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FOOD SAFETY – MAIN CONCEPTS AND MANDATORY REQUIREMENTS FOR MANAGEMENT SYSTEM AND APPLICATOPN (DESK STUDY)

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ABSTRACT

Food safety is related to the presence of food borne hazards in food at the point of consumption (intake by consumer). Hazards could occur at any stage of food chain, so adequate control throughout the food chain is essential. Undoubtedly, food safety is ensured through the combined efforts of all the parties interested and participating in the food chain from F (farm) to F (fork).Interested parties within the food chain include feed producers and primary producers through food manufacturers, transport, storage, operators and subcontractors to retail and food service outlets. At least, there are 8 main concepts controlling and limiting the issue of food safety which will be discussed in this current article. To establish food safety system 4 key elements were   required to ensure food safety along the food chain up to the point of consumption. The International Standard (ISO 22000) offer the essential 4 requirements to any community and / or organization aiming to establish, manage, apply and implement food safety system. The 1st element is "interactive communication" between customers and suppliers continuously about identified hazards and control measures. The 2nd element "system management" refer to the mandatory team work responsibilities and authorities. The 3rd element "prerequisite programmes PRP,s" refer to the preliminary steps to enable hazard analysis and to establish the operational prerequisite programmes (PRP's). Finally, the 4th element "HACCP principles" is dealing with hazard identification, control and monitoring of the critical control point.

Keywords: Interactive communication, Prerequisite programmes (PRP's), Hazard analysis and assessment, Traceability, Nonconformity, product withdrawal.

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Introduction

Food safety is related to the presence of food born hazards in food at the point of consumption. Food hazards can occur at any stage of the food chain, so adequate control throughout the food chain is essential. Thus, food safety is ensured through the combined efforts of all the parties participated in food chain. Organizations within the food chain ranged from primary producers through food manufacturers, transport, storage up to retail and food service outlets (all together with interrelated organizations and service providers were shared in the responsibility of food safety and security[1].

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It is worthy to focus on 8 main concepts which are highly correlating and affecting any proposed system of food safety. Concept (1) the need for food is combined with the condition of food security. Food security exists whenever the availability of safe, nutritious foods needed for an active and healthy life have access at all times to a sufficient supply. Over time, food insecurity leads to poor health, increased risk to certain diseases and dramatic effects on children. Concept (2) health problems related to food safety mainly originate within body cells. So, such problems occurred as a result of the biochemical changes that take place inside human body [11]. Concept (3) Humans have many adaptive mechanisms for managing, eliminating and get rid of a lot of undesirable substances and molecules contaminated his food. Concept (4) some groups of people are at higher risk when exposed to certain food contaminants than

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others. In other words, the risk of exposure to certain hazard(s) is not shared equally among all persons either within or between certain populations [2]. Concept (5) the visual inspection and/ or the sensory evaluation of any food *product is not quite enough to decide is such product safe or not. Concept (6)* Contrary to the previous concept it is not logic or recommended to take all food products and batches to specific labs for inspection and determination of all the known natural, physical, biological and chemical hazard(s), considering that the registered chemical hazards, so far exceed four thousands[3]. Concept (7) many reports and epidemiological studies emphasized that more than 60% of the problems of acute food poisoning and food-borne diseases occurred during the household processes of storage, cooking and preparation and finally, Concept (8) Absolutely, there is no good or bad food, only some foods could be rapidly spoiled. Such foods need careful and appropriate treatments of handling, storage and preparation[3,4]

Humans need enough food to live and the right assortment of foods for optimal health. In both, developed and developing countries, food consumption is combined with the conditions of food safety. Disruption in the availability of nutrients or the presence of food hazards initiate disorders and diseases that eventually affect tissues and consequently, organs and systems. Healthy humans have adaptive mechanisms during the biochemical processes of digestion, absorption and transmission of food components and contents. The 3 successive mechanisms are capable to exclude most of food hazards within the undigested, unmetabolized and/ or unabsorbed fractions which excreted with urine and stool.

Efficient food safety system

Interactive Communication

Communication along the food chain is essential to ensure that all relevant food safety hazards are identified and adequately controlled at each step within the food chain. Interactive communication is completely required between all organizations and interested parties involved up and down-stream in the food chain to recover the ultimate area from F to F.

Communication with customers and suppliers about identified hazards and control measures will assist in clarifying customer and supplier requirements. Recognition of the organization role and position within the food chain is essential to ensure the interactive communication throughout the chain in order to deliver safe food products of food safety to the final consumer. Undoubtedly, the responsibility of food safety is distributed with different shares between the interested parties involved in the food chain. The international standards ISO 22000 offer the principles and requirements of the recent most effective food safety system which could be applied independently or aligned and integrated with existing related management system requirements. This international standard require that all hazards that may be reasonably expected to occur in the food chain, including hazards that may be associated with the type of process and facilities used, are identified and associated. Thus, it provides the means to determine and document why certain identified hazards need to be controlled by a particular organization[5].

To ensure that sufficient information on issues concerning food safety is available throughout the food chain an external and internal communication systems should be established. The external communication system should link the organization with; a) suppliers and contractors, b) consumers, in particular in relation to instructions regarding intended use, specific storage requirements, shelf life and customer feedback including customer complaints, c) statutory and regulatory authorities, d) other organizations that have an impact on/ or will be affected by the effectiveness of updating of the food safety system. While, an internal system should establish to implement and maintain effective arrangements for communicating with personnel issues having an impact on food safety, including; 1) products or new products, 2) raw materials, ingredients and services, 3) production systems and equipments, 4) production premises, location of equipments and surrounding environment, 5) cleaning and sanitation programmes, 6) packaging, storage and distribution system, 7) personnel qualification levels, 8) statutory and regulatory requirements, 9) knowledge related food safety hazards and control measures, 10) relevant enquiries from

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external interested parties, 11) complaints indicating food safety hazards associated with certain products, and 12) any other conditions that have an impact on food safety[2].

Documentation system requirements

The food safety management system mandate documents needed by the organization to ensure the effectiveness development, implementation and updating of the food management system. Such documents should be established to define the controls needed to; 1) approve documents for adequacy prior to issue, 2) review and update documents as necessary and re-approve documents, 3) ensure that changes and the current revision status of documents are identified, 4) ensure that relevant version of applicable documents are available at points of use, 5) ensure that documents remain legible and readily identifiable, 6) ensure that relevant documents of external origin are identified and their distribution controlled, and 7) to prevent the unintended use of obsolete documents and to ensure that they are suitably identified as such if they are retained for any purpose. As well, records should be established and maintained to provide evidence of conformity to requirements and evidence of the effective operation of the food safety management system. A documented procedure should be established to define the controls needed for the identification, storage, protection, retrieval, retention time and disposition of records[1].

The Pre-requisite programmes "PRP's"

Any organization involved in food chain should establish, implement and maintain the suitable pre-requisite programmes aiming to control the likelihood of introducing food safety hazards to the product through the work environment. Also, to control natural, physical, biological and chemical hazards including cross contamination between products and to control food safety hazard levels in the product and product processing environment. Thus, the proposed PRP's should cover the 4 main tasks of; a) appropriate to the organizational needs with regard to food safety, b) appropriate to the size and type of the operation and the nature of the products being manufactured and/or

handled, c) implemented across the entire production system, and d) approved by the food safety team[2].

To establish a suitable and efficient PRP's, the organization should consider and utilize appropriate information dealing with statutory and regulatory requirements, customer requirements, codes of hygienic practices, national, international and sector standards. So, the organization should consider; 1) the construction and lay-out of buildings and associated utilities, 2) premises, workspaces and employee facilities, 3) supplies of air, water, energy and other utilities, 4) supporting services including wastes and sewage disposal, 5) the suitability of equipment and its accessibility for cleaning, maintenance and preventative maintenance, 6) management of purchased materials, supplies, disposals and handling of products, 7) measures for the prevention of cross contamination, 8) cleaning and sanitizing, 9) personal hygiene and other aspects as appropriate. The operational PRP's should be documented to include the essential information for each programme. Such essential information should include, not limited to, food safety hazards to be controlled, control measures, monitoring procedures, corrective actions to be taken if monitoring shows that the operational PRP's are not in control, records of monitoring as well as responsibilities and authorities[6].

Hazard analysis and assessment of control measures

The food safety team should conduct a hazard analysis to determine which hazards need to be controlled, the degree of control required to ensure food safety and which combination of control measures is required. The first step is to identify hazard(s) and determine the acceptable levels. Thus, all food safety hazards that are reasonably expected to occur in relation to certain type of products, type of process and actual processing facilities should be identified and recorded. When identifying the hazards, consideration should be given to; 1) the steps preceding and following the specified operation, 2) the process equipment, utilities, services and surroundings, 3) the preceding and following links in the food chain. For each of the food safety hazards identified, the acceptable level of such hazards should be determined whenever possible. The determined

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level should be take into account established statutory and regulatory requirements, customer food safety requirements, the intended use by the customer and other relevant data. The justification for and the result of the determination should be recorded[7].

A hazard assessment should be conducted to determine, for each hazard, whether its elimination or reduction to acceptable levels is essential to the production of a safe food and whether its control is needed to enable the defined acceptable levels to be met. Each food safety hazard should be evaluated according to the possible severity of adverse health effects and the likelihood of their occurrence. The methodology used should be described and the results of the food safety hazard assessment should be recorded. Consequently, and based on hazard analysis and assessment, an appropriate combination of control measures should be selected which is capable to prevent, eliminate and/ or reduce these food safety hazards to defined acceptable levels. In this selection, each of the control measures should b reviewed with respect to its effectiveness categorized as to whether they need to be managed through PRP's or by the HACCP plan. The selection and categorization should be carried out using a logical approach including the following criteria; 1) its effect on identified food safety hazard relative to the strictness applied, 2) its feasibility for monitoring, 3) its place within the system to other control measures, 4) the likelihood of the failure in the functioning of a control measure, 5) the severity of the consequences, 6) whether the control measure is specifically established to eliminate or reduce the level of hazard, and 7) the synergistic effects between two or more control measures[8].

Establishing PRP's and HACCP plan

The following information should be identified and included for each program and/ or critical control point; 1) food safety hazard(s) to be controlled, 2) control measures, 3) monitoring procedures, 4) corrective actions to be taken, if necessary, 5) responsibilities and authorities, and 6) records of monitoring.

For each hazard aiming to be controlled by the HACCP plan, critical control point(s) should be identified and

critical limits should be determined for each hazard, as well. The critical limits should establish to ensure that the identified acceptable level of the food safety hazards in the end product is not exceeded. So, the critical limits should be qualitative and should be measureable. While, critical limits based on subjective data should be supported by instructions, specifications, education and training. A monitoring system should be established for each CCP to demonstrate that it is under control. The system should include all scheduled measurements relative to the critical limits and should cover the following requirements; 1) measurements or observations that provide results within an adequate time frame, 2) monitoring devices used, 3) applicable calibration method(s), 4) monitoring frequency, 5) responsibility and authority related to monitoring and evaluation of results, and 6) record requirements and methods. When monitoring results exceed critical limits, the previous specified planned corrections and corrective actions should be applied and implemented. The corrective actions should ensure that; a) the cause of non-conformity is identified, b) the parameters controlled at the CCP are brought function and under control, and c) that the recurrence is completely prevented. Also, documented procedures should be established and maintained for the appropriate handling of potentially unsafe products to ensure that they are not released until they have been evaluated [6].

Following the establishment of operational PRP's and the HACCP plan, the organization should update the necessary information of; 1) product characteristics, 2) intended use, 3) flow diagrams, 4) process steps, and 5) control measures. The verification activities should be established and documented to confirm that the PRP's are implemented, the hazard analysis is continually updated and hazard levels are within identified acceptable levels[9].

Traceability, Control of non-conformity and product withdrawal

The organization should establish and apply a suitable traceability system that enables the identification of product lots and their relation to batches of raw materials, processing and delivery records.

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Traceability records should be maintained for a defined period for system assessment to enable the handling of potentially unsafe products and in the event of product withdrawal. Records should be in accordance with the statutory and regulatory requirements. The organization should ensure that when critical limits for CCP's are exceeded or there is a loss of control of PRP's. The products affected are identified and controlled with regard to their use and release. Documented procedures should be established and maintained defining the identification and assessment of affected end products to determine their proper handling and a review of the corrections carried out. Corrections should be approved by the responsible person(s) and should be recorded together with information on the nature of the non-conformity, its causes and consequences including information needed for traceability purposes related to the nonconforming lots. To enable the complete and timely withdrawal of lots of end products which have been identified as unsafe, top management should appoint the authorized personnel to initiate the process of products withdrawal [6].

Validation, Verification and improvement of the food safety management system

The food safety team should plan and implement the processes needed to validate control measures and / or control measures combinations and to verify and improve the food safety management system. Prior to implementation of suggested control measures to be included in PRP's and HACCP plan and after any change, the organization should validate that; a) the selected control measures are capable of achieving the intended control of the food safety hazard(s) for which they are designed, b) the control measures are effective and capable to ensure control of the identified food safety hazards to obtain end products that meet the defined acceptable levels[2].

Also, the organization should conduct internal audits at planned intervals to determine whether the food safety management system conforms to the planned arrangements and is effectively implemented and updated. An audit programme should be designed taking into consideration the importance of the

processes and areas to be audited, as well as, any updating actions resulting from previous audits. The management responsible for the area being audited should ensure that actions are taken without undue delay to eliminate detected non-conformities and their causes. Follow-up activities should include the verification of the actions taken and the reporting of the verification results.

Evaluation of each of verification results, beside the analysis of results of verification activities should be conducted to; 1) confirm that the overall performance of the system meets the planned arrangements, 2) identify the need for updating or improving the food safety system, 3) identify trends which indicate a higher incidence of potentially unsafe products, 4) establish information for planning of the internal audit programme concerning the status and importance of areas to be audited, 5) provide evidence that any corrections have been taken are effective[10].

Continual Improving and Updating of the food safety management system

Top management should ensure that the organization continually improves the effectiveness of the food safety management system through the use of main elements of; communication, management review, internal audit, evaluation and analysis of verification results and activities, validation of control measures, corrective actions and food safety management system updating. Also, top management should ensure that the food safety system is continually updated. The evaluation and updating activities should be based on; 1) input from internal suitability, adequacy and effectiveness of the food safety system, 3) output from management review. All system updating activities should be recorded and reported in an appropriate manner as an input to the management review[2].

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