ACTIONS TO MAINTAIN FOOD HYGIENE

INTRODUCTION

Food hygiene is the conditions and measures necessary to ensure the safety of food from production to consumption. It is a fundamental requirement of any food process that the food produced should be safe for consumption. Food safety is a basic need but there is a danger that it may be overlooked in the development of effective and efficient processes. Food safety remains a critical issue with outbreaks of foodborne illness resulting in substantial costs to individuals, the food industry and the economy. Unsafe food has been a human health problem since history was first recorded, and many food safety problems encountered today are not new. Although governments all over the world are doing their best to improve the safety of the food supply, the occurrence of foodborne disease remains a significant health issue in both developed and developing countries. Food can become contaminated at any point during slaughtering or harvesting, processing, storage, distribution, transportation and preparation. Proper food preparation can prevent most food borne diseases. More than 200 known diseases are transmitted through food.

The chances of food contamination and cross contamination become higher especially in the lower socio-economic classes due to unsatisfactory environmental conditions, poor personal hygiene, poor quality and insufficient water supplies, unhygienic preparation storage and feeding of foods. Food safety hazards are contaminants that may cause a food product to be unsafe for production. Lack of adequate food hygiene can lead to food borne diseases and death of the consumer. Contaminated food presents one of the most common cause and major contributor to gastrointestinal illness (e.g. acute diarrhea, nausea, vomiting and abdominal pain), compromised nutritional status and less resistance to disease and loss of productivity in the world.

The World Health Organization has long been aware of the need to educate food handlers about their responsibilities for food safety. In the early 1990s, WHO developed the Ten Golden Rules for Safe Food Preparation and introduced the Five Keys to Safer Food in 2001. Recognizing the importance of safe food in human health WHO has selected the theme of Food Safety for the World Health Day 2015 with the objective of ensuring safety of food from farm to plate.

FOOD CONTAMINATION DURING FOOD PROCESSING

The food processing steps are shown in (Fig 1) The presence of unwanted materials such as dust and particles during the manufacturing and transportation time is called contamination. The term contaminants include any unwanted matter that is found in the product. These contaminants affect the quality of the product or the process. It has been demonstrated that food contamination, either from microbiological or chemical origin, is the highest concern for consumers. Sample treatment devices, such as micro extraction techniques able to remove the matrix interferences and to concentrate the analyses from the sample, have been developed and proposed as powerful tools for food analysis. But the task of identifying the contaminants, either those coming from the food production, the food processing or the packaging is still a challenge. The information about the likely contaminants coming from each step of the food processing is essential.

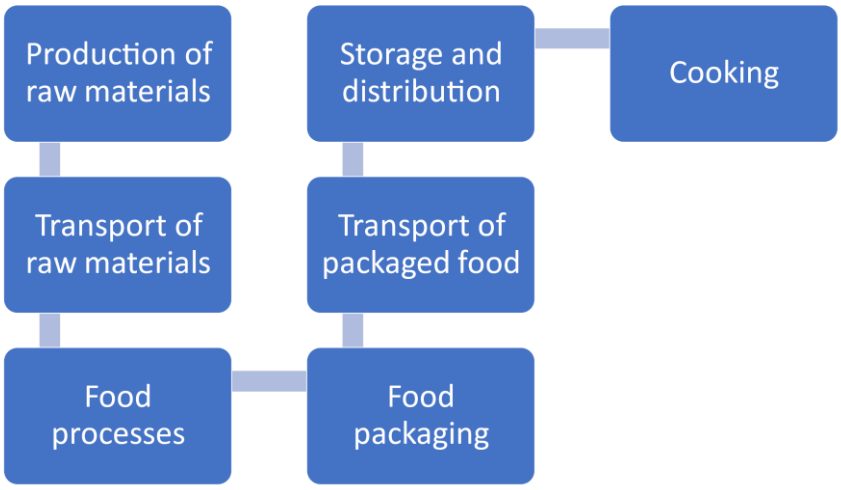

Figure 1. Steps of Food Processing

1. EXTERNAL RAW FOOD CONTAMINATION

Industrial growth, advances in the use of agrochemicals, or the urban activities can contribute to the presence of food contaminants. An important focus of food contaminants is the use of fertilizers and pesticides, since they can cause health problems if they are consumed by humans. Some studies detected pesticide residues in fruits and vegetables and also some derivatives with also adverse effects, such as metabolites from organochlorine pesticides have been found in fatty food Heavy metals such as cadmium, lead, mercury, and arsenic, recognized as toxic, can be present in air, soil, and water, and therefore they can be transferred to foodstuff. The analysis of heavy metals has been performed in several foodstuffs such as honey, spinach, potatoes, fish and tea.

2. CONTAMINATION DURING FOOD TRANSPORT

Food contamination can also take place during transportation. It can be cause by from vehicle exhausts of petrol and diesel or because a cross contamination in the vehicle used for food transportation. This cross-contamination can create a serious risk for food safety. In 1999, a major illness in the European Economic Community was attributed to fungicide contaminated pallets used for transportation and storage of food packaging materials. Long distance transport ship has been also several times affected by cross contamination from chemicals used for disinfection or from other sources. The contamination of food can take place by permeation of naphthalene, methyl bromide, toluene, ethyl benzene and ortho par a xylenes through a theoretical high barrier material.

3. CONTAMINATION CAUSED BY CLEANING PROCESSES

Cleaning and disinfecting during food processing eliminate the presence of possible microorganisms and therefore, they are crucial to reduce food contamination. Chemicals used as cleaners or disinfectants must be appropriate for food contact surfaces and need to be accepted by the legislation. Products such as glass cleaners or some metal cleaners can't be used because they might leave unsafe residues. The addition of sanitizers in quantities far above permitted levels could leave some residual concentration on treated materials or food even in minimum processed fruits and vegetables, and therefore, to quantify the residual chemicals present in the food is important in order to certify that they have been completely removed. Some common surfactants are quaternary ammonium compounds such as dodecyl-trimethyl-ammoniumchloride and nonionic surfactants such as stearyl alcohol ethoxylate. Factors affecting its elimination from different materials surfaces, such as rinsing time or water temperature.

4. CONTAMINATION DUE TO HEATING STEPS

The use of high cooking temperatures in combination with external factors, can lead to the formation of toxic compounds, which can have a deleterious effect on the food quality and safety. Certain toxics compounds (e.g., acrylamide, nitrosamines chloropropanols, furanes or PAHs) can be formed in foods during their processing, such as during heating, baking, roasting, grilling, canning, hydrolysis or fermentation. Frying is by far the cooking process that can act as a generator of a wide variety of toxic compounds into the food. Flavor substances are produced by reactions of oxidized frying oil with proteins and other sulfur and nitrogen substances in the food. Various compounds are released from the food into frying oil, enhancing

discoloration or off-flavors. Pigments present in frying oil may also be adsorbed on the surface of fried food. Certain processing contaminants, such as nitrosamines, can be formed by interaction of natural food components with food additives during heating. Nitrosodimethylamine has been detected in certain foods as a result of the direct-fire drying or roasting processes. Nitrosamine formation during vapor or boiling cookings (which implies lower temperatures, 100oC) are lower than the amount formed during frying, roasting or grill cooking. The production of mutagens is much lower in absence of fat. Model mixtures containing Maillard precursors such as glycine, glucose and creatinine were heated in contact with iron salts and fats.

Microwave heating is becoming an increasingly used process for heating foodstuffs in home and in some industrial sectors. A common characteristic of the microwaving cooking is that the food is cooked in the packaging material (wrapping film, container) in the microwave oven. Such microwavable packaging materials include plastics, paperboard and composites, which during microwave cooking many of their components (i.e., plasticizers, antioxidants, monomers, stabilizers, etc) can migrate from the package into the food. This results in a decrease of food quality and food safety.

5. FOOD PACKAGING

Food packaging provides many advantages such as physical protection, barrier protection and it also allows a better food preservation that will increase the shelf life of the product. The direct or indirect contact between the food and the packaging material can end up the transference of these substances from the packaging to food, in a phenomenon called migration. Migrants can pose a health risk for consumers if they have a toxic effect. To protect the consumers, there is a strict legislation in FDA, Europe, Mercosur, Australia and Euroasia as well as in many countries to avoid the contamination from the materials and articles to the food in contact with them.

6. CONTAMINATION DURING FOOD STORAGE

Food storage conditions are key parameters in food quality and safety. Proper storage extends the shelf life of food, which depends on the food type, packaging and storage conditions, particularly temperature and humidity. Organoleptic changes should not occur during food storage and therefore packaging materials used for long term storage should exhibit very good barrier properties. Moisture can lead to the breakdown of some packaging materials (e.g., paper degradation and metal rusting). The optimal range of temperature is the cool to moderate range, between 4 and 21^0C. Direct sunlight can speed deterioration both on the food and on the

packaging. Depending on the barrier properties the transference of compounds through the packaging material will be different as was demonstrated.

FOOD SAFETY HAZARD

Food safety hazards are contaminants that may cause a food product to be unsafe for production. Hazards are defined by Codex 1997 as follows: “Hazard: a biological, chemical or physical agent in, or condition of, food with the potential to cause an adverse health effect”. Hazards may enter a food product from its ingredients or may contaminate during processing or handling. It is important to understand the likely hazards that might be encountered in the chosen ingredient types, or that might be present in the processing environment. This allows the development team to identify the best ways to control these hazards, either by preventing their entry to the process, destroying them or reducing the contamination to a level. It is no longer process a food safety risk. This information on likely hazards and proposed control options should link with the prerequisite good manufacturing practice programs and HACCP systems to ensure everyday control is established in the manufacturing operation.

Ways to maintain food safety and hygiene

A. Good Manufacturing Practices (GMP).

B. Sanitation Standard Operating Procedure (SSOP).

C. Good Hygiene Practices (GHP).

D. Hazard Analysis of Critical Control Points (HACCP).

1. GOOD MANUFACTURING PRACTICES (GMP)

GMP have existed since the 1970s, but were formalized in different countries only in the mid-1990s. GMP are actions applied to the production of food, drug, and medical equipment production. GMP are based upon four points : exclusion, removal of undesirable and foreign matter, inhibition, and destruction of undesirable microorganisms. The elements that make up GMP are : the facility and its surroundings, the staff, cleaning and sanitization processes; equipment and utensils; processes and controls; and storage and distribution. Analysis and control of these elements by the GMP program aim at the production of high-quality foodstuffs GMP are one of the ways to control foodborne diseases. Industries that have adopted GMP

programs obtained the following results, among others: better quality of foodstuffs; safer products; decreased incidence of consumer complaints ; better, more agreeable, cleaner and safer working environment; greater employee motivation and productivity; and improved psychological conditions. The implementation of GMPs is a continual process based upon the management of the PDCA (plan, do, check, and act) cycle.

2. SANITATION STANDARD OPERATING PROCEDURE (SSOP)

SSOP are written procedures developed and implemented in a facility to prevent direct contamination or adulteration of the products. SSOP include a complete description of the specific activities required to maintain utensils and equipment free of pathogenic microorganisms and minimal deteriorating microbiota, preventing the contamination of foodstuffs that get in contact with these utensils and equipment. The facility is required to maintain these written procedures on file, and these must be available to regulating or government bodies upon request. The following central directives of SSOP have been determined considering the potential sources of contamination: cross-contamination from raw to cooked products (e.g., surface contact with contaminated foods); contact of product with nonpotable water (e.g., condensation on exposed products) or other unsafe substances; contact with nonfood substances (e.g., pesticides); contact with airborne substances; diseases or inadequate hygiene of handlers; foreign matter; and pest control.

3. GOOD HYGIENE PRACTICES

Good hygiene practices (GHP) are the procedures and practices undertaken with the use of best practice principles. European Commission (EC) Regulation No 852/2004, defines food hygiene as the measures and conditions necessary to control hazards and to ensure fitness for human consumption of a food stuff taking into account its final use. GHP are generally called the prerequisite measures upon which other Food Safety and Quality Management Systems are built. They include an exhaustive list of measures and among them is staff personal hygiene and training. Food hygiene training is a legislative requirement that ensures that safety practices are used and maintained in food preparation environment. lack of success in hygiene training were methods used, demographics of trainees and their preparedness to learn, lack of supervision after training, absence of refresher programmes and lack of resources to implement knowledge gained in areas with economic challenges.

4. HAZARD ANALYSIS OF CRITICAL CONTROL POINTS (HACCP)

It is a systematic set of activities used to control food production in order to ensure food safety and prevent changes in foodstuffs. The system is based upon the use of control practices in given production steps where there is a greater probability of occurrence of health hazards. The prerequisite programs for HACCP implementation in food industries are GMP and SSOP, which involve several aspects of the food industry, such as physical structure and maintenance, water supply, personal hygiene, pest control, sanitization techniques and equipment, calibration of instruments, and quality control of raw material and ingredients, among others. Prerequisite Programs (PRPs) provide a hygienic foundation for the HACCP system by enabling environmental conditions that are favorable for the production of safe food. The system is applied to all steps of the food chain, from the production of raw material to the final product, including aspects related to consumer demands, such as processed products that do not have negative effects on their health. The HACCP system uses predetermined concepts and terms that include :

- Hazard: Unacceptable biological, physical, or chemical contamination that renders food inadequate for consumption.
- Risk: Estimated probability of the occurrence of a hazard.
- Critical control point (CCP): Production step where preventive measures are applied in order to maintain the given product under control, and to eliminate, prevent, or reduce risks to the health of the consumer.
- Critical limit: Value or attribute determined for each variable related to a critical point. Noncompliance leads to risks to consumer health. Critical limits are determined by guidelines or legal standards, specialized literature, practical expertise, previous surveys, internal company regulations, and other sources.
- Corrective action: Immediate and specific actions to be put into place when noncompliance with critical limits occur.
- Validation: Use of supplementary tests or review of monitoring records to determine if the HACCP system is functioning according to the plan.
- Decision tree: Logical sequence used to determine if a raw material, ingredient, or process step is a CPP for a given hazard.