ideally, testing and monitoring of CCPs should be done continually; however, when that cannot occur, operators need to prove that testing will be done frequently enough to prove that potential hazards are under control (King, 1992).

5). Establish corrective action to be taken where there is a deviation identified by monitoring a critical control point. Immediate corrective action must be taken when monitoring shows that a critical control point is not being controlled. Corrective action must be taken immediately when a critical limit has been exceeded, since there is then an increased risk of foodborne illness (McSwane and Linton, 2000). Corrective action procedures and responsibilities for their implementation need to be specified. This will

include action to bring the process back under control, and must be conducted on each CCP in the process.

6). Establish effective record-keeping systems that document the HACCP plan is working effectively. Record keeping provides the foodservice operators with the ability to prove that their production system is operating effectively; if ever a concern with their facilities' food safety arises. For example, if an incident of food poisoning occurs, with an effective HACCP plan, not only do you know that the incident could not have been caused by anything that could have occurred in your facility, you can prove it. If a foodborne illness allegedly occurs at an institution, one of the best defenses is the thoroughness of the record keeping and documentation. Records may include but are not limited to: temperature charts for cooking, chilling and storage of food products.

7). Establish procedures for verification that the HACCP system is working properly. HACCP requires that verification activity be ongoing and all authentication procedures be incorporated within the HACCP plan (Spears, 1995). Verification entails frequent reviews of the HACCP plan in action, such as ensuring CCPs are within limits, corrective actions are being taken as necessary, and monitoring procedures are conducted as prescribed; as well as the calibration of process monitoring instruments (King, 1992).

3.3 Change Management

More and more organizations today face a dynamic and changing environment. If an organization is to going to survive, it must respond to changes in its' environment. The inability to respond to changes in the health care delivery patterns can result in a lack of services or the inefficient use of existing resources. Organizations need to incorporate the newest trends and procedures, which also means that organizations require an equally flexible and responsive workforce that can adapt to rapidly changing environments. Furthermore, the organization needs to adapt when government agencies enact new laws.

The old adage that 'the only constant in the world is change' was never more applicable than to the delivery of health care services (Clinical Service Steering Committee, 2001). Nowhere is organizational restructuring more evident than in the changing environment of the healthcare industry. It is clear that the health system and peoples' health needs are changing with or without the involvement of government. Such changes need to be constantly addressed to ensure the sustainability of high-quality services in a healthcare system.

Budget decreases and employee reduction efforts are often required in order for an organization to remain viable. At the same time, downsizing and resource utilization can alter employees' job responsibilities, reduce job security, alter career advancement opportunities, not to mention create significant concerns in relation to morale and job

satisfaction among employees that can offset their performance (Decker, Wheeler, Johnson, & Parsons, 2001).

Employees develop certain psychological expectations of the company that, when violated through restructuring or other organizational changes, tend to create distrust and resistance (Decker et. al., 2001). Employees' perceptions of organizational change play an integral role in the success of the restructuring process. Therefore, it is essential that employers understand and address employees' perspectives, motivation factors and concerns through the transition period (Decker et. al., 2001).

One of the most well documented findings from studies involving individual and organizational behavior is that organizations and their members resist change (Robbins, 1998). However this can be positive in that it provides a degree of stability and predictability to behavior. Resistance can also be a source of functional conflict, since resistance to a plan or change may stimulate a healthy debate and result in a better decision. However it can also hinder performance, adaptation and progress (Robbins, 1998).

When employees are participating at all stages of the change, the resistance is reduced because the employees take pride in their accomplishments. Offering employee counseling, therapy, new-skills training or a leave of absence may help alleviate stress and anxiety, while education and training can reduce the amount of resistance encountered. Since the source of the resistance often lies in misinformation or poor

communication, open communication with employees to help them understand the logic behind the change is essential. Interaction can be achieved through one-to-one discussions, group discussions, town-hall type meetings, group presentations, memos, and reports.

The elements of change management encompass:

- 1). *Structure* - is defined by how the tasks are formally divided, grouped and coordinated but it is as ever changing as the environment of the organization. A change to the structure of an organization can involve redesigning of jobs, alterations to work schedules, employee work routines or implementing policies and procedures to increase standardization.
- 2). *Technology* - can involve the introduction of new tools, policies, procedures or operating methods and are most often aimed at increasing production efficiency.
- 3). *Physical setting* - involves decisions about space configurations, interior designs and the layout and placement of equipment in relation to work areas. Changes can also pertain to variations in the quantity and type of lighting, temperature, ventilation, levels and type of noise, the cleanliness of the general work area, as well as removing partitioning, making it easier for employees to communicate with each other.

- 4). **Personnel-** typically involves changing the behavior and attitudes of employees through communication, joint decision-making and participative problem solving. Its' focus is on helping individuals and groups interact and work more efficiently

Change management involves people/agents who are responsible for managing change; they can be managers, employees of the organization or outside consultants. The change agent objectively looks for problems, and the kind of problem determines the type of change action. All change agents must have specified knowledge in the theory and methods of change and involve everyone in the consultative process (Robbins, 1998).

3.4 Action Research (AR)

The benefit of AR is that it is problem focused and relies on employee input. Each of the five AR steps incorporates some aspect of the seven HACCP principles.

Action research consists of five steps:

1. **Diagnosis** –The change agent begins by gathering information about problems, concerns, and needed changes from members of the organization by asking questions, interviewing employees, reviewing records, and listening to the concerns of employees and managers.

Step 1 of HACCP involves assessing hazards and risks associated with raw materials and ingredients, processing, preparation, storing, holding and consumption of the

food. It functions as a baseline for the identification of problems and concerns that exist in the foodservice operation.

2. **Analysis** – The information gathered during the diagnostic stage is analyzed and the change agent synthesizes this information into primary concerns, problem areas, and possible actions.

The focus is on problem areas and includes any point in a specific food system where loss of control may result in an unacceptable health risk. Therefore, it is crucial to determine the critical control points (CCPs) that are required to control the hazards (Step 2) identified in the diagnosis step. Once the CCPs have been identified, there needs to be a method to control it. Critical limits are control procedures and standards that apply to each identified CCP (Step 3). They describe the difference between a safe and unsafe product. A critical limit is the absolute tolerance or safety limit of the CCP.

3. **Feedback** – The people that are actively involved in any change program must also be involved in determining what the problem is and participating in creating the solution. Under the philosophy of action research, when the employees are participating in all stages of the change, they tend to take pride or ownership of their accomplishments. Once the information from steps one and two are shared with the employees, then action plans for bringing about any needed change are developed.

Steps 4 and 5: Establishing procedures to monitor the control of the critical control points and establishing corrective action to be taken where there is a deviation identified by monitoring a critical control point. Encompasses the analysis of the concerns addressed in the diagnosis component of action research.

4. **Action** – The employees and the change agent carry out specific actions to correct and modify problems that have been identified.

Steps 6 and 7 involve employee input and participation, which will help in developing effective record-keeping systems that document that the HACCP plan, is working, and establishing procedures for verification that the HACCP system is working properly.

5. **Evaluation** – Consistent with the scientific underpinnings of action research, the change agent develops evaluation forms for the managers to assess the effectiveness of the action plans.

4.0 Methodology

4.1 Diagnosis/Information Gathering

This stage included the collection, compilation and corroboration of data as it related to program needs in terms of structure, technology, physical setting and personnel. The *diagnosis/information gathering* stage involved the development and implementation of three assessment tools.

Semi-structured interview.

An interview tool (Appendix 1) for site managers was developed to gather information on the structure, technology, physical setting and personnel of their facility. Accompanying the interview was a letter of informed consent (Appendix 2). The format of the interview consisted of twelve demographic type questions that explored the managers' experiences in the foodservice industry, the size of the facility, how many supervisors, full-time and part-time staff. The next eighteen questions investigated the type of HACCP prerequisite programs that were in place, if any; and who monitored the actions of employees to ensure that the HACCP prerequisite programs were being practiced. There were three attitude type questions that were designed to determine how the managers felt about training, hygiene and sanitation. The last three questions asked the managers to rank their facilities in terms of food safety and sanitation and to identify weaknesses within the operations, as well as asking the managers what their expectations were with respect to incorporating HACCP into daily routine activities.

The interview tool was administered to each of the managers involved in the study. The researcher, at the convenience of the manager, arranged an appointment for a site visit. Each visit involved an introduction to the manager and staff, an explanation as to the purpose of the visit, and a tour of the facility conducted by the manager. The researcher both conducted and recorded the results of each interview, which typically took approximately half an hour. The interviews were conducted within two weeks of each other and were all completed by the end of March 2000.

The development of the interview was based on the HACCP guidelines identified by KASAR CANADA LTD, out of Pictou, Nova Scotia (1998), the National Advisory Committee on Microbiological Criteria for Foods (NACMCF, 1998), Bryon (1990), and Fein, Jordon-Lin, & Levy (1995). Each reference cited examples of questions to be considered when conducting a hazard analysis, risk assessment, and general overview of a foodservice facility. The practice questions were adopted from Unklesbay, Sneed, & Toma (1998), Fein et. al, (1995), and Williamson, Gravani, & Lawless (1992). The interviews were pre-tested with five Food and Nutrition university students and two dietitians that work in the retail and patient foodservice department of the QEII Health Sciences Center.

On-site audit and observation.

An on-site audit of pre-existing prerequisite programs (Appendix 3) was developed to determine what programs, if any, were in use at the sites. This audit was based on HACCP guidelines prepared by KASAR CANADA LTD. (1998); such guidelines are a component of the HACCP program in use at the SERCA Foodservice Inc. warehouse in Halifax, Nova Scotia.

The audits were conducted and the results recorded by the researcher during the same visit as the interview. The on-site audit included a tour of each facility whereby all records, forms and supporting documentation from each facility were compiled. This included receiving logs, temperature check forms, menus, recipes, maintenance requisitions, thermometer calibration records, etc. Furthermore, the researcher looked for the binders or files that housed the completed forms. The results of the audit were compared to the results of the interview and attempts were made to verify that the practices reported by managers during the interview were in place. Each audit took approximately forty-five minutes to an hour, were conducted within two weeks of each other, and were all completed by the end of March 2000.

The NACMCF (1998) insists that the production of safe food requires that a HACCP plan be built on a solid foundation of prerequisite programs. Each segment of the food industry must provide the conditions necessary to guarantee the safety of the food produced. Prerequisite programs must provide the basic

environmental and operating conditions that are necessary for the production of safe, wholesome food and need to be assessed during the design and implementation of each HACCP plan, as well as documented and regularly audited (NACMCF, 1998).

Knowledge and Practice questionnaire

A knowledge and practice questionnaire (Appendix 4) was developed and administered to all food service staff at the six sites of the CDHA. The format of the questionnaire contained four demographic questions that explored length of time in the foodservice industry, as well as food safety handling training. There were eight questions that explored the food safety practices of employees. The practice questions had a four-point response scale, ranging from always to never, and the knowledge questions used fifteen true/false questions. The practice questions were deliberately placed before the knowledge questions in an attempt of getting a more honest practice response.

The questions used in the development of the questionnaire were adopted from Unklesbay et. al., (1998), Walter, Cohen, & Swicker, (1997) and Manning, (1994). These references cited various practice, knowledge and attitude type questions to assess the food safety consciousness of foodservice employees. The questionnaire was pre-tested with ten subjects, 3 utility workers, 2 cashiers, 2 cooks helpers and a cook at the QEII Health Sciences Center, the remaining two

were Food and Nutrition university students. Any misconstructions or misunderstandings were taken into account and adjusted accordingly.

The purpose was to determine the food safety practice and knowledge among all foodservice employees of the CDHA. Therefore, the intended sample was all current employees who represent the CDHA; however, the actual sample consisted of staff volunteers. The managers distributed the questionnaires to the employees accompanying their pay stubs. The employees were given instructions in regards to voluntary participation, anonymity and completion of the questionnaire (Appendix 5). The questionnaire took approximately fifteen minutes to complete. Once the questionnaire was completed, it was sealed in the envelope provided and returned to the manager's office, where it was placed in an identified envelope that contained the researcher's name and address. The researcher collected the questionnaires from the managers.

4.2 Analysis

Semi-Structured Interview

The results of the interview scores were compiled in Microsoft Excel™ (Version 9.0, 2000, Microsoft Corporation, Troy, NY). The tabular presentation of the data provided a basis for identification and comparison of the six sites. Common themes regarding managers' expectations of a HACCP program within their facility were identified. This allowed the researcher to understand each

manager's perception of HACCP and identified inclusionary criteria to be concentrated on during the development of the HACCP implementation manual.

On-Site Audit

The results of the audit and observation were compiled in Microsoft Excel™. The results were compared to the NACMCF and KASAR CANADA LTD guidelines for prerequisite programs. Deficiencies were identified for each site. A tabular compilation of data allowed for the easy identification of what prerequisite programs met the HACCP guidelines, and where there was need to meet HACCP requirements.

The Knowledge and Practice Questionnaire

The completed questionnaires were compiled in Microsoft Excel™. Descriptive and relative statistics were conducted using the analysis and tools component of Microsoft Excel™. The practice questions had a four-point response scale, ranging from always to never, with always being coded 1 and never coded as 4. The food safety knowledge questions used fifteen true/false questions, where true was coded as 1 and false coded 2. Computation of the percent rate of correct responses for each question and the analysis of variance was used to determine whether significant differences existed between average correctness rates at the different sites. In each case, each response was assessed as correct or incorrect. ANOVA and Chi-square techniques were used to determine whether significant differences existed between sites in proportion to employees with different levels

of training and experience, and in average correctness rates in response to practice and knowledge questions.

The practice variable was measured according to whether the question was answered correctly. Always was scored as 1 and never scored as 4. The practice score for each site was determined by the percent of correct responses. The knowledge variable was determined using fifteen true/false questions. True was scored as 1 and false scored 2. The knowledge variable was measured according to whether the question was answered correctly or incorrectly. The knowledge score for each site was determined by the percent of correct responses.

4.3 Action

Structure

All policies and procedures were reviewed and adjustments made according to the seven HACCP principles and the prerequisite program recommendations. Prerequisite programs (Appendix 6) and standard operating procedures (Appendix 7) that need to be in place at each site were developed. New HACCP forms including time temperature, fridge and freezer temperature forms, and receiving logs were also developed (Appendix 8).

Technology

This included the development of various tools and operating methods to promote food safety awareness and increase the efficiency of food handling. All recipes at

the test site Dartmouth General Hospital (DGH) required adjustments (Appendix 9). Standard operating procedures were developed that incorporated the flow of food from such stages as purchasing, receiving, storage, preparation, thawing, cooking, holding, cooling, reheating, serving and general food safety procedures. Abbreviated HACCP short systems were developed by category (Appendix 10) rather than by recipe, since many foods can be classified into categories that undergo similar operations and whose processes have identical CCPs (Bryan, July 1990). Such groupings can simplify and streamline the development of the HACCP program while decreasing the tedious paper trail. The purpose of the HACCP systems are to identify the foods and procedures that are most likely to cause foodborne illness, build in procedures that help to reduce the risk and incidence of foodborne outbreaks, and help in the monitoring of all procedures to ensure food safety.

All tools developed will be distributed to the managers of each site at a District Food Service Committee meeting. Each manager will receive a copy of the HACCP implementation manual that includes the following sections: introduction, standard operating procedures, HACCP prerequisite programs, categorized HACCP short systems, HACCP forms, and staff education guidelines based on what was identified by the foodservice questionnaire. Only the manager of the test site will receive the recipes, since they are only relevant to that site; however, all managers will get one recipe per category in order for them to put their facilities' recipes in the suggested format. There will also be an electronic

file distributed to each manager containing all sections of the manual, to allow the manager to adjust their components as needed in the future.

Physical Setting

Each facility was examined according to the HACCP prerequisite guidelines, and all sites received recommendations (Appendix 11) as to how to improve upon the efficiency of their foodservice operation. The prerequisite programs investigated the following components: personnel; premises including outside property and building structure, design, construction and maintenance, lighting, ventilation, waste disposal, employee facilities, and water and ice; equipment including general equipment, calibration requirements, and preventative maintenance; transportation including incoming material storage, non-food chemicals receiving and storage, and finished product storage; sanitation; pest control; and finally record keeping. All these prerequisites were explored in great detail and recommendations were made on a site-by-site basis.

Personnel

An employee training kit (Appendix 12) was compiled to familiarize each employee with the components of a HACCP program. The training program included personal hygiene habits, food handling Do's and Don'ts, a pictorial copy of the six-step method for proper hand washing, an explanation of the danger zone, and a pictorial overview of important temperatures to remember.

4.4. Feedback on Materials Developed

There were informal meetings every three to four weeks with the manager of DGH to discuss the status of the manual, seek input and communicate goals. The manager reviewed all components of the HACCP manual, provided feedback and made suggestions in terms of the manual's organization and structure. The exclusions of the HACCP long systems were also discussed with the manager and it was concluded that only the use of the HACCP short systems were deemed necessary as it was important to streamline the HACCP plan. Revisions to the Food and Nutrition department policies and procedures were also made. The corrections and revisions were made directly on old policies and passed along to the department secretary for retyping.

The remaining five site managers were informed of the status of the HACCP manual through written updates, typically one to two pages that included the latest developments and concerns. The updates were presented at the Regional Food Service Committee meetings held once a month, by the manager of DGH, in an attempt to keep all site managers in touch with the researcher and up-to-date on the development of the HACCP manual.

All supervisors and cooks were presented with the opportunity to review and revise the recipes and then the revised tools were tested with the staff for their input, recommendations and advice. Each person took a section or category of recipes and reviewed them according to current practice. The revisions to the recipes involved such

changes as yield, pan size and oven temperature. The changes were noted directly on the recipe and the researcher adjusted the recipes after a follow-up consultation with the supervisors and the manager.

4.5 Evaluation

Evaluation is an important component to the development of any program. Due to time lines, an actual evaluation is deemed to be outside the scope of this thesis. However, there will be guidelines provided for managers in terms of prerequisite programs, how to develop them, and how frequent to monitor them.

5.0 Results

5.1 Semi-Structured Interview

The managers had 10 to 22 years experience in the foodservice industry, and had been in their current positions from 3 to 15 years (Table 1). Each site had one manager with the exception of sites 4 and 5, which share a manager. Site 1 employed one part-time (PT) and two full-time foodservice supervisors while site 2 employed one full-time (FT) supervisor. The smaller operations, including sites 3, 4,5 and 6, did not employ any supervisors, as the managers were responsible for the day-to-day operations of their facilities.

Table 1
Foodservice Management of CDHA

Overview of Managers	Foodservice Sites					
	1	2	3	4	5	6
Years in Industry	>10	20	>10	>10		22
Years in Current position	7	15	1-5	6-10		11
# of Managers	1	1	1	1		1
# of Supervisors	2 FT 1 PT	1 FT	1	0		0

All sites were described as acute care facilities, while four of the six sites included some form of long-term care as well (Table 2). Facility size ranged from 25 beds to > 125 beds, and the full-time equivalent (FTE) complement varied as well from 1 to >25. The managers reported that 87% of all CDHA foodservice staff had received the Nova Scotia

Food Handlers Course. There was no agreement as to when the staff would be retrained, nor was there any set plan for staff retraining.

Table 2
Foodservice Facilities of CDHA (n=6).

Description of Sites	Foodservice Sites					
	1	2	3	4	5	6
Type of facility	Acute	Acute/LTC	Acute	LTC	Acute/LTC	Acute/LTC
Location	Urban	Rural	Rural	Rural	Rural	Rural
# of beds	>125	25-75	<25	25-75	25	75
# of FTEs	>25	1-5	1-5	1-5	1-5	6-10
# staff with food safety course	24	12	4	10	8	10
# staff without food safety course	8	2	0	0	0	0

Five of the six site managers ranked themselves as adequate in food safety (Table 3). Improved record keeping, including increased usage of the sanitation checklist, time-temperature forms, and more frequent truck inspections, were all reported as areas that the managers would like to see improve. HACCP expectations ranged from increased food safety preparation techniques to increased compliance with time-temperature forms. One site manager felt that the HACCP program should be as simple and easy as possible to ensure compliance.

Table 3
Food Safety Adequacy Ranking and HACCP Expectations.

Sites	Food Safety Adequacy	Manager identified areas for improvement according to HACCP requirements
1	2	Proper and safe food prep & service usage techniques Identify and address major food safety concerns
2	3	Improved record keeping, especially daily temperature checks
3	2	Improved record keeping, especially daily temperature checks Improved quality control
4	2	Improved record-keeping, truck inspections and documentation Would also like an extra FTE
5	2	Improved record keeping, especially daily temperature checks Increased use of sanitation checklist
6	2	Improved record-keeping, such as daily temperature checks at steam table More frequent truck inspections Simple and easy

More than adequate, no needed changes (1), Adequate, some changes needed (2); Less than adequate, need some changes (3); Poor, major changes needed (4).

All managers reported that there were no records kept for any products they purchased, nor was there any temperature checks performed upon receipt of perishable stock (Table 4). When asked if the temperature checks were performed when the product was ready for service, the responses ranged from always to occasionally; however, it was discovered that only one of the six sites could consistently produce the completed temperature checks forms.

Table 4 Foodservice Practices of the CDHA Facilities (n=6) {optimal responses in bold}.

Foodservice Practice	1	2	3	4	5	6
Does the FS operation keep records of all products purchased?	Always	Always	Occasionally	Frequently	Never	Always
Does the FS operation ever purchase outside the Metro Food Buying contract?	No	Yes	Yes	No	No	Yes
Are temperature checks performed when the product is ready for service?	Freq.	Freq.	Occasionally	Occasionally	Occasionally	Always
Are there records of these temperature checks?	Yes	Yes	No	Yes	No	Yes
Are temperature checks performed when the food is hot holding for service?	Never	Never	Occasionally	Occasionally	Occasionally	Frequently
Are there records of these temperature checks?	No	No	No	Yes	No	No
Are fridge/freezer temperature checks performed?	Yes	Yes	No	Yes	Yes	Yes
How often are these temperature checks performed?	2X/day	2X/day	Never	2X/day	1X/day	3X/day
Are there records of these temperature checks?	Yes	Yes	No	Yes	Yes	Yes
Are regular cleanliness inspections of counter tops and general work areas conducted?	Yes	No	No	Yes	No	Yes
How often are these cleanliness inspections conducted?	Daily	Never	Never	Daily	Never	Daily
Are these cleanliness inspections documented?	No	No	No	Yes	No	No
Whose responsibility is it to verify that the safety/quality checks are being completed?	Super.	Super.	Manager	Manager	Manager	Senior cook & manager
Is this responsibility incorporated into the job description of the person responsible for doing it?	Yes	Yes	No	Yes	Yes	Yes
Are the verifications recorded in a timely and written manner?	Yes	Yes	No	Yes	No	Yes

Five out of six of the sites routinely recorded temperature checks on all fridges and freezers. The external temperature dials on the industrial fridges/freezers at all six sites have never been calibrated. Four out of the six sites had no fridges/freezers alarms to alert security or staff if one of the units happened to break down and not all units contained hang-type thermometers located inside the refrigeration/freezer unit. Some sites used domestic type fridges and deep freezers that also did not contain thermometers.

Inspection of the delivery trucks was not a regular occurrence, and there were no routine cleanliness inspections of workspaces. At the four sites without supervisors it was the manager's responsibility, while at the other two sites it was the foodservice supervisor's responsibility to ensure these cleanliness checks and temperature audits were regularly performed.

All managers strongly agreed that both managers and staff should have a provincially recognized food handler's course, should educate their employees on personal hygiene, cleanliness and sanitation, and believed that the decisions and actions of foodservice employees impact the organization's risk of foodborne illness, food quality and spoilage of foods.

5.2 On-Site Audit

Each facility was reviewed in terms of HACCP prerequisites. Table 5 presents the results of how each site scored if HACCP certification was sought at the point in time when the on-site audit was conducted. All prerequisite programs were investigated on a site-by-

site basis. Supporting documentation such as standard operating procedures (Appendix 7), time-temperatures forms (Appendix 8), HACCP recipes (Appendix 9), categorized short HACCP systems (Appendix 10), were developed and revised according to the HACCP guidelines.

Table 5
Prerequisite Programs Satisfied at the CDHA Foodservice Sites (n=6).

Prerequisite Programs	Foodservice Sites					
	1	2	3	4	5	6
Personnel	X	X	X	X	X	X
Premises	X	X	X	X	√	X
Transportation	X	X	X	X	X	X
Storage	X	X	X	√	√	X
Equipment	X	X	X	X	X	X
Sanitation	X	X	X	X	X	X
Pest Control	X	X	X	X	X	X
Record Keeping	X	X	X	X	X	X

The site did not meet the prerequisites (X); the site met the prerequisites (√).

Even though the table appears to indicate that no one site met the prerequisites, the actual situation is not quite as poor as it appears because all prerequisites have more than one component. If the site did not satisfy each component, then they received an X indicating work needs to be done to ensure the prerequisites are met. Those rankings meant the prerequisite was deemed incomplete and resulted in a deficient ranking. Site 4 had exceptionally clean and organized storage facilities that met all requirements, while site 5 met the requirements for both storage and premises.

The analysis of the prerequisites determined that employees need to receive education and training to understand the importance of critical control points, critical limits, monitoring procedures, methods of documentation, and action to be taken in the event that the limits are not met or are exceeded. Those employees who are responsible for the HACCP program must be adequately trained in its' principles and record keeping requirements.

No site had a program in place with regards to employee education and training, nor was there a fully detailed sanitation program in place at any site. An employee education and training kit has been developed as part of this thesis project (Appendix 12) to teach staff about general food safety, foodborne illness, the basics of HACCP, the importance of time-temperature control, how to effectively take temperatures of various products and personal hygiene. However, each site will need to develop a site-specific sanitation program to meet the needs of their facility.

Pest control was controlled by either a third party or an outside contractor for all sites, which can result in an incomplete prerequisite when there is lack of communication between parties. It is essential to have documentation of what is happening at the facility, in terms of number and location of traps, especially when an outside source is conducting the work.

All sites need to concentrate on the record keeping and documentation components. There were discrepancies discovered when conducting the on-site audit, in that what was

reported as occurring on a regular basis could not be verified nor supported by the necessary documentation.

5.3. Foodservice Practice & Knowledge Questionnaire

A total of 78 surveys were distributed throughout the six sites of the CDHA; 35 were completed and returned, yielding a 45% response rate. On average the respondents answered 6.83 ± 1.10 of the eight practice questions correctly, and 12.86 ± 1.70 of the fifteen knowledge questions correctly. The results of the food safety practice and knowledge questions are summarized in Tables 6 and 7 respectively.

Table 6
Food safety practice questions and the percent responses (n=35) answered correctly.

Practice Questions	Correct Response	(%) Correct
I serve ground meats when they are red inside or medium rare	Never	97
I leave frozen meat/fish/poultry in a sink full of cold water to thaw	Never	54
When preparing food, I check the food temperatures	Always	63
I wash, rinse and sanitize knives between cutting sandwiches with different fillings	Always	83
I discard food that has passed the expiration date	Always	94
I ensure that leftovers are disposed of, or wrapped, dated and stored properly	Always	97
I wash, rinse and sanitize the cutting board between cutting meats & vegetables	Always	97
During food preparation, I protect the food from glass, dirt & physical hazards	Always	97

For the purpose of analysis the practice questions were grouped according to stage, including preparation, cooking or storage. When the staff was asked a preparation

question regarding the proper technique for thawing frozen meat, there was a large variety in responses, ranging from always to never. The percent correct response was 54%, meaning that almost half of those surveyed responded incorrectly.

The percent of correct responses for the practice cooking questions ranged from 63% to 97%. Only 63% of respondents indicated that they regularly check food temperatures during preparation. The percent of responses answered correctly regarding safe storage practices ranged from 94% to 97%.

Again, for the purposes of analysis, the knowledge questions were grouped according to stage, including preparation, cooking, storage and sanitation. The results of the food safety knowledge questions are summarized in Table 7.

Table 7 below indicates that the percent of correct responses for knowledge questions pertaining to preparation ranged from 66% to 100%. Only 66% of respondents correctly answered the question regarding soaking vegetables in water to remove all traces of dirt and pesticides. The percent of correct responses for knowledge questions regarding cooking ranged from 83% to 94%. These questions pertained to food safety, temperature control and the danger zone, and were answered relatively well.

Table 7
Food safety knowledge questions and the percentage of responses (n=35) answered correctly

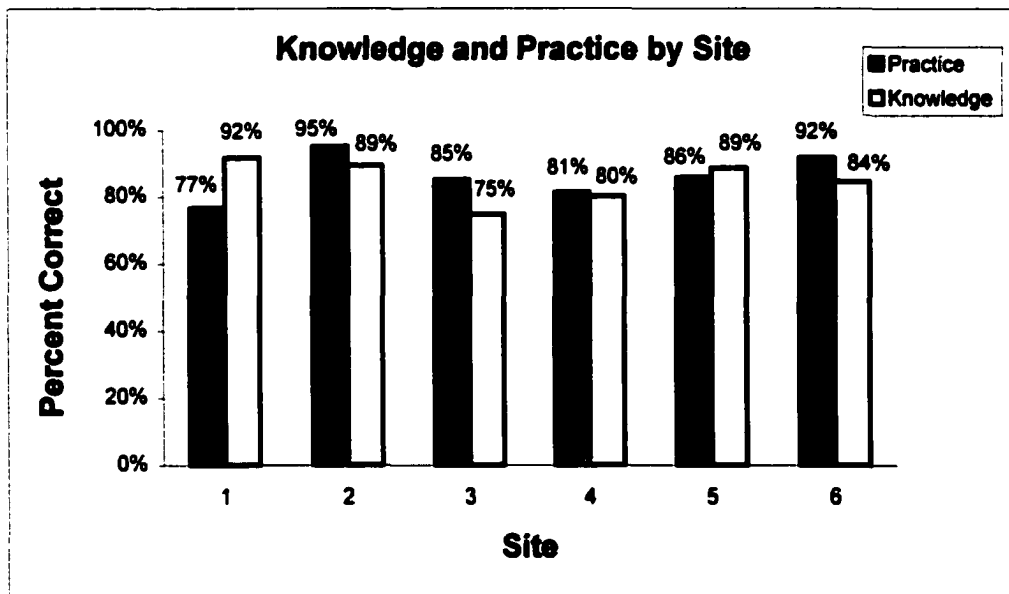
Knowledge Questions	Correct Response	(%)
A turkey can be thawed at room temp. if left no longer than 24 hours	False	100
Cross-contamination doesn't cause food-poisoning	False	100
Washing dishes in detergent also sanitizes them	False	91
Once cooked, it is not necessary to reheat food thoroughly	False	94
Unsafe foods can be identified by the look, smell & feel	False	80
To check temp. of large roast, place thermometer at visible end of bone	False	86
It's not necessary to rinse utensils before putting them in the sanitizer	False	86
When a refrigerator has a built-in thermometer, you only need to check the temp. of unit, not the food in it.	False	69
Soaking vegetables in water will remove all traces of dirt, fertilizer and pesticides.	False	66
Proper hand washing takes approximately 20 seconds.	True	66
The danger zone is between 40°F (4°C) and 140°F (60°C)	True	83
In a refrigerator, raw foods should be stored below ready-to- eat or cooked foods.	True	89
The most common cause of food poisoning is poor temp. control.	True	94
Sanitizing means reducing the number of harmful micro-organisms	True	94
First in first out (FIFO) is a method of stock rotation.	True	89

Only 69% of respondents knew to check the temperature of the food inside the refrigeration unit and not just rely on the built-in or hang-type thermometer. Twenty percent of respondents still think that unsafe food can be identified by the way in smells, looks or feels. Under the sanitation grouping of questions, only 66% of respondents knew that proper hand washing takes a minimum of twenty seconds, which means that

34% of CDHA foodservice employees are unaware that proper hand washing takes 20 seconds to help prevent contamination and control the spread of disease.

The differences between sites were presented in a bar graph (Figure 1) according to the percent correct responses for both the practice and knowledge scores. The percentage of correct responses for the knowledge questions among the foodservice staff of all six sites ranged from 75% to 92%. Site 1 received the highest knowledge score while site 3 received the lowest knowledge score. Similarly, the percent of correct responses for the practice questions among the foodservice staff of all six sites ranged from 77% to 95%.

Figure 1. The foodservice staff knowledge and practice questionnaire: A site comparison of the percentage of correct responses.



Site 2 received the highest practice score while site 1 received the lowest practice score.

Site 1 scored the highest in knowledge while site 3 scored the lowest in knowledge. The

higher the knowledge score does not necessarily mean higher food safety practices, as evidenced by the scores received by site 1 and site 5. This may mean that the education may not be sufficient to ensure improvements in practice. Interestingly, site 1 had the greatest difference between knowledge and practice scores, while site 4 had the smallest difference between knowledge and practice scores.

Four of the six sites scored higher in practice than they scored in knowledge, which means the employees are aware of safe food practices even though they may not be aware of the reasoning or logic behind their actions. Research shows that knowledge and practice are not always positively correlated; increased knowledge does not necessarily improve practices (Walter, Cohen & Swicker, 1997).

Of the 35 respondents, 97% had completed the provincially recognized safe food-handling course. This sample may not be representative of the foodservice employee population since those who received the course may have been more confident to complete the questionnaire, or it could mean that in part the overall workforce may be worse than the sampled ones in terms of knowledge and practice.

Differences between the average practice scores at each site were not statistically significant [$F \{5, 29\} = 1.61, p > .05$], nor were the average knowledge significantly different [$F \{5, 29\} = 2.09, p > .05$].

5.5. The Development of the HACCP Implementation Manual

Once the prerequisites and documentation records were reviewed, the development of the manual was started. The manual was compiled based on the four elements of change management.

Structure

The standard operating procedures (Appendix 7) were developed according to ServSafe® Essentials (1999), and encompassed: purchasing, receiving, storage, preparation, thawing, cooking, holding and displaying, cooling, reheating, serving, and general food safety practices such as calibrating thermometers, recording time and temperature, preventing contamination, cleaning and sanitizing, personal hygiene and proper hand washing. New time temperature forms, fridge and freezer temperature forms, receiving logs, foodborne illness forms as well as delivery rejection forms were developed (Appendix 8). Policies and procedures were reviewed and adjustments were made according to the seven principles of HACCP and the prerequisite program recommendations.

HACCP forms were also developed according to the templates that were already developed and adjustments were made following HACCP guidelines. They included refrigeration repair/ calibration log, daily fridge and freezer temperature records, daily food temperature records, interior building checklist, daily dishwasher temperature log,

daily three sink pot wash temperature log, product/delivery rejection log, and foodborne illness customer complaint log.

Technology

The recipes were collected from all sites of the CDHA, along with all original templates for recording food temperatures, as well as temperatures of the fridges and freezer units, etc. Research insists that all HACCP plans are site specific. Buchannan & Whiting (1998) stated “HACCP plans must be product, plant, and even production-line specific. Relying on generic HACCP plans is insufficient because they cannot deal with the unique characteristics of individual plants” (p.1532). For this reason, DGH was deemed the test site, as it is the largest of the facilities.

The recipes were already standardized; therefore they were adjusted to include the flow of food, critical control points and critical limits (Appendix 9). The changes were in bold print and contained temperatures in both degrees C and degrees F, along with basic standard operating procedures that are required for production. These changes were made following the National Restaurant Association (NRA) ServSafe® guidelines. This included the development of various tools, and operating methods to promote food safety awareness and increase the efficiency of food handling.

Abbreviated HACCP short systems were based on the ServSafe® Essentials (1999) guiding principles, and were developed by category (Appendix 10) rather than by recipe for convenience. It was also decided that the use of the abbreviated systems would streamline the HACCP plan. The categories encompassed soups, stocks and stews; meats; poultry and feathered game; seafood; shellfish; fruits; vegetables; stuffing and dressing; battered and breaded foods; egg and egg dishes; salads and pre-prepared cold foods; grain dishes; hot desserts; cold desserts; heated sauces and gravies; and cold sauces and dressings. Each category contained the general principles for purchasing, cooking, holding, cooling and reheating. Using this categorizing approach streamlined the HACCP program while decreasing the tedious paper trail.

The purpose of the HACCP systems are to identify the foods and procedures that are most likely to cause foodborne illness; builds in procedures that help to reduce the risk and incidence of foodborne outbreaks; and also helps in the monitoring of all procedures to ensure food safety.

Physical Setting

There were detailed prerequisite programs (Appendix 6) developed for all sites and they were adapted from KASAR CANADA LTD., NRA ServSafe®. These prerequisites are based on procedures, criteria and actions for each manger to know how and when to use the guidelines. They involved an assessment of the following areas, *personnel* involving food safety, sanitation and hygiene training; *premises* such as the outside property and

building design construction and maintenance, as well as lighting, ventilation, waste disposal and employee facilities; **equipment** including all general day to day equipment, food contact surfaces, maintenance and calibration; **transportation** such as delivery trucks, carts for meal delivery; **storage** including incoming material storage, non-food chemicals receiving and storing as well as finished product storage; **sanitation** involving the review of all cleaning and sanitation checklist and programs each facility had in place; **pest control** involving the review of maps of all traps, what chemicals are sprayed and the date, time and locations of the spraying of chemicals; and finally the **record keeping** component of each facility was explored to determine if the records accurately reflected the event, conditions and activities of each site

Each facility was examined according to the HACCP prerequisite guidelines, and all sites received recommendations (Appendix 11) as to how to improve upon the efficiency of their foodservice operation.

Personnel

Staff education and training materials (Appendix 12) were developed based on weaknesses identified through the practice and knowledge questionnaire. The training program included an overview of HACCP, a copy of terms and their appropriate definitions, personal hygiene habits, 'Do's & Don'ts' of safe food handling, a pictorial copy of the six step method for proper hand washing, temperature and thermometers checks, an explanation of the danger zone, and a pictorial overview of important

temperatures to remember, a section on to use and calibrate thermometers that included many pictures and diagrams of the important components of thermometers, and an explanation on the ice-point and boiling-point method of calibrating hand held thermometers, and a pictures of how to take temperatures of various foods and products.

The last section of the employee training material was a presentation of the various forms contained within the HACCP manual. These were included for the supervisors to review with new staff so they are comfortable using the forms during daily operations.

Overview

All tools developed were distributed to the managers of each site at a District Food Service Committee meeting. Each manager received a copy of the HACCP implementation manual which included the following sections: introduction, standard operating procedures, HACCP prerequisite programs, categorized HACCP short systems, HACCP forms and staff education guidelines based on what was identified by the foodservice questionnaire. Only the manager of the test site will receive the recipes, since they are only consistent with that site, however, all managers will get one recipe per category, along with a blank recipe, in order for each manager to put their facilities' recipes in the suggested format. There will also be an electronic file distributed to each manager containing all sections of the manual to allow the manager to adjust their components as needed in the future.

5.4. Feedback

Feedback on the HACCP implementation manual was solicited from the manager, cooks and supervisors at DGH during the course of its' development. The manager frequently reviewed the manual and made comments or suggestions for the organization of the manual. The cooks had input into the development of the HACCP recipes. The recipes were divided by category, including poultry, beef, pork, fish, entrees, desserts, salads, sandwiches and salad plates. Each cook took a section of recipes that mostly pertained to their area of expertise, meaning the baker took the dessert recipes and so on. The cooks were asked to take the recipes, read through them, and make any changes required. These changes included alterations to the serving size, serving utensils, or procedures for making the product. The recipes were then left with the supervisors who reviewed and verified the changes in the recipes, and then forwarded the recipes on to the manager, who passed them on to the researcher.

The manager and supervisors also reviewed and commented on the employee education training kit. This education tool focused on the areas identified by the foodservice questionnaire as requiring more training. Such areas included proper hand washing techniques and hygiene, temperature control and the 'danger zone,' as well as thermometer calibration.

6.0. Discussion

6.1 Impact of the Change Management Approach on HACCP Implementation

Initially it appeared that implementation based on the 7 principles of HACCP was straightforward. However, literature searches found no examples or investigations of theoretical frameworks that coincided with the HACCP principles. It was apparent that HACCP implementation was more complex, resulting in a change in the original scope of this thesis, which was to develop, implement and evaluate a HACCP program for the six sites of the CDHA based on the 7 principles. This involved conducting foodservice questionnaires, semi-structured interviews and the on-site audits of the prerequisite programs. These tools were to assess what procedures and programs were in place and to determine where the employees stood in terms of food safety knowledge and practice. This aspect of the project did not change. It was tedious and very time consuming due to the amount of travel involved, scheduling appointments with managers, and making attempts to visit the facility when the majority of staff were present yet the time of day was slow enough to meet with them, observe the food safety practices in use.

The scope of the development of the HACCP manual is where original insight fell short. It was anticipated that there would be the development of one HACCP program for all sites comprising the CRHB, now the CDHA. However, through research and practical experience, it was discovered that not only was this not feasible, it was not recommended by experts in the field because all HACCP programs should be site specific. Generic HACCP plans are insufficient because they cannot deal with the characteristics of

individual foodservice operations. HACCP plans must be product, plant, and even production line specific (Buchanan & Whiting, 1998). Two facilities may produce the same recipes and products; however, it is unlikely to expect that both operations would have the same geographical location, ingredient sources, facilities' layout, equipment and processes (Buchanan & Whiting, 1998). Not only should each HACCP food safety program be tailored to the needs of the individual foodservice establishment, but it should also fit the resources and constraints of the establishment that is planning to implement it (McSwane and Linton, 2000).

The sites of the CDHA had different recipes, different equipment and delivery methods for patient food, as well as different patient populations. Some facilities utilized space by offering a dining room food service experience to patients, whereas others used the traditional tray delivery system. Some sites were acute care while others were long-term care or continuing care. The type and amounts of equipment, storage space, facility layout and overall functioning of the foodservice operations were quite different from each other. This made it extremely difficult because not only did all sites use their own recipes unique to the facility, not all sites had standardized recipes. The menus could not be changed to one menu for the entire CDHA because the population base of each facility was inimitable. Therefore, it was impossible to standardize all recipes at all sites and then ensure that all recipes followed the HACCP flow of food.

To rectify this inadequacy, the researcher gave each site manager an electronic file of all documents used in the HACCP manual, as well as a blank copy of the HACCP recipe

format. Each manager will then be able to adopt his/her recipes to this format as required, and if recipes should change with alterations to the menu, the managers can update their files as needed. All managers were also given detailed descriptions of how their facility ranked according to the prerequisite programs, as well as what should be set-up and maintained according to the prerequisite programs. A copy of all standard operating procedures, categorized HACCP short systems, and all forms that have been developed were also provided in the HACCP implementation manual.

6.2 Effected External Changes on Project

Poor response rate for the foodservice staff questionnaire

DGH had the poorest response rate per site. This may be because the foodservice staff practice and knowledge questionnaires were given out with pay stubs during the same week the provincial budget was announced. This announcement meant the Central Region Health Board (CRHB) would amalgamate with the Nova Scotia Hospital and the QEII Health Sciences Center in Halifax to become the Capital District Health Authority (CDHA). The budget also called for a \$5 million dollar cut in services provided by the CRHB. This aspect of the budget sparked a lot of anger and frustration among all employees of CRHB. The threat of job loss with the merger became the focal point of every day conversations. The elimination of some site services which were now to be offered by one site at one designated location meant more job loss, particularly at the middle management level.

The amount of job uncertainty and job cuts meant that staff was discouraged, scared, and the employee morale was extremely low. This may reflect the low response rate for survey completion at DGH and explains why employees of the food and nutrition department at DGH were reluctant to fill out a survey that they thought would create an increase in workload.

Poor Morale

The changes announced in the provincial budget started to occur almost immediately and morale was at an all-time low. At the same time the researcher/change agent was adapting the current recipes at DGH to incorporate the HACCP guidelines and standard operating procedures. As suggested in the change management philosophy, the change agent involved the cooks in all decisions pertaining to the recipes alterations and presentation to help alleviate some of the resistance that occurs during the change process. Staff participation involved four cooks. One cook refused to participate stating that she had “too much work to do” which prevented her from sparing the time to review the purposed recipe changes. Another staff cook participated but his input is questionable due to the fact that he recently accepted a job with another department and stated he “did not care if whoever replaced him could follow the recipes.” However, there were two female cooks who reviewed the recipes, made suggestions, alterations to cooking times, pan size, product ingredients and offered valuable insight. Their input and participation meant their involvement in the development of their HACCP plan at the Dartmouth General Hospital.

Shared Services

The establishment of the Capital District Health Authority (CDHA) implies shared food services. The scope of shared food services means less production at the other sites. The usual job demands of a cook may no longer be needed every day, 12 hours a day, seven days a week, meaning a loss of jobs at other sites other than the QEII, or a redistribution of responsibilities.

The impact on food safety involves two sites. There is an increased risk of food contamination at the central production facility because the food is being mass-produced and may mean that the raw food ingredient is sitting out for a longer period of time while the food product is being produced. It is possible that cross-contamination, poor staff hygiene or improper cooking and/or cooling techniques may contaminate the food product.

The food then gets shipped to DGH. The receiving stage becomes the first control point in the flow of food at DGH. The food may already be contaminated from the other site, so to prevent the continuation of the growth of microorganisms, the hazard needs to be stopped and eliminated completely. Therefore the first critical control point (CCP) is cooking. At the cooking stage, DGH can completely eliminate the hazard that may be present in the bulk produced food product from spreading to the patients at DGH.

6.3. Prerequisite Programs - Sanitation

As habits and lifestyles change in many countries, an increasing number of people are depending on food service establishments for their meals. Although food preparation techniques, proper food handling, and recommended sanitation practices are well documented, they are not fully implemented (Cohen, Reichel, Schwartz, 2001).

The on-site audit revealed there was no verifiable sanitation program in place within the facilities of the CDHA. It is not enough for foodservice managers and supervisors to assume or even know that good food safety practices are used; there must be evidence and records that ensure correct sanitation and food handling procedures are followed (Setiabuhdi, et. al, 1997). An effective sanitation program should be based on recognized and nationally accepted guidelines for food safety. The program should contain detailed requirements for avoiding food contamination in the following areas: personnel (disease control, cleanliness, education, training); plant and ground (proper equipment storage, waste disposal); sanitary operations (maintenance cleaning and sanitizing building and fixtures); sanitary facilities (water supply, toilet facilities, hand washing facilities). It should also entail basics concepts of food sanitation, personal hygiene, foodborne illness, food contamination, food safety, and the HACCP principles (Cohen et al, 2001).

The sanitation program should be a detailed description of all equipment, including clean in place equipment housed within the foodservice facility. Most of the equipment should have manufacturer's instructions for dismantling the equipment for cleaning and how to reassemble it. If a piece of equipment does not contain such information, contact the

supplier and request it. All equipment requires clear, easy to follow instructions detailing how to clean the equipment and what to clean it with. Color-coding equipment such as cutting boards, storage boxes and lids in addition to knives, spoons, tongs and brushes can facilitate food safety and sanitation. Coding has even been extended to include shelving units and portion bags to visually demonstrate proper storage locations of particular foods to prevent cross-contamination (Norton, 2001).

The sanitation program should also include all work areas, floors, fridges, freezers, storage rooms and cupboards. All areas within the food preparation areas and areas of service need to be accounted for. Cleaning and sanitation routines will need to be incorporated directly into the job descriptions of the employees. There needs to be a daily cleaning list for food contact surfaces as well as a weekly cleaning duty list which will include areas that should be cleaned on weekends when there is less traffic and use of particular areas, rooms and equipment.

Since HACCP and sanitation have the same goal – to ensure food safety neither system by itself can be absolutely effective. Some hazards requiring control cannot be ‘sanitized away’ while other hazards cannot be ‘cooked away’ (Setiabuhdi, et. al, 1997). Although sanitation is a part of a HACCP plan, it is also a plan that must be built and planned separately. Details of a sanitation program are developed based on government regulations and uniform nationally accepted public health principles and standards (Setiabuhdi, et. al, 1997). In contrast, a HACCP system targets a hazard and controls it by proper cooking, but a HACCP system by itself is not adequate. Inadequate sanitation

can cause contamination of food materials after they pass a critical control point, and a HACCP system would be powerless to correct such a problem. Furthermore, inadequate sanitation can also cause problems that cooking is not intended to correct (Setiabuhdi, et. al, 1997).

There is a gap between the accumulated knowledge on food safety and actual implementation of food sanitation practices. Cohen et. al (2001) stated that inexperienced teenagers or foreign employees who have difficulties communicating in the local language often lack knowledge about food safety, hygiene, and sanitation practices; and even educated managers in the food service industry are often unaware of the dangers associated with improper personal hygiene and incorrect sanitation practices. Research supports the notion that training will decrease the incidents of foodborne illness caused by improper handling; however few studies testing the effectiveness of such training programs have been published (Cohen et al., 2001).

The manager and/or supervisors at DGH should teach the sanitation training, as they will be the ones responsible for monitoring the program. Oral communication and visual aids have proven to be beneficial educational devices. It is important to avoid the one-size-fits-all adage, since the needs of each workplace differs. A system of incentives may also prove beneficial in adherence to, and maintenance of, the sanitation program (Cohen, et. al, 2001).

6.4 Education and Training

The organizations that will excel in the future are those that will tap people's commitment and capacity to learn, and provide education and training for employees at all levels of the organization (Gates et. Al, 2000). Education and training is key to the successful implementation of a HACCP program (McSwane & Linton, 2000). However, training is the last step in the creation of the HACCP plan. The training program should integrate safety procedures, corrective actions and recorded keeping methods into each employee's work routines to create and maintain uniform behavior. The first step in the education process is to identify training needs (Manning, 1994). However, concern and acknowledgement of food safety issues and their relationship to the prevention of foodborne illness must precede any instruction (Unklesbay, et. al., 1998). Employees must fully appreciate what is required to assure food safety and understand why they are conducting a particular task. An explanation of HACCPs' practical objectives, with emphasis on its' nature as an approach to be initiated rather than a program to be implemented, should be introduced early in the education of employees (Ehiri & Morris, 1996). Staff must comprehend what HACCP means and then learn the skills necessary to make it function.

High turnover, limited educational backgrounds and language barriers often combine to complicate food safety training objectives. At DGH, there is a lot of movement among the staff, which makes training a lost financial investment if the staff is relocating to other

jobs, both within the organization and outside the healthcare industry. However, training is essential and must be conducted during the employees' initial stages employment.

Instead of focusing on theory, focusing on behavior should be the fundamental basis of any HACCP training program. What foodservice employees have to know is what they need to do-everyday-to keep food safe (Hernandez, September 1999). Provincially recognized food safety handlers courses do just that. These programs focus on the day-to-day handling and preparation of food. Ninety-seven percent of CDHA employees who responded to the questionnaire had completed such a course. The 'one size fits all' approach to developing an effective education program is no longer suitable; there is definitely a need for flexible, employee-friendly and affordable methods of training (Hernandez, March 1999).

The commitment managers have to educating their staff, such as conducting regular in-services, determines the success of the HACCP program (Beasley, 1995). The success of a training program could also be measured by changes in practices as well as an increase in knowledge. Newly acquired practices could be measured against previous practices to determine that appropriate changes have been made (Walter, Cohen & Swicker, 1997). New challenges the foodservice industry may experience include keeping food safety information up-to-date and training employees to practice and maintain safe food behaviors.

Food safety procedures are not effective if the employees won't use them, or won't use them systematically. Before a HACCP plan can be considered complete, you must create a system of verification that reviews procedures daily to identify what is working well and where modifications are necessary (Hernandez, November 1999). Verification proves that we are accomplishing our food safety goals and provides extra insight into our safety measures, while records help the verification process by tracking food safety actions (Hernandez, June 1999).

Since hazards may change, new recipes may be added and different products may be introduced into a foodservice facility, it is necessary to plan to regularly evaluate monitoring charts, records and hazard analysis checklists for performance. This is precisely why each manager will receive an electronic copy of all components of the HACCP implementation manual. Each manager can then update the HACCP recipes, systems and record keeping tools to directly reflect the occurrences in their foodservice establishment.

The prevention, monitoring and documentation at the root of a HACCP program are exactly what the foodservice establishment must incorporate to mitigate the circumstances that can lead to a foodborne illness accident in the operation (Hernandez, October 1999). Specify who should perform what documentation, when it should be performed, and how (Hernandez, November 1999). Employee empowerment may be the strongest link in the development of an effective documentation scheme, as they are ultimately the ones who will be involved. Providing the cooks with the opportunity to

participate in the recipe development created a sense of pride and ownership. Employees are the key to the every day functioning of the foodservice operation, and often have insight and clarification that may be overlooked by management. A total food safety system is one that has been tested with employees and proven effective in preventing foodborne illness.

6.5 The Relevance of Change Management Approach to HACCP Implementation

Over the past ten years there has been major changes in the health care system, including such significant changes as the flattening or redeployment of the organizational structure and reductions in staff (Gates, Rimmel, Adamson, & Hutt, 2000). The foodservice industry has not escaped unscathed. A survey of hospital executives indicated that approximately 70% expect to reduce services, which will include food and nutrition services (Silverman, Gregoire, Lafferty, & Dowling, 2000).

Foodservice directors expect to serve meals to fewer inpatients, employ less staff, have smaller expense budgets, and generate more revenue in the future (Silverman et. al., 2000). Accompanying these changes is the reduction in middle management and supervisors, meaning that foodservice workers must work more independently at a time when resources are limited and the workload increased (Gates et. al., 2000).

Change management incorporates both business and human needs; it is a holistic and integrated model of organization (Farias & Johnson, 2000). The change management

approach to developing a HACCP implementation manual is a more effective model as it explores both the components of a HACCP program and all areas of a foodservice operation that may otherwise be overlooked. Approaching HACCP through the action research perspective allows for the diagnosis of structure, technology, physical setting and personnel, which are all essential elements in a HACCP program.

Following the seven principles of HACCP, as identified by both the NACMCF (1999), and the USA National Food Safety Initiative (1999) omits crucial steps in the development and transition process. The seven principles involve conducting a hazard analysis; determining the critical control points; establishing critical limits; establishing monitoring procedures; establishing corrective actions; establishing verification procedures; and establishing record-keeping and documentation procedures. However, these steps are simply not enough as they neglect the impact on employees, and do not provide an avenue for employee participation and involvement. Traditional approaches to ensure food safety have significant limitations; therefore intensified efforts need to be made to implement HACCP in the foodservice industry (Bryan, November 1990).

Internally, change can have a substantial impact on the staff because often times the staff members who carry out the organizational tasks do so without proper preparation and without previous experience (Schharitzer & Korunka, 2000). These newly introduced structures and processes may cause feelings of inadequacy, fear of failure, fear of the unknown and lack of understanding which all may lead to increased stress experienced by the employee. Participatory involvement requiring more formal information on behalf

of the management and staff, along with commitment to one's job, is essential to adapting to changes in the work place, particularly in the context of organizational change (Shatenstein, Ska, & Ferland, 2001).

When DGH employees are participating in the change or implementation of the HACCP program, the encountered resistance may be reduced because the employees have a sense of self-satisfaction and are proud of their accomplishments. The source of the resistance often lies in misinformation or poor communication therefore; keeping open lines of communication may help employees understand the logic behind the change. Offering employee counseling, therapy, new-skills training or a leave of absence may help alleviate stress and anxiety, while education and training can reduce the amount of resistance encountered. Maintaining open communication may be achieved through one-to-one or group discussions, town-hall type meetings, group presentations, memos, e-mail and reports.

7.0 Recommendations and Conclusions

All sites within the CDHA need to focus on developing and/or strengthening their prerequisite programs. These programs are the fundamental underpinnings of an effective HACCP program; they are the universal steps that control the operational condition within the food establishment, allowing for an environment that is favorable to the delivery of safe food products (KASAR CANADA LTD, 1998).

Following the 7 steps of HACCP is not enough to implement HACCP in an institutional foodservice establishment, it omits crucial steps in the development and transition process, neglects the impact a change such as HACCP has on the employees and does not provide the employees with an avenue for participation and involvement. There is a need for a larger, encompassing approach that focuses on organizational change and embraces the components of change management: structure, technology, physical setting & personnel.

Change management incorporates both business and human needs; it is a holistic and integrated model of organization (Farias & Johnson, 2000 & Worren, Ruddle & Moore, 1999). This approach to developing a HACCP implementation manual is a more effective model as it explores both the components of a HACCP program and all areas of a foodservice operation that may otherwise be overlooked. However, changes need to be managed in order to derive maximum benefit from new opportunities and to avoid reactive situations. The faster the speed of change, the more difficult and stressful it is to

manage (Edwards & Walton, 2001). Therefore, it is important to implement one aspect of the HACCP program at a time to ease the transition.

Adult learners need to feel that their experience is respected and that the learning is meaningful to real-life problems. Stressing the value and importance of each employees input dispels negative attitudes. While education and training opportunities can be provided, follow-up is essential to ensure that organizational directions and goals continue to be achieved (Gates et al., 2000). Education and training should begin with an explanation of its practical objectives, with emphasis on its nature as an approach to be initiated rather than a program to be implemented (Ehiri & Morris, 1996).

An atmosphere of openness, good communication, leadership and training engenders good change management. Communication, and informality minimize fear and suspicion, staff resent the sense that changes are imposed upon them and that they are powerless – they need to be involved (Gates et al., 2000). The foodservice employees involved in the implementation of the HACCP program need to understand the rationale behind decisions that are being made, even if they do not agree with them.

The scientific nature of HACCP should not be allowed to overshadow its simple practical objectives, which include the detection of potential hazards, the determination of procedures crucial to food safety, and the devising and implementation of effective preventative measures to ensure compliance with approved standards (Ehiri & Morris, 1996).

Acceptance and implementation of HACCP programs tend to be more frequent among larger food businesses (especially manufacturing and large retail outlets) than among small business and catering firms (Ehiri & Morris, 1996). Traditional approaches to ensure food safety have significant limitations therefore intensified efforts need to be made to implement HACCP in the foodservice industry (Bryon, July 1990). Therefore more emphasis should be placed on advocating HACCP to small businesses, using simple streamlined approaches (Ehiri & Morris, 1996).

“Continuing change will be the constant in the next century, there is every good reason to predict that change will continue to dominate the lives of all humanity and not least the lives and professional activities of all our future colleagues (Engel, 2000). ”

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APPENDIX 1

Manager's Semi-Structured Interview

*check boxes did not format

Central Region Health Board (CRHB) Foodservice Structured Interview

The purpose of this interview is to gather information on current food safety/sanitation practices for the development of a HACCP program for the CRHB foodservice operations.

1. How many years have you been employed in the foodservice industry?

Less than 1 year

1-5 years

6-10 years

Greater than 10 years

2. How long have you been in your current position?

Less than 1 year

1-5 years

6-10 years

Greater than 10 years

3. What type of facility does your foodservice operation serve?

Acute care hospital

Long term care facility

Nursing home

Hospital/nursing home

Other (please specify) _____

4. What type of region is your facility located in?

Urban

Rural

5. What type of foodservice system do you primarily operate?

Conventional

Cook-chill

Assembly serve

Other (please specify) _____

6. What is the number of total beds?

Less than 25

25-75

75-125

Greater than 125

7. How many managers/supervisors?

1

2

3

4

5 or more

8. **How many full-time equivalents in the foodservice department?**
 1-5
 6-10
 11-15
 16-20
 21-25
 Greater than 25
9. **How many part-time employees in the foodservice operation?**
 1-5
 6-10
 11-15
 16-20
 21-25
 Greater than 25
10. **State the number of foodservice employees currently on staff who place in each of the following categories.**
 — Definitely completed a Food Safety Course (ie.Food Safety Training Program Level 1), and have documentation in employee personnel file
 — Definitely completed a Food Safety Course (ie.Food Safety Training Program Level 1), but have no documentation in employee personnel file
 — May have completed a Food Safety Course (ie.Food Safety Training Program Level 1), but there is no documentation of this in employee personnel file
 — Definitely have not completed a Food Safety Course (ie.Food Safety Training Program Level 1)
11. **Typically how frequently are your foodservice employees retrained?**
 Every year
 Every 1-2 years
 Every 3-5 years
 Never
12. **Who conducts food safety/sanitation training?**
 Public Health Officer
 Manager/supervisor
 Other, please specify _____
13. **Does your foodservice operation keep records of the supplier for every product purchased?**
 Always
 Frequently
 Occasionally
 Never

- 14. Does your foodservice operation ever purchase products from outside the list of suppliers contained in the Metro Food Buying Contract?**

Yes
No

- 15. a) When receiving perishable stock, are temperature checks performed?**

Always
Frequently
Occasionally
Never

- b) Are there records of these temperature checks?**

Yes
No

- 16. a) Are temperature checks performed when the product is ready for service?**

Always
Frequently
Occasionally
Never

- b) Are there records of these temperature checks?**

Yes
No

- 17. a) When food is being held hot during service, are temperature checks performed?**

Always
Frequently
Occasionally
Never

- b) Are there record of these temperature checks?**

Yes
No

- 18. a) Are regular temperature checks conducted on all refrigerators and freezers?**

Yes
No

- b) How often are these temperature checks conducted?**

Twice/day
Once/day
2-3x/week
1x/week
Never

c) Are there records of these temperature checks?

Yes

No

19. a) Are regular cleanliness inspections of delivery trucks performed?

Yes

No

b) How often are these cleanliness inspections conducted?

Daily

Weekly

Biweekly

Monthly

Annually

Never

20. a) Are regular cleanliness inspections of counter tops and general work areas conducted?

Yes

No

b) How often are these cleanliness inspections conducted?

Daily

Weekly

Biweekly

Monthly

Annually

Never

c) Are these cleanliness inspections documented?

Yes

No

21. a) Who's responsibility is it to verify that the safety/quality checks are being completed?

Director/manager

Supervisor

Staff

Other (please specify) _____

b) Is this responsibility incorporated into the job description of the person responsible for doing it?

Yes

No

c) Are the verifications recorded in a timely and written manner?

Yes

No

22. All foodservice managers should have a current Food Safety/Food Handler's course.
 Strongly Agree Agree Disagree Strongly Disagree

23. All foodservice operations should educate their employees on personal hygiene, cleanliness and sanitation.

Strongly Agree Agree Disagree Strongly Disagree

24. I believe that the decisions and actions of my foodservice employees impact the organization's risk of foodborne illness, food quality and spoilage of foods.

Strongly Agree Agree Disagree Strongly Disagree

25. a) How would you rank the daily food safety and sanitation practices in your foodservice operation?

More than adequate, do not need any changes

Adequate, some changes are needed

Less than adequate, need some changes

Poor, major changes are needed

b) If you indicated that some changes are needed, please identify areas for improvement

26. What are your expectations or what would you like to see in regards to HACCP implementation at your facility?

Thank-you for your time and participation 😊

APPENDIX 2

Letter of Consent for Managers' Interview and On-Site Audit

Letter of Informed Consent to Participants of a Thesis/CRHB Regional Project

Project Title: Hazard Analysis Critical Control Points (HACCP) Program for Central Region Health Board Foodservice Operations.

The purpose of this study is to determine current Hazard Analysis Critical Control Points (HACCP) practices and knowledge of the CRHB foodservice managers/supervisors and whether there are differences in management knowledge and practice as related to foodservice type, size, and structure. It is expected that this study will make a contribution to the current understanding of HACCP in foodservice operations, specifically health care. This in turn will be beneficial for all foodservice operations in evaluating their current HACCP procedures.

I would appreciate your participation in a semi-structured interview, followed by an on-site observation of the foodservice operations within the Central Region Health Board. **Your response is on a volunteer basis and you may refuse to participate.**

Once completed this project, I will be presenting the results in my thesis document, presentation and possibly in journals. You may also request a summary of the results once we have completed the study.

This is to certify that I, _____ agree to participate in a research study conducted by Lesley Erin Corbett, Master's of Applied Human Nutrition – Dietetic Internship Optional Specialization Student at Mount Saint Vincent University.

The study and my part in the study have been defined and fully explained to me by the researcher and I fully understand them.

I understand that I am free to deny any answers to specific items or questions in the interview. I further understand that I am free to withdraw my consent and terminate my participation at any time.

I understand that any published data or answers to questions will remain confidential with regard to my identity and site unless I grant permission upon review of specific publications before presented in thesis and other publications

If you have any questions about this study you can reach Lesley Corbett at (902) 479-2428. Alternately you may direct your inquiries to my thesis advisor Professor Linda Mann at MSVU at (902) 457-6146 or Theresa Glanville, Chair of the Applied Human Nutrition Department at (902) 457- 6248.

Date

Participant's Signature

Participant's Position

Participant's Site

Lesley Corbett – MAHN Student

APPENDIX 3

On-site Prerequisite Program Audit

Prerequisite Programs

Prior to the development of facility specific HACCP Plans, it is critical that effective Prerequisite Programs have been developed, implemented, and documented. Prerequisite Programs have been defined as: universal steps or procedures that control the operational condition within a food establishment, allowing for an environment that is favorable to the delivery of safe food products.

Prerequisite Programs are:

- ❖ *Personnel*
- ❖ *Premises*
- ❖ *Transportation*
- ❖ *Storage*
- ❖ *Equipment*
- ❖ *Sanitation*
- ❖ *Pest Control*
- ❖ *Record Keeping*

Personnel – Education and training are requires elements in developing and implementing a HACCP program. Employees who are responsible for the HACCP program must be adequately trained in its principles and record keeping requirements.

ASSESSMENT CRITERIA	COMPLIANCE
1. PERSONNEL	
A). General food hygiene and training ❖ Appropriate training in personal hygiene and food safety handling techniques is provided to all food handlers prior to the beginning of their employment ❖ The training is continuously updated at regular intervals ❖ Employees wear clean clothes, hair and beard restraints ❖ Good hygienic practices observed, no eating/ drinking or smoking ❖ Personnel with infections restricted	

B). Technical training is appropriate for job tasks assigned ❖ Personnel are trained to understand the CCP for which they are responsible, the critical limits, the procedures for monitoring, corrective actions, and record keeping ❖ Personnel and supervisors responsible for the cleaning and sanitation training are appropriately trained	
2. PREMISES	COMPLIANCE
A) Outside property and building ❖ Building not located in close proximity to any environmental contaminants ❖ Roadways properly graded, compacted, dust proofed, and drained ❖ Building exterior designed, constructed and maintained to prevent entry of contaminants and pests	
B) Design, construction and maintenance ❖ Floors, walls, ceilings constructed of material that is durable, impervious, smooth, cleanable and suitable for the conditions in the area ❖ Where appropriate wall, floor and ceiling joints are sealed and angles are coved to prevent contamination and facilitate cleaning ❖ Windows sealed or equipped with close fitting screens ❖ Doors have smooth, non-absorbent surfaces and are close fitting and self closing where appropriate	
C) Lighting ❖ Lighting is appropriate such that the intended production or inspection activity can be effectively conducted ❖ Light bulbs and fixtures are made of shatter proof materials	
D) Ventilation ❖ Sufficient air exchange to prevent unacceptable accumulation of	

steam, condensation and dust	
E). Waste Disposal ❖ Containers covered, adequate number, insect and rodent proof, emptied at proper interval, clean ❖ Outside storage area clean, enclosure properly constructed ❖ Containers used for food waste are clearly identified, leak proof, and where appropriate covered ❖ Waste is removed and containers are cleaned and sanitized at an appropriate frequency to minimize contamination potentials	
F). Employee facilities ❖ Process areas are provided with adequate number of conveniently located hand washing stations with trapped waste pipes to drains ❖ Washrooms have hot and cold potable running water, soap dispensers, sanitary hand drying equipment, or supplies and a cleanable waste receptacle ❖ Hand washing notices are posted in appropriate areas ❖ Toilets are separated from and do not open directly into food processing areas	
3). EQUIPMENT	
A). General equipment ❖ Equipment is designed, constructed, and installed to be accessible for cleaning, sanitizing, maintenance and inspection	
B) Food Contact Surfaces ❖ Food contact surfaces of equipment and utensils are smooth, non-corrosive, non-absorbent, non-toxic, free from cracks or crevices and can withstand repeated cleaning and sanitation ❖ All paints, coatings, chemicals, lubricants and other materials used for food contact surfaces or equipment where there is a	

possibility of contact with foods are listed in the "Reference Listing of Accepted Construction Materials, Packaging Materials and Non Food Chemical Products"	
C). Equipment maintenance and calibration ❖ Maintenance and calibration of equipment is performed by trained personnel ❖ Maintenance records are kept, information includes identification of equipment maintenance activity, date, person, and reason for activity	
D). Calibration Records ❖ Information expected includes identification of equipment, date, person responsible, calibration results	
4). TRANSPORTATION	
❖ Delivery trucks are inspected upon receipt of goods ❖ Carriers are inspected prior to loading to ensure they are free from contamination and suitable for the transportation of food ❖ The facility has a program in place to demonstrate the adequacy of cleaning and sanitizing , and includes a cleaning schedule ❖ Carriers are loaded, arranged and unloaded in manner that prevents damage and contamination of the food ❖ Incoming materials/products are received in an area separate from storage ❖ Products requiring refrigeration are transported at 4°C or less and are appropriately monitored. Frozen products are transported at temperatures that do not permit thawing ❖ Finished products are transported under conditions to prevent microbiological, physical and chemical deterioration	
5). STORAGE	
A). Incoming Material Storage ❖ Refrigerated products are stored at 4°C or less, and frozen	

ingredients are stored at temperatures that do not permit thawing ❖ Ingredients are handled and stored in a manner to prevent damage and/or contamination	
B). Non-Food chemicals receiving and storing ❖ Chemicals are received and stored in a dry, well ventilated area ❖ Non-food chemicals are stored in appropriate areas that prevents contamination of food, food contact surfaces, or packaging materials ❖ Chemicals are stored in clean and correctly labeled containers	
C). Finished product storage ❖ Finished product is stored and handles under conditions to prevent deterioration ❖ Stock rotation is controlled to prevent deterioration that could present a health hazard ❖ Returned or defective product is clearly identified and isolated in a designated area for appropriate disposition	
6). SANITATION	
❖ The facility has a written cleaning and sanitation program for all equipment which includes: the name of responsible person, the frequency of the activity, chemicals and concentration used, temperature requirements, procedures for cleaning and sanitizing ❖ The facility has a written cleaning and sanitation program for premises, production, and storage areas, which specifies areas to be cleaned, method of cleaning, person responsible, and the frequency of the activity. ❖ The sanitation program is carried out in a manner as to not contaminate the food ❖ Effectiveness of the sanitation program is monitored and verified by routine inspection of premises and equipment ❖ The records of the sanitation activities include the date, person responsible, the findings, and the corrective action taken	

7). PEST CONTROL	
❖ There is an effective written pest control program for the premises and equipment that includes: - the name of the person at the facility responsible for pest control - the name of the pest control company - the list of chemicals used, the concentration, the location where applied, method and frequency of application - a map of trap locations ❖ Pesticides are used in accordance with the label instructions ❖ Pest control records are kept - they include results of the inspection program and the corrective action taken - records of the pest control activities - date, person responsible	
8). RECORD KEEPING	
❖ Records are legible, permanent and accurately reflect the actual event, condition or activity ❖ Errors or changes are identified in a manner such that the original record is clear ❖ Each entry on a record is made by a responsible person at the time of the event ❖	

APPENDIX 4

Foodservice Practice and Knowledge Questionnaire

Central Region Health Board (CRHB) Foodservice Employee Questionnaire***Section A***

Answer the following questions by marking the response that applies:

1. **How many years have you worked in the foodservice industry?**
 Less than 1 year
 1-5 years
 5-10 years
 Greater than 10 years
2. **How long have you been in your current position?**
 Less than 1 year
 1-5 years
 5-10 years
 Greater than 10 years
3. **Have you ever completed a Food Safety Handlers Course?**
 Yes
 No
4. **How long has it been since you last completed a Food Safety Handlers Course?**
 Never
 Less than 6 months
 6 months – 1 year
 1-3 years
 3-5 years
 Greater than 5 years

Section B

Answer the following questions by circling the response that **best** represents your food preparation practices for each of the following items:

1. **I leave frozen meat/fish/poultry in a sink full of cold water to thaw**
 Always Often Sometimes Never

- | | | | | | |
|----|--|--------|-------|-----------|-------|
| 2. | When preparing food, I check the food temperatures | Always | Often | Sometimes | Never |
| 3. | <u>I wash, rinse and sanitize</u> the cutting board between cutting meats and vegetables | Always | Often | Sometimes | Never |
| 4. | I discard food that has passed the expiration date | Always | Often | Sometimes | Never |
| 5. | During food preparation, I protect the food from glass, dirt and other physical hazards | Always | Often | Sometimes | Never |
| 6. | I serve ground meats when they are red inside or medium rare | Always | Often | Sometimes | Never |
| 7. | I ensure that leftovers are disposed of, or wrapped, dated and stored properly | Always | Often | Sometimes | Never |
| 8. | <u>I wash, rinse and sanitize</u> knives between cutting sandwiches with different fillings | Always | Often | Sometimes | Never |

Section C

Circle T for true and F for false for each of the following statements:

- | | | |
|---|---|--|
| T | F | 1. Proper hand washing takes approximately 20 seconds. |
| T | F | 2. The danger zone is between 40°F (4°C) and 140°F (60°C) and represents the range in which microorganisms grow and multiply the best. |
| T | F | 3. The most common cause of food poisoning is improper temperature control. |
| T | F | 4. Cross-contamination does not cause food poisoning. |
| T | F | 5. Washing dishes in detergent also sanitizes them. |
| T | F | 6. A turkey can be thawed at room temperature if it is left out no longer than 24 hours. |

- T F 7. Soaking vegetables in water will remove all traces of dirt, fertilizer and pesticides.**
- T F 8. Unsafe foods can always be identified by the way they look, smell and feel.**
- T F 9. Once cooked, it is not necessary to reheat food thoroughly because most of the bacteria have been killed.**
- T F 10. When a refrigerator has a built-in or hang type thermometer, you only need to check the temperature of the unit, not the food stored in it.**
- T F 11. To check the temperature of a large roast, you should place the thermometer near the visible end of the bone.**
- T F 12. In a refrigerator, raw foods should be stored below ready-to- eat or cooked foods.**
- T F 13. Sanitizing means reducing the number of harmful micro-organisms by using very hot water or a sanitizing solution.**
- T F 14. It is not necessary to thoroughly rinse utensils before putting them in the sanitizer.**
- T F 15. First in first out (FIFO) is a method of stock rotation.**

Thank-you for your time and participation 😊

APPENDIX 5

Letter of Informed Consent for Foodservice Staff

Dear Employees;

I would appreciate your participation in a questionnaire of the foodservice operations within the Central Region Health Board (CRHB). Your valuable participation involves completion of the enclosed survey. **Your response is on a volunteer basis and you may refuse to participate.**

The purpose of this study is to determine current food safety/sanitation knowledge and practice of the CRHB foodservice workers. It is expected that this study will make a contribution to the development of an effective Hazard Analysis Critical Control Point (HACCP) program, including training within the CRHB.

To maintain your anonymity, the questionnaires are not identified by name. This will ensure personal confidentiality. They are coded by site so that I can determine if there has been a representative response from all CRHB sites.

Once completed this project, I will be presenting the results in my thesis document and presentation and possibly in journals. You may also request a summary of the results once we have completed the study.

When you have completed all the questions, please return the questionnaire in the blank envelope provided. You may detach this page from the rest of the survey to keep for your own personal records.

If you have any questions about this study you can reach Lesley Corbett at 479-2428. Alternately you may direct your inquiries to my thesis advisor professor Linda Mann at MSVU at 457-6146 or Theresa Glanville Chair of the Applied Human Nutrition Department at (902) 457- 6248. Thank you for your participation.

Yours truly,

Lesley Corbett
Masters of Applied Human Nutrition

APPENDIX 6

STANDARD OPERATING PROCEDURES

Adopted from the Servsafe® Training's A Practical Approach to HACCP Course Book
The Educational Foundation of the National Restaurant Association

Purchasing

This area covers everything from raw materials to subcontractors. Written and agreed specifications should include food safety considerations. Control of subcontractors should be managed through assessment and records retained. This will include calibration, process equipment servicing, hygiene, and pest control (Mortimore and Wallace, 1998).

Suppliers should be assessed on the basis of risk to ensure their ability to deliver to the specified requirements. In the case of suppliers of 'high-risk' or 'potentially hazardous materials', this will include the audit of the supplier's premises (Mortimore and Wallace, 1998).

Suppliers

Choose reputable and reliable suppliers whose products and practices meet federal and provincial standards. Select suppliers who:

- ✓ Use adequately refrigerated delivery trucks
- ✓ Train their employees in food safety practices
- ✓ Use protective, leak-proof, durable packaging
- ✓ Adjust delivery schedules to meet your needs so your products do not arrive during busy work times
- ✓ Cooperate with your employees to inspect products when they are delivered
- ✓ Allow you to inspect their delivery vehicles and production facilities

Purchasing

Meat

Foodservice operations are required to purchase meat that has been federally or provincially inspected. Ask your supplier for written proof of government-inspected meat.

Poultry

Only accept poultry that carries a Grade A or Utility quality inspection stamp on the carcass, parts, or packaging. Suppliers need to be federally or provincially inspected, ask your supplier for written proof of government-inspected poultry.

Fish and Seafood

Shellfish must only be purchased from suppliers who are federally inspected. Shellfish is not required to be inspected if still inside their shell, therefore it is essential to purchase shellfish from reputable and certified suppliers. Shell stock identification tags for clams, mussels, and oysters must be kept on file for 90 days after receipt of delivery. Ask your supplier for written proof of government-inspected fish and seafood.

Eggs and Egg Products

Eggs should be purchased from inspected and approved processing plants. The shield on egg cartons indicates that federal regulations are enforced to maintain quality and reduce contamination. The quality of the eggs should be grade AA or A. Ask your supplier for written proof of government-inspected eggs and egg products.

Purchasing Continued

Dairy Foods

Only buy pasteurized milk and cheeses from approved and inspected suppliers that comply with the Natural Food Commission. Reject any milk if it is delivered past its expiration date. You may also decide to reject a shipment if a short shelf life remains that does not allow for an acceptable usage time. All milk products, such as cream, dried milk, cottage cheese, soft cheese, and cream cheese, must also be made from pasteurized milk. Dairy products should not have a sour or moldy taste, visible moulds, or specks, or a strange color or texture. Ask your supplier for written proof of government-inspected dairy foods.

APPENDIX 7
HACCP FORMS

**WHAT TO ASK WHEN YOU RECEIVE A CUSTOMER COMPLAINT ABOUT
FOODBORNE ILLNESS**

When speaking with an ill customer ask the following questions to ensure all the necessary information is collected for a full investigation:

1). NAME: _____

2). ADDRESS: _____

3). PHONE #: (____) _____

4). WHAT DO YOU THINK MADE YOU SICK?

5). WHAT DATE/TIME WAS THE FOOD ITEM SERVED?

6). WHAT DATE/TIME WAS THE FOOD ITEM EATEN?

7). DID YOU EAT IN? _____ OR TAKE OUT? _____

8). HOW MANY PEOPLE IN YOUR GROUP? _____

9). DID ANYONE ELSE IN YOUR GROUP BECOME ILL? _____

10). IF YES, WHAT ARE THEIR NAMES: _____

11). LIST ALL OF THE FOOD EATEN DURING THIS VISIT INCLUDING THE
FOOD ITEM YOU SUSPECT MADE YOU ILL. _____

12). WHAT TYPES OF SYMPTOMS DID YOU EXPERIENCE? _____

13). WHAT TIME DID YOU BEGIN TO FEEL THESE SYMPTOMS? _____

14). DID YOU RECEIVE ANY MEDICAL ATTENTION AS A RESULT OF THIS
EVENT: _____

15). WHAT WAS THE NAME OF THE ATTENDING PHYSICIAN? _____

16). AT WHAT PHONE NUMBER CAN YOUR PHYSICIAN BE REACHED? _____

17). WHAT WAS THE NAME OF THE HOSPITAL YOU ATTENDED? _____

18). WAS YOUR ILLNESS A CONFIRMED CASE OF FOODBORNE ILLNESS? _____

19). WHAT WAS THE NAME OF THE FOODBORNE AGENT (i.e. Salmonella)
THAT CAUSED YOU TO BECOME ILL? _____

Once you have obtained this information, you should contact you manger and/or director.
Contact the local department of health, and check all temperature logs/cold storage units in the
department.

Signature/date of person who took the complaint: _____

REJECTING A PRODUCT

**WHEN REJECTING A DELIVERY ITEM RECORD THE FOLLOWING
INFORMATION:**

1). DATE OF DELIVERY: _____

2). TIME OF DELIVERY: _____

3). NAME OF SUPPLIER: _____

4). WAS THE SUPPLIER NOTIFIED DURING THE RECEIVING STAGE OR
AFTER THE DELIVERY WAS COMPLETE? _____

5). WAS THE PRODUCT RETURNED TO THE SUPPLIER? _____

6). WHAT IS THE REASON FOR RETURNING THE PRODUCT? _____

**If you are unable to send the rejected item wit the delivery person, keep
the rejected product. Do not throw it away.**

Signature: _____

Date: _____

APPENDIX 8 – Sample Recipes

Recipe Name: Roast Beef Standardized Date: August 1999
 Recipe Yield: 45 servings Portion Size: 90 g (3 oz)
 Serving Utensil: Tongs Serving Equal to: 3 Protein
 Not Appropriate for the Following Diet Types: **No Red Meat**

Ingredients	Weight/Imperial Measure	Metric Measures
Beef insides, boneless, raw	20-24 lbs	9-11 Kg
Water	4.28 quart	4 L

Preparing

Preheat oven to 350°F (166°C)

Place thawed meat in roasting pan and pour water over meat

Cooking

Bake at 300°F (140°C) to 325°F (154°C) approximately 7 hours, until internal temperature reached 170°F (80°C). Cover with foil when half cooked to prevent drying.

CCP

Cook beef until a final internal product temperature of **165°F (73.9°C)** or higher is reached for at least 15 seconds.

Cooling

Remove from oven. Cut in half width wise. Place in jello pan. Cool in refrigerator uncovered. Wrap and date when completely cooled.

CCP

Cool meat from **140°F (60°C) to 70°F (21.1°C) within 2 hours and from 70°F (21.1°C) to 40°F (4.4°C) within an additional 4 hours**—for a total cooling time of 6 hours. Store in a refrigerated unit at an internal product temperature of **40°F (4.4°C) or lower.**

Preparing for Service

On day of use, prepare for slicing by removing excess fat and waste. Slice against the grain on # 30-35 setting on meat slicer (90g slices).

Place in solid jello pan. Cover with broth (2L (2.14 qt) water + 1 c (250 ml) beef broth) and place in steam line.

Serving and Holding**CCP**

Hold meat at 140°F (60°C) or higher for service. Do not mix new product with old.

Standard Operating Procedures: Measure all internal product temperatures with a clean and sanitized thermometer. Properly wash hands and exposed parts of arms before handling food, after handling raw food, and after any interruption that might contaminate hands. Wash, rinse, and sanitize all equipment and utensils before and after use. Return all ingredients to refrigerated storage if preparation is interrupted.

Recipe Name: Meatloaf

Standardized Date: March 1995

Recipe Yield: 48 orders/ 7 loaves

Portion Size: 1 1/4" slice = 90g

Serving Utensil: Tongs

Serving Equal to: 3 protein

Not Appropriate for the Following Diet Types: Allergy to Gluten or eggs

Ingredients	Weight/Imperial Measure	Metric Measures
Medium carrots	2 cups	500 ml
Celery	1 cup	250 ml
Onion powder	1 Tbsp	15 ml
Salt Free Beef Broth	1 quart	1 Liter
Bread Crumbs	3 quarts	3 Liter
Parsley	3 Tbsp	45 ml
Eggs Beaten	6	6
Salt	1 tsp	5 ml
Ground Beef	8 lbs	3.6 Kg

Preparing

Place carrots and celery in food processor and finely mince

Combine all ingredients and mix thoroughly

Place in 10 X 6 loaf tins

Cooking

Bake at 300°F (140°C) to 325°F (154°C) oven for ~ 50 minutes

CCP

Cook ingredients until a final internal product temperature of 165°F (73.9°C) or higher is reached for at least 15 seconds.

Preparing for Service

Remove from oven and place meatloaf on a cookie sheet lined with parchment paper and a grate.

Cooling

Place meatloaf in fridge uncovered

CCP

Cool from 140°F (60°C) to 70°F (21.1°C) within 2 hours. Store in a refrigerated unit at an internal product temperature of 40°F (4.4°C) or lower.

Reheating

CCP

Reheat meatloaf to an internal product temperature of 165°F (73.9°C) or higher for at least seconds within 2 hours.

Serving and Holding

CCP

Hold meatloaf at 140°F (60°C) or higher.

Standard Operating Procedures: Measure all internal product temperatures with a clean and sanitized thermometer. Properly wash hands and exposed parts of arms before handling food, after handling raw food, and after any interruption that might contaminate hands. Wash, rinse, and sanitize all equipment and utensils before and after use. Return all ingredients to refrigerated storage if preparation is interrupted.

APPENDIX 9

SOUPS, STOCKS & STEWS	CCP	Critical Limits	Monitoring	Corrective Action
Purchasing	CP	Purchase only pasteurized milk products. Purchase all meat, fish and poultry from reputable suppliers.	Check supplier's proof of regulation.	If a supplier can not prove they are regulated-choose a more reputable supplier
Cooking	CCP	Cook all hot soups and stews to at least recommended internal product temperatures.	Measure temperatures.	Reheat one time to 73.9°C (165°F) or higher for at least 15 seconds within 2 hours, if product has been held less than 2 hours. If temperature is below 60°C (140°F) longer than 2 hours, discard product. Never mix new product with old.
Holding	CCP	Hold for service at 60°C (140°F) or higher.	Measure temperatures.	If product has not cooled to 21.1°C (70°F) or lower within 2 hours, reheat to 73.9°C (165°F) or higher for at least 15 seconds within 2 hours. Discard product that does not cool to 4.4°C (40°F) within 6 hours.
Cooling	CCP	Cool soups and stews from 60°C (140°F) to 21.1°C (70°F) within 2 hours and from 21.1°C (70°F) to 4.4°C (40°F) within an additional 4 hours – for a total cooling time of 6 hours.	Measure temperatures. Thin soups should be cooled in 3" pans, while thicker stews and soups should be cooled in 2" pans.	Continue heating to 73.9°C (165°F) or higher.
Reheating	CCP	Reheat soups and stews to 73.9°C (165°F) or higher for at least 15 seconds within 2 hours.	Measure temperatures.	If temperature is not reached for at least 15 seconds within 2 hours, discard product.

APPENDIX 10

SAMPLE EMPLOYEE EDUCATION & TRAINING

Good Personal Hygiene Habits

- Bathe daily with soap and water
- Use deodorant
- Keep fingernails clean, short and well trimmed. Do not use fake nails or polish.
- Wear an appropriate hairstyle and restrain hair properly.
- Wear clean clothing on the job. Do not wear your uniform to and from work. Wear your street clothes to and from work and change into your uniform in the assigned locker-room.
- Use clean, protective clothing, such as an apron, whenever necessary.
- Never use your apron as a hand towel.
- Limit jewelry to ring and small earrings only; better yet, wear none.
- Cover cuts or sores with a water-resistant bandage, and change bandages often.
- Wear plastic gloves if the cut or sore is on your hand.
- Do not come to work if you are ill. Stay home if you have a fever, diarrhea, vomiting or if you are sneezing and coughing.

When Handling food, DO:

- ❖ Wear plastic gloves when preparing ready to eat foods.
- ❖ Change gloves every time you change a preparation job.
- ❖ Wash hands and change gloves after any action that might contaminate foods, such as coughing, handling raw meat or poultry, picking up objects from the floor, or putting out trash.

When Handling Food, DO NOT:

- ❖ Sneeze or cough.
 - ❖ Scratch or touch your head, hair, skin, eyes or mouth.
 - ❖ Drip sweat onto equipment, food or food contact surfaces.
 - ❖ Wipe sweat with your hands, or cloths that are used on food contact surfaces.
 - ❖ Wear gloves away from the food preparation area.
 - ❖ Engage in activities such as smoking, eating, or chewing gum, which can result in hand-to-mouth contact.
- If a sneeze or cough is unavoidable, use a disposable tissue, and wash your hands.
 - When a cough is unavoidable and you do not have access to a tissue, cover your mouth and nose with your upper arm or shoulder -never with your hands.