Chapter 25

Prevention of Healthcare-associated Food Borne Illnesses

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Key Points

- Food-associated outbreaks of gastrointestinal infections continue to occur in health care settings, especially in developing countries.
- The concepts of food hygiene are similar to those used in other areas of infection prevention and control.
- Control of microbiological hazards in food production is strongly reliant on effective temperature control.
- Inspection and auditing often reveal deficiencies in catering practices and allow corrective action to be taken.
- A Hazard Analysis Critical Control Points system should be the cornerstone of any food production process, especially in kitchens serving healthcare institutions.
- Routine testing of food handlers' faeces, blood, or rectal swabs is neither cost-effective nor normally indicated.

Prevention of Food-borne Illnesses

The burden of food-borne illness in low resource countries is well documented. Intestinal diseases are prevalent in the community and transmission within healthcare facilities is common.

The prevalence of healthcare-associated (HA) food-borne illness in developing countries varies; rates of HA Salmonella and Shigella infections reaching 3% and 2.5% respectively have been reported. Fewer HA food-borne illnesses occur in developed countries. Nevertheless, more than 200 outbreaks of Salmonella were documented in United Kingdom hospitals over a 10-year study period. Other microbes that can cause food-related illness include hepatitis A, Campylobacter, and Yersinia.

The role of infection prevention and control (IPC) Teams (ICT) in promoting safe food hygiene practices depends on the type of catering used and the presence or absence of other stakeholders, such as catering managers and/or environmental health officers. When the facility out-sources catering, the role of ICTs may be limited to ensuring a due diligence approach through supervision of food distribution, as well as inspections and audits of the suppliers' kitchen premises. If food is prepared in the facility, the ICTs may need to provide a more significant contribution. Therefore, ICTs need to have a clear understanding of effective food hygiene.

Food Hygiene[1]

Food pathogens will survive, and may multiply, if food is left within the temperature danger zone (5° C to 60°C). Control of microbiological hazards during food production is strongly dependant on effective temperature control.

Cold food must be served as soon as possible after removal from refrigeration. Heating food to achieve 75°C in its thickest part for 1-2 minutes will guarantee destruction of any biological hazards. When food is cooked and then cooled, cooling must be rapid; then the food should be held at temperatures that prevent microbial growth. Temperature control should be maintained until food is served.

Keeping hot food at an appropriate temperature is particularly important in systems where food is prepared in the kitchen and transported hot to be served without further re-heating. These systems are particularly risky and ICTs must pay special attention to ensuring that hot holding temperatures are maintained above 63°C.

The common causes of food-borne illness are:

- Preparing food more than a half day in advance of needs.
- Storage at room temperature.
- Inadequate cooling.
- Inadequate reheating.
- Undercooking.
- Cross contamination from raw to cooked food.
- Contamination from food handlers.

The concepts of food hygiene are similar to those used in other areas of IPC. ICTs are therefore ideal candidates to spearhead food hygiene training. Numerous tools are available, both on the Internet and in print, to aid development of effective programmes. The importance of preventing conditions for temperature and time to allow bacteria to reach infecting doses in food must be stressed. Effective personal and environmental hygiene and potential sources of contamination should also be part of any food hygiene training program.[2-3]

Hazard Analysis Critical Control Points[4]

Hazard Analysis Critical Control Points (HACCP) was pioneered in the 1960s within the United States' National Aeronautics and Space Administration program; it is incorporated into legislation on food safety both in the United States and the European Union. HACCP analyses the food production process to determine possible microbiological, physical, or chemical hazards that may contaminate food as it is produced. Critical control points (steps in the process after which any contamination cannot be reversed) are identified. Preventive interventions are devised which are then monitored and corrected if any unacceptable deviation takes place. HACCP systems need to be recorded, audited, and verified routinely.

HACCP systems provide significant improvement in the quality and the safety of food. A successful HACCP system consists of a number of good hygiene practices, including regular equipment cleaning and maintenance, provision of effective hygiene facilities, systems to control insects and other pests, and regular training for staff on food hygiene.

A HACCP food safety management system analyses and controls the food production process from biological, chemical, and physical hazards. HACCP incorporates all steps involved in the preparation of a food item, from procurement of raw materials, to the handling, manufacturing, and distribution of the finished product. (See Table 25.1)

HACCP, as a food safety management system, requires a great deal of commitment, especially from management and administration. Furthermore, a successful HACCP system must be preceded by a sound basis of education and specific training of management and employees, each in their particular role in food production. Sufficient amount of time, materials, and equipment must be allocated for such training since it makes up an important pre-requisite to the HACCP system.

Pre-requisite programmes

An effective HACCP system requires a good foundation of pre-requisite programmes. Pre-requisite programmes are procedures which generally address operational and environmental conditions together with Good Manufacturing Practice (GMP) that are essential for the production of safe products.

Pre-requisite programmes are to be managed separately from the HACCP plan, yet need to be documented and frequently audited. Typical examples of pre-requisite programmes include:

- Facility - The establishment should be located, constructed, and maintained permitting good sanitary design principles. There should be linear production flow from raw to cooked in order to minimise any risk of cross-contamination.
- Supplier Control – the company needs to ensure that its suppliers can document that they follow an effective food safety programme.
- Cleaning and Sanitation – a cleaning and sanitation schedule should be in place within the company, which is both practical, efficient, and validated.
- Personal health and hygiene – a written set of standard operational procedures should be implemented for all employees to follow, including personal protective clothing and hand hygiene.
    - ◊ Similar principles of hand hygiene apply to food handling as those in clinical practice.

- ◊ In this instance, the emphasis is on washing rather than using hand rub due to the risk of some degree of soiling with dirt, food, or other organic material.
- ◊ All hand hygiene products should be certified to be food safe.
- ◊ Hands should always be washed before handling or preparing food that is cooked or ready to eat.
- ◊ In addition, no food handler should be allowed to work if suffering from an infectious diseases or showing symptoms of diarrhoea, vomiting, or skin lesions.

- Training – each employee should have documented training that covers his or her role in food production, as well as all other components of food safety. These include personal hygiene, cleaning and sanitation, hand hygiene, and GMP.
- Pest control – a regular and effective pest control programme needs to be in place and documented by the company.

Preliminary Tasks in the Development of HACCP

1) Assemble the HACCP Team

Before starting the HACCP plans, a HACCP team needs to be set up. This team will be responsible for developing the HACCP plan; it needs to be made up of individuals with adequate expertise on the product and its process. The team could include individuals from areas such as engineering, production, quality assurance, and microbiology.

2) Description of Food

A general description of the food, its ingredients, the processing involved, and the expected/ intended consumer needs are to be highlighted by the HACCP Team.

3) Compile a Flow Diagram

A flow diagram is a schematic representation of the processes involved in order to manufacture a specific type of food item. Its purpose is to provide a simple, clear outline of the process, yet cover all steps. Once compiled, the flow diagram needs to be verified on-site, by the HACCP team, in order to determine its accuracy and completeness.

The Seven Principles of HACCP

1 – Conduct a Hazard Analysis

The aim of this step is to develop a list of hazards which can potentially cause a substantial type of injury or illness unless controlled. Each step in the flow diagram needs to be analysed for any biological, chemical, or physical hazard.

Once the hazard analysis is completed, each hazard for each step in the food process should be listed along with any measures that are used to control the hazards. Not all hazards can be prevented, however all can be controlled. More than one control measure may be required for some hazards.

2 – Determine Critical Control Points (CCP)

A critical control point is defined as a step where a specific control can be applied and which consequently prevents or eliminates a food safety hazard and/or reduce it to an acceptable level. A CCP decision tree is used in order to simplify the decision and identification of each CCP.

A CCP is required at any step where a hazard can be prevented, eliminated, or reduced to acceptable levels. Examples of such CCPs include, but are not limited to thermal processing, chilling, disinfection, and

re-heating.

3 – Establish Critical Limits

A critical limit is a maximum and/or minimum value which a hazard must be controlled at a CCP to prevent, eliminate, or reduce to an acceptable level the occurrence of a food safety hazard. A critical limit is thus used to differentiate between safe and unsafe process operating conditions.

Each CCP needs to carry at least one critical limit. Examples of critical limits include factors such as temperature, time, water activity (aw), pH, salt concentration, and available chlorine.

4 – Establish Monitoring Procedures

Each CCP needs to be kept under control and must be monitored to ensure such. Monitoring serves three main purposes.

1) Monitoring is used to identify a deviation in a CCP and thus the critical limit is not being reached.
2) Monitoring also serves as written documentation for verification purposes.
3) Monitoring needs to be continuous and real-time; monitoring is to be recorded on specific monitoring sheets which are to be completed, including the date, time, and initials of the person performing the monitoring.

5 – Establish Corrective Actions

If and when a critical limit to a particular CCP is not reached, for whatever reason, corrective action needs to be applied to counteract it.

6 – Establish Verification Procedures

Verification procedures determine the usefulness of the whole HACCP plan and that the system is operating as required. These need to be performed and documented by the HACCP team. Microbiological analysis of food products could be utilised as a verification measure. Should a negative verification occur, the HACCP plan needs to be reviewed by the HACCP team.

7 – Establish Record Keeping

An effective HACCP plan mandates effective and comprehensive documentation. Records need to be maintained to cover the whole HACCP plan. Examples of records necessary include: a list of CCPs and the respective control measures and critical limits; corrective actions; verification procedures; and validation schedules.

Testing of food, environment, and individuals

Food and environmental testing in the microbiology laboratory is expensive and labour intensive. It is not a requirement to monitor food safety through routine laboratory testing; a complete and functional HACCP system is more than sufficient.

Nevertheless, there are occasions when food and environmental testing is useful. It can provide confirmation of microbiological quality and safety. One useful spin-off is the impact such tests often have on food handlers, who can see visual evidence of the theoretical principles they had been taught.

A simple method of quality control that can be performed in all laboratories and is quite cost-effective is semi-quantitative testing of environmental swabs taken from the production area. Routine testing for pathogens is of little benefit; it is more cost effective to perform counts of indicator microorganisms, especially *E. coli*, to identify poor hygienic food production practices.

Routine testing of food handlers' faeces, blood, or rectal swabs is neither cost-effective nor generally indicated. An individual who screens negative may later become a carrier. More worryingly, a negative screen may induce a false sense of security and result in negligence toward general and personal hygiene practices. It is much more beneficial that any money earmarked for food handler testing be invested in better training of food handling personnel.

Ward kitchens

Ward kitchens should be kept clean. Refrigerators should be sited away from direct heat or sunlight and have a temperature monitoring device to document the internal temperature at least once daily. If at any time the refrigerator temperatures fall out of appropriate range, the corrective action to fix the problem should be well documented and a decision as to whether the food should be discarded be made and documented.

All items should be labelled, dated, and used within 72 hours. Any items that are not labelled, out-dated, or left exposed or unwrapped should be discarded. Attention should be given to separation between raw and cooked items; cooked items always being placed above raw items if in the same refrigerator.

Food Service Audits

Food service practices should be established and include checklists for every day documentation of critical points. Additional inspection and auditing of kitchen practices can identify any deficiencies in catering practices and allow corrective action to be taken in a timely manner.

When undertaking an audit, particularly for the first time, ICTs should work with the food service team to develop critical checklists and use them to audit practice. The audit should include points related to common causes of foodborne illness.

Particular attention should be given to evidence of prolonged exposure of food to warm temperatures. Other critical factors include:

- Cross-contamination arising from lack of compliance with hygiene practices for hand or equipment cleaning;
- Undercooking of high-risk meat products such as poultry; and
- Cross-contamination between raw and cooked items.

If an audit is likely to be repeated regularly, an itemised audit sheet should be prepared including all the different areas in the kitchen being reviewed. In this way it is easier to achieve standardisation and reproducibility from one audit to the next and variations with time are more easily identified.

Table 25.1. Adapting HACCP to health care food production

Step in Process	Hazard	CCP
Receipt of food	Ready to eat foods contaminated with food poisoning bacteria or toxins.	Visual and temperature checks on food received. Accept frozen foods at <-18°C and chilled foods at <4°C.
Storage	Growth of food poisoning bacteria, toxins on high-risk (ready to eat) foods. Further contamination.	High-risk perishable foods stored covered and dated at safe temperatures. Rotate stock and use by recommended date. Ensure a pest free environment.
Preparation	Contamination of high-risk (ready to eat) foods. Growth of pathogenic bacteria.	Limit exposure to ambient temperatures during preparation. Prepare with clean equipment used for high-risk (ready to eat) foods only. Separate cooked and raw foods. Wash hands before handling food.
Cooking	Survival of pathogenic bacteria.	Thaw frozen items completely at temperatures <15°C. Cook food (especially chicken and minced meats) to at least 75°C in thickest part for two minutes.
Cooling	Contamination. Growth of pathogens. Toxin production.	Cool foods as quickly as possible. Chill rapidly and refrigerate within 90 minutes. Do not leave out at room temperature to cool.
Chilled storage	Growth of pathogenic bacteria.	Temperature control. Date code high-risk (ready to eat) foods. Check on a periodic basis for expiration dates. Store food at least 6 inches above the floor and away from the wall. Use in rotation and always within shelf life. Consume within three days of cooking.
Hot holding Distribution	Growth of pathogenic bacteria. Toxin production.	Keep food hot at >63°C.
Reheating	Survival of pathogenic bacteria.	Avoid if possible. Reheat to >75°C.
Serving	Growth of pathogens. Toxin production. Contamination.	Serve cold high-risk foods as soon as possible after removing from refrigerated storage. Serve hot foods quickly. Ensure hands and equipment used to serve food are clean.

Summary

High standards of food hygiene must be maintained in food preparation, especially in healthcare settings. The most effective way in which this can be achieved is through the implementation of a comprehensive and robust HACCP system supported by good principles of food hygiene and underpinned by robust monitoring and documentation.

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