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Significance of HACCP and SSOP in Food Processing Establishments

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Abstract: This critical review article aimed to discuss about HACCP in particular with due emphasis to its principles and advantages of implantation HACCP in food establishments. As well known fact, food borne diseases remain one of the most widespread public health problems in the contemporary world and an important cause of reduced economic productivity, despite progress in food science and technologies. Hazard analysis and critical control points (HACCP) have become an obligation worldwide in many countries with advanced food industries. HACCP it is systematic method of identifying, assessing and controlling of hazards throughout the whole food chain, which are significant for food safety. In addition, the application of HACCP systems can aid inspection by regulatory authorities and promote international trade by increasing confidence in food safety. A successful HACCP system is not achievable without well-conceived, well-written and properly implemented Standard Operating Procedures (SOPs). Sanitation Standard Operating Procedures are necessary to ensure sanitary conditions in food plants. They should be written in a useable, step-by-step format for cleaning and sanitizing to prevent product adulteration and they must be monitored and documented. Valid SOPs are important to ensure that sanitation programs in a food handling facility are effective. The use of SOPs is an excellent way to demonstrate proficiency of tasks or functions such as a process controls, daily sanitation or sanitation system. Public-private partnership can also be considered for its effective implementation.

Key words: Food Born Disease · Food Safety · Hazard Analysis Critical Control Point · Standard Operating Procedures

INTRODUCTION

People have the right to expect the food they eat to be safe and suitable for consumption. Food borne illness and food borne injury are at best unpleasant; at worst, they can be fatal. Effective hygiene control, therefore, is vital to avoid the adverse human health and economic consequences of food borne illness, food borne injury and food spoilage. Everyone, including farmers and growers, manufacturers and processors, food handlers and consumers, have a responsibility to assure that food is safe and suitable for consumption [1].

The Hazard Analysis and Critical Control Points (HACCP) system has proven to be such a system [2]. HACCP is a science based and systematic system used to identify: Specific hazards to food safety and measures for the control of hazards to ensure the safety of food [3].

HACCP principles are used as a tool to assess hazards and establish control-systems that focus on preventing the production of unsafe food, rather than relying on end product testing. The system can be applied throughout the food chain from primary production to final consumption and implementation should be guided by scientific evidence of risks to human health [3]. Most of the HACCP principles and importance have remained undermined by most food processing plants in developing counties and this review aims to discuss the significance of HACCP system and their prerequisite programs in food processing establishments.

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HACCP History: Hazard Analysis and Critical Control Points (HACCP) was developed in the late 1950s and pioneered in the early 1960s by the Pillsbury Company, with participation of the National Aeronautics and Space Administration (NASA), the Natick Laboratories of the U.S. Army and the U.S. Air Force Space Laboratory Project Group [4, 5]. NASA's concern for safe food is clear; typical food borne illness symptoms (e.g., nausea, diarrhea, vomiting) could be catastrophic in space. Unfortunately, conventional end-product testing was and still is incapable of providing the desired 100% assurance against contamination by bacteria, viruses, toxins and chemical and physical hazards. HACCP was essential to creating space program food that approached as near as possible full assurance against contamination [5].

HACCP was first described in detail to a large audience at the Conference for Food Protection in 1971 [6]. It was then applied with great success to low-acid canned foods in 1974 [7]. In the decades since its development, HACCP has become widely recognized as the best approach for improving food safety [5]. One of HACCP's strongest recommendations came in 1985 from the National Academy of Sciences. In addition, HACCP has been endorsed by the U.S. National Advisory Committee on the Microbiological Criteria for Foods, 15 the International Commission on Microbiological Specifications for Foods,16 the U.S. Food and Drug Administration (FDA), 17 the Conference on Food Protection and the Codex Alimentarius Commission of the United Nations [5].

HACCP System and its Principles: Hazard Analysis Critical Control Point System (HACCP) is defined as a systematic approach to assure food safety by U.S. National Advisory Committee on Microbiological Criteria for Foods (NACMSF). The system was developed as an alternative to traditional control systems such as finished product analysis and process controls [8]. HACCP is a comprehensive food safety and self- inspection system that goes beyond routine inspections of equipment and appearance and helps uncover and solve dangerous defects in food handling [9]. HACCP looks at the flow of potentially hazardous foods the path that food travels throughout the food service operation. We must follow this path from recipe development through delivery of products, storage, preparation, holding or displaying, serving, cooling and storing leftovers for the following day and reheating foods. Each step of the way poses the risk of contamination due to mishandling. HACCP creates a complete system to ensure safety, including plans for corrective actions, recordkeeping systems and verification steps to ensure that potential risks are controlled [9, 10]. HACCP is based on seven basic principles [11]:

- **Conduct a Hazard Analysis:** Plans determine the food safety hazards and identify the preventive measures the plan can apply to control these hazards. A food safety hazard is any biological, chemical, or physical property that may cause a food to be unsafe for human consumption. The most practical approach is first to construct a process diagram, with clearly defined individual process steps. All inputs, including raw materials at each step, must then be identified. Subsequently, the hazards that could occur in the product at a given step need to be categorized and ranked according to the risk they present. This is done in order to apportion appropriate levels of resources to their control [12]. The HACCP team conducts a hazard analysis and identifies appropriate control measures.

- **Identify Critical Control Points:** Acritical control point(CCP) is a point, step, or procedure in a food manufacturing process at which control can be applied and, as a result, a food safety hazard can be prevented, eliminated, or reduced to an acceptable level. Potential hazards that are reasonably likely to cause illness or injury in the absence of their control must be addressed to determine if they are CCP's and performed by the HACCP Team.

- **Establish Critical Limits for Each Critical Control Point:** A critical limit is the maximum or minimum value to which a physical, biological, or chemical hazard must be controlled at a critical control point to prevent, eliminate, or reduce to an acceptable level. CL's are used to distinguish between safe and unsafe operating conditions at a CCP.

- **Establish Critical Control Point Monitoring Requirements:** Monitoring activities are necessary to ensure that the process is under control at each critical control point. Purpose of monitoring are essential for facilitating tracking of the operation, used to determine if there is a loss of control and a deviation occurs at a CCP, provides written documentation for use in verification.

- **Establish Corrective Actions:** These are actions to be taken when monitoring indicates a deviation from an established critical limit. The final rule requires a plant's HACCP plan to identify the corrective actions to be taken if a critical limit is not met. Corrective actions are intended to ensure that no product injurious to health or otherwise adulterated as a result of the deviation enters commerce.

- **Establish Verification Procedures for Ensuring the HACCP System:** Validation ensures that the plants do what they were designed to do; that is, they are successful in ensuring the production of a safe product. Plants will be required to validate their own HACCP plans. FSIS will not approve HACCP plans in advance, but will review them for conformance with the final rule. Verificationensures the HACCP plan is adequate, that is, working as intended. Verification procedures may include such activities as review of HACCP plans, CCP records, critical limits and microbial sampling and analysis. FSIS is requiring that the HACCP plan include verification tasks to be performed by plant personnel. Verification tasks would also be performed by FSIS inspectors. Both FSIS and industry will undertake microbial testing as one of several verification activities. Verification also includes 'validation' the process of finding evidence for the accuracy of the HACCP system (e.g. scientific evidence for critical limitations).

- **Establish Record Keeping Procedures:** The HACCP regulation requires that all plants maintain certain documents, including its hazard analysis and written HACCP plan and records documenting the monitoring of critical control points, critical limits, verification activities and the handling of processing deviations.

The successful application of HACCP requires the full commitment and involvement of management and the workforce. It also requires a multidisciplinary approach; this multidisciplinary approach should include, where appropriate, expertise in agronomy, veterinary health, production, microbiology, medicine, public health, food technology, environmental health, chemistry and engineering, according to the particular study. The application of HACCP is compatible with the implementation of quality management systems, such as the ISO 9000 series and is the system of choice in the management of food safety within such systems. While the application of HACCP to food safety is considered here, the concept can be applied to other aspects of food quality [13].

Prerequisite Programs to Implement HACCP: Prerequisite Programs (PRPs) are defined by ISO 22000 as: specified procedure(s) or instruction(s), specific to the nature and size of the operation, that enhance and/or maintain operational conditions to enable more effective control of food safety hazards and/or that control the likelihood of introducing food safety hazards to and their contamination or proliferation in the products(s) and product processing environment [14].

Prerequisite programs provide the basic environmental and operating conditions that are necessary for the production of safe, wholesome food. There are three major basic programs that need to be implemented by commercial food processors to achieve food safety: Current Good Manufacturing Practices (cGMPs), Sanitation Standard Operating Procedures (SSOPs) and Good Agricultural Practices (GAPs). These programs act as guidelines for food processors and should be viewed as essential prerequisites for the development and implementation of a HACCP system [15].

If the facility is operating under the Hazard Analysis Critical Control Point (HACCP) system, SOPs are usually included as precursory, prerequisite, or foundation programs. Valid SOPs are required under HACCP regulations, or as part of third party HACCP audits or other customer audits. International Organization for Standardization (ISO) accreditation also requires the use of SOPs, but addresses them as work instructions. For example, to receive accreditation under ISO 9000, a company must establish a quality management system that includes developing and implementing SOPs [14, 16].

In addition to this there several factors are involved in the processing of sanitary, consumer-safe foods. Sanitation involves all activities and responsibilities for preventing product adulteration, as well as the implementation of actions to prevent the occurrence of some hazards that can harm consumers. Providing a clean and sanitized environment and equipment for food processing is essential for producing safe foods, but that is not the limit of responsibility. Personnel practices, plant facilities, equipment and operations designed to prevent contamination, pest control and warehousing practices are all equally important as shown in the Figure 1. It is imperative that all of these considerations be addressed in the design of a comprehensive sanitation program and a subsequent HACCP system [15].

Fig. 1: Prerequisite programs to implement HACCP
Source: National Advisory Committee on Microbiological Criteria for Foods, 1997

Sanitation Standard Operating Procedures (SSOPS): Sanitation Standard Operating Procedures are the specific, written procedures necessary to ensure sanitary conditions in the food plant. They should be written in a useable, step-by-step format for cleaning and sanitizing to prevent product adulteration and they must be able to be monitored and documented. Finally, they should have sufficient detail to be clearly understood and effectively used by employees. All SSOP procedures must be appropriately documented and validated [16, 17]. A successful HACCP system is not achievable without well-conceived, well-written and properly implemented Standard Operating Procedures [17].

Certain other terms and acronyms (e.g., Good Sanitation Practices [GSPs], Good Hygienic Practices [GHPs] and Good Handling Practices [GHPs]), have been used for general programs and practices related to sanitation throughout food handling facilities. However, these terms are now being used less frequently, since these general programs are being replaced with more specific standard operating procedures [17]. They provide individuals with very specific and directed information and instructions to effectively perform these functions [16].

The development and use of SOPs for key functions are an integral part of the overall food handling or processing operation. They may describe technical and/ or administrative operational functions of the organization. Effective SOPs promote consistency in implementing processes or procedures (even when there are personnel changes) and may increase efficiency through reduced employee work-load. They also provide a framework for personnel training and minimize the potential for misunderstanding and miscommunication. An additional advantage of well-written SOPs is improved data comparability, credibility and legal defensibility [16].

Valid SOPs are important to ensure that sanitation programs in a food handling facility are effective. The use of SOPs is an excellent way to demonstrate proficiency of tasks or functions such as a process controls (e.g. testing and calibration of a pasteurizer or cooker, thermometer calibration), daily sanitation (e.g. cleaning and sanitizing of equipment, hand-washing) or sanitation system (e.g. sanitary design and construction of equipment and buildings). Well documented SOPs (written and implemented) are a very good indicator to an auditor that an establishment has control over their processes [16].

SOPs should be written as a group or team project with input from all affected individuals with sufficient knowledge and experience regarding the procedures and processes involved. There should be ample time given to analysis and evaluation of the processes and system. Consideration should be given to the number of SOPs required, a description of the main tasks and the general order or steps. Consideration should also be given to training requirements and needs[16]. Both pre-operational (before daily processing begins) and operational (during processing) sanitation needs are included in SSOPs to prevent direct product contamination or adulteration. Therefore, the decision about how often to clean the processing line would be addressed in the plant's SSOPs and supporting documentation.

Pre-Operational SSOPs: These are established procedures that describe the daily, routine sanitary procedures that occur before processing begins. The procedures must include the cleaning of product contact surfaces of facilities, equipment and utensils to prevent direct product contamination or adulteration. These might include descriptions of equipment disassembly, reassembly after cleaning, use of acceptable chemicals according to label direction and cleaning techniques and application instructions, including concentrations, for sanitizers applied to product contact surfaces after cleaning.

Operational SSOPs: These are established procedures that describe the daily, routine sanitary procedures that will be conducted during operations to prevent direct product contamination or adulteration. Established procedures for operational sanitation must result in a sanitary environment for preparing, storing, or handling any meat or poultry food product. Established procedures during operations might include, where applicable: 1) Equipment and utensil cleaning/ sanitizing/ disinfecting during production, as appropriate, at breaks, between shifts and at mid-shift cleanup. 2) Procedures for employee hygiene, such as cleanliness of outer garments and gloves, hair restraints, hand washing, health, etc. 3) Product handling in raw and in cooked product areas [16].

The Significance of HACCP System in Food Industries: Food plant internal control procedures based on HACCP principles have become an obligation worldwide in many countries with advanced food industries. HACCP procedures are imposed on relevant food plants by the competent authorities, whose task is to assess and evaluate the correct application and conduct of HACCP. The food plants themselves are responsible for the proper implementation of HACCP, such as monitoring of sensory, physical and chemical parameters during production and immediate intervention in case of emerging health risks and recording of results [10, 13].

HACCP is internal sanitary related control and monitoring system in food plants with the aim of preventing/minimizing or eliminating health hazards to consumers [18]. Hazard analysis by critical control points (HACCP) is widely accepted, rigorous and systematic method of identifying, assessing and controlling of hazards throughout the whole food chain [9]. HACCP identifies, evaluates and controls hazards, which are significant for food safety. The characteristics of HACCP include potential for immediate prevention measures before or during production to counteract suspected or emerging health risks and exclusively aimed at health risks to consumers.

The HACCP system, which is science-based and systematic, identifies specific hazards and measures for their control to ensure the safety of food. HACCP is a tool to assess hazards and establish control systems that focus on prevention rather than relying mainly on end-product testing. HACCP identifies the risks and then applies preventative control measures[5]. Any HACCP system is capable of accommodating change, such as advances in equipment design, processing procedures or technological developments [13].

HACCP can be applied throughout the food chain from primary production to final consumption and its implementation should be guided by scientific evidence of risks to human health. As well as enhancing food safety, implementation of HACCP can provide other significant benefits. In addition, the application of HACCP systems can aid inspection by regulatory authorities and promote international trade by increasing confidence in food safety [13, 18].

HACCP creates a complete system to ensure safety, including plans for corrective actions, recordkeeping systems and verification steps to ensure that potential risks are controlled. HACCP also clearly recognizes that the responsibility for ensuring safe food rests on the food industry. “A HACCP system will emphasize the industry’s role in continuous problem solving and prevention rather than relying solely on periodic facility inspections by regulatory agencies.” Clearly, the food industry is in the best position to proactively ensure safe food [5]. The system also sufficiently flexible to accommodate changes introduced, such as progress in equipment design, improvements in processing procedures and technological developments related to the product. It is therefore particularly useful for new operations.

The HACCP system overcomes many of the limitations of the traditional approaches to food safety control (generally based on `snap-shot' inspection and end-product testing). Firstly, the difficulty of collecting and examining sufficient samples to obtain meaningful and representative information in a timely manner and with reasonable cost of end-product analysis is key problem solved by HCCP. Secondly, reducing the potential for product recall because of bad record keeping is minimized. The third is identification of problems without understanding the causes and lastly, limitations of 'snap-shot' inspection techniques in predicting potential food safety problems [3, 5].

CONCLUSION

In general, the primary benefits of HACCP, it is a science-based, preventative and risk control system. HACCP prevents food borne illness by applying science to identify the risks in a method of food handling or processing. HACCP is a complete system that includes corrective actions, recordkeeping and verification, all of which increase the effectiveness and efficiency of both HACCP and conventional sanitation methods. In order to manage microbial contamination and growth from the farm up to the consumer, the Hazard Analysis Critical Control Point (HACCP) approach is widely used. Now-a-days HACCP approach has become mandatory for the food processing industries to ensure that safe foods are available to the public. It is strongly recommend for developing countries should take HACCP in to consideration in their food establishments.

REFERENCES

1. C.A.C., 199. General Principles of Food Hygiene, Adopted 1969. Amendment 1999. Revisions 1997 and 2003, 1969.
2. World Health Organization (WHO), 2007. Food Safety-Food borne Diseases and value chain management for food safety. "Forging links between Agriculture and Health" CGIAR on Agriculture and Health Meeting in WHO/HQ.
3. Cumpanici, A., 1996. Guide To Hazard Analysis And Critical Control Points (Haccp) Implementation. For the Fruit and Vegetable Industry in Moldova. USAID. http://export.acsa.md.
4. FDA, 2001. FOOD CODE, supra note 5, at 423, 2001.
5. Fortin, N.D., 2003. The Hang-Up with HACCP: The Resistance to Translating Science into Food Safety Law, Food and Drug Law Journal, 58(4): 565-595.
6. Archer, D.L., 1999. The Need for Flexibility in HACCP, Food tech, 44(5): 174.
7. Riswadkar, A.V., 2001. An Introduction to HACCP: The Hazard Analysis and Critical Control Point System for Food Processors, professional safety. pp: 33-36.
8. Giese, J., 1998. New developments in microbial testing, Food Technology, 52: 79-80.
9. Lee, J.A and S.C. Hathaway, 1998. The challenge of designing Valid HACCP plans for Raw Food commodities, Food Control, 9(2-3):111-117.
10. FDA, 2009. Hazard Analysis and Critical Control Point Principles and Application Guidelines, FDA/ CFSAN.http://www.fda.gov/Food/FoodSafety/HazardAnalysisCriticalControlPointsHACCP/HACCPPrinciplesApplicationGuidelines/default.htm.
11. Pennington, T.H., 2000. Introduction. In HACCP in Meat Industry, CRC Press Cambridge, pp: 3.
12. Buncicm, S., 2006. Integrated food safety and veterinary public health, CAB International, www.cabi.org.
13. FAO / WHO, 2009. Technical Meeting on the Application of the Hazard Analysis Critical Control Point (HACCP) System in Small and or Less Developed Businesses (SLDBs), Rome, Italy.
14. Goodrich-Schneider, R., K.R. Schneider, M.D. Danyluk and R.H. Schmidt, 2012. HACCP: An Overview, University of Florida, http://edis.ifas.ufl.edu.
15. Barron, F.H., 2002. Pre-HACCP programs for food processors: Good Manufacturing Practices (GMPs), Sanitation Standard Operating Procedures (SSOPs) and Good Agricultural Practices (GAPs), Clemson University. Department of Food Science and Human Nutrition College of Agriculture, Forestry and Life Sciences.
16. Lelieveld. H.L.M., M.A. Mostert and J. Holah, 2005. Handbook of hygiene control in the food industry, Woodhead Publishing Limited, Cambridge CB1, England.
17. Schmidt, R.H. and D. Newslow, 2013. Hazard Analysis Critical Control Points (HACCP) Prerequisite Programs, University of Florida/IFAS Extension. http://edis.ifas.ufl.edu.
18. Schweitzer, G., M.Z. Reza and G. Jackson, 2006. Food Safety and Foodborne Disease Surveillance Systems. Proceedings of an Iranian-American Workshop. National Academy of Sciences, United States of America. www.national-academies.org.