International Journal of Agricultural and Life Sciences

ISSN: 2454-6127(Online) Journal homepage: http://www.skyfox.co

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To cite this article : Matikka, S., & Jacob Farah, T. (2023). Food Safety Regulation and Standards for Food Processing and Incubation centres. Int J Agric Life Sci, 9(2), 399-402. doi: 10.22573/spg.ijals.023.s122000114.

To link to this article : https://doi.org/10.22573/spg.ijals.023.s122000114

Data Availability Statement : All relevant data are within the paper and its Supporting Information files.

Funding : The author(s) received no specific funding for this work.

Competing Interests : The authors have declared that no competing interests exist.

Published online: 30 June 2023.

International Journal of Agricultural and Life Sciences- IJALS (2023), Volume 9 (2) pp.399-402
http://dx.doi.org/10.22573/spg.ijals.023.s122000114
Available online at http://www.skyfox.co
ISSN: 2454-6127

REVIEW ARTICLE

Food Safety Regulation and Standards for Food Processing and Incubation centres

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Received: 12 Mar 2023/ Revised: 02 April 2023/ Accepted: 18 May 2023/ Published: 30 June 2023

Abstract: Food standards, legislation, and regulations have tremendous effect on food safety and quality around the world. The safety of food is fundamental to all consumers. They must have confidence that the food they buy and eat is as expected, safe, and that they are protected by fraud (Food Standards Agency, 2009). Globally, food and health agencies have been looking into this matter very seriously and have developed various legislations as guidance to both food businesses and consumers. It is essential for all food manufacturers and food establishments to adhere to these standards.
Keywords: Codex, WHO, FAO, FSMS 22000:2018, HACCP.

INTRODUCTION

Since 56 years ago, the Codex Alimentarius Commission (CAC) of the Food and Agriculture Organization (FAO)/World Health Organization (WHO) are in charge of development of food standards, guidelines, and other recommendations to govern the safety and quality of food and to ensure fair practices in food trade as stipulated in the Codex Alimentarius (Lupien, 2000). Codex Alimentarius is a compilation of food standards developed and presented in a unified, codified approach. This standard is used together with documents such as Codes of hygienic and good manufacturing practices (GMPs), recognized methods of analysis and sampling, and general principles and guidelines (Randell and Whitehead, 1997). Additionally, it also covers the increased use of food additives for food preservation, latest pesticide compounds used in agriculture and food storage, harmonization of food standards in various countries, and issues such as accurate labeling and promotion of good food hygiene to minimize or remove contamination of food, and pathogenic microorganisms (Lupien, 2000). The Codex Alimentarius contains standards for all the principal food, whether processed, semi-processed, or raw. Nonetheless, for practical reasons, no standards exist for fresh, perishable commodities which do not move widely in international trade, such as milk (Randell and Whitehead, 1997).

To regulate quality assurance systems, CAC has established the HACCP system as a means to assess hazards and set up control systems which centre on preventive measures, instead of solely testing on end-products. HACCP system can be functional throughout the food chain, from farm to fork. Besides enhancing food safety, the HACCP system guarantees better use of resources and fast actions to problems. This system also eases inspection and certification service provided by regulatory authorities (Randell and Whitehead, 1997).

Later, other standards were developed worldwide in accordance to the developed standards, for example, Food Act 1983 and Food Regulations 1985 in Malaysia (Food Act, 1983), Food Standards Act 1999 in the United Kingdom (Food Standards Act, 1999), Regulation (EC) No 178/2002 that outlines the food regulations in the EU (Official Journal of the European Communities, 2002), and others. In addition, food are also regulated by International Standards (ISO) as the world population is growing speedily and international food trade is regular. It is important to address this challenge in a safe and sustainable way, to promote safety, quality, and efficiency across the entire food industry by guidance and best practice in food production methods and testing (ISO and Food, 2017).

Additionally, in major religious food preparation, some requirement set by the religion must be met. For example, the halal and haram rules are stated in the Quran and afterward be adopted into halal standards worldwide, while Jewish food prescriptions are laid down in Jewish biblical and rabbinical sources (Havinga, 2010). Recently, to control major religious food production, some standards have been set, such as ISO Standard for Halal Food MS 1500:2009. In this chapter, cross-contamination, critical control points, and quality control in conventional food and some major religious food would be discussed in regard to food standards and regulations. The comparison and contrast of dietary laws in different religions have been explained comprehensively in previous chapters, thus this chapter would only discuss some of critical control points that differentiate one ruling from another.

TRADITIONAL AND LATEST STANDARDS PRACTICES

Conventional food productions are generally viewed as an operation in a mature and low technology area, where research and development (R&D) activities are limited and patenting is rare (Avermaete et al., 2004). The conventional food producers are usually categorized as small industry and can be further subdivided into microbusinesses with less than 10 employees (Taylor, 2001). The system includes convergence at a macroeconomic level, territorial articulation at a microeconomic level, and integration of actors at the microlevel of production, consumption, and distribution (de Noronha and Nicolas, 2000). The production of food is usually based on the historical preparation technique that the producer received from their ancestors.

Although the conventional methods of the production during processing and packaging are still in use to date, the conventional food productions, or small medium enterprises (SMEs) contribute to more than 70% of the economic growth. Nonetheless, improper handling temperature and poor personnel hygiene of food handlers are still observed during the food preparations. There is less control over food compared to large-scale food manufacturing. Standard

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ISSN: 2454-6127

controls are usually based on monitoring, while safety assurance is based on visual inspection. More decisions must be made at critical control points, and those decisions are made by a great number of staff members at multiple locations. However, in the conventional production, they do not establish any system for monitoring critical control points during food processing. It is often difficult to provide the necessary supervision to ensure consistency on how staff follows the standard operating procedures (National Food Service Management Institute, n.d.). Subsequently, the product can be exposed to the hazards that can cause serious health problems to the consumers.

Conventional food production produces specialized regional products of a different nature than those produced by large firms. Large firms generally have a national or international market approach and consequently focus on products with more of a mass appeal (Avermaete et al., 2004). It is noted that large manufacturing company adopts modern food safety technique to ensure that the products can be sold globally. Apart from marketability, food safety issues are becoming more important in international trade because consumers have become more aware of food safety risks and demand greater guarantees regarding product handling (Unnevehr, 2000). The implementation of Good Manufacturing Practices (GMP), Hazard Analysis Critical Control Points (HACCP), and ISO 22000 Food Safety Management System in food production is the evidence that producers are committed to ensure the product is fit for human consumption. However, the mass production often is always perceived as low quality by customers, yet to be less desirable than conventional food preparation.

Management of food safety hazards is part of a trend towards greater quality management to meet increasingly specialized product specifications and niche market demands. Internationally recognized certification, often through the International Organization for Standardization (ISO), is increasingly applied to food production and processing. The ISO provides a "standard for standards" through application of a framework for verifying the elements of a firm's production process to ensure quality and the safety of the products (Unnevehr, 2000).

HACCP is a system of food safety management that, in the last few decades, have been incorporated into national governments and international strategy to reduce the prevalence of food-borne disease. HACCP presents the food industry with the most effective management tool to secure safe food. As such, the adoption of its principles will offer a legal defences (in many countries) in the event of an outbreak of food-borne disease. In coping with this set of interrelating factors, even the largest food companies, equipped with significant resources of money, technical expertise, and management skills, may face a difficult challenge; the small- and medium-sized enterprises (SMEs) may feel the difficulties of implementing the HACCP (Bao et al., 2007). It was cited that the difficulties of small industries to adopt HACCP in their food production system are because of lack of expertise and severe skills shortage to maintain the system, time, and budget constraint and no proper documentation during the production (Taylor, 2001).

CROSS-CONTAMINATION IN PROCESSING, PACKAGING, STORAGE, AND TRANSPORT

Food can be contaminated in a number of ways, whether it is prepared and served by street vendors, in restaurants, in food manufacturing, or in our own house. Food contamination happens when unwanted item had been introduced to the food along the process in food chain that can bring adverse health effect to human consumption. There are three types of food contamination, (i) biological; (ii) physical; and (iii) chemical.

BIOLOGICAL CONTAMINATION

Biological contamination refers to food that is contaminated by organisms or sub-stances they produce. This includes biological matter produced by humans, rodents, insects, and microorganisms. Bacteria and viruses are typically the two biggest causes of biological contamination and can result in some of the most common types of food poisoning including Salmonella, E. coli, Listeria, and norovirus.

PHYSICAL CONTAMINATION

Physical contamination is when a foreign object contaminates food. This can happen at any stage of the production process and could include Band-Aids, steel wool, or pieces of plastic. Physical contamination can cause injury to an individual who inadvertently consumes the foreign object. The added risk associated with physical contamination is that the foreign object could be carrying biological contamination.

CHEMICAL CONTAMINATION

Chemical contamination refers to food that has been contaminated with a natural or artificial chemical substance. These contaminants are particularly dangerous as they expose people to any number of toxic substances, some of which can be fatal. Chemicals can also contaminate food at any time of the food process, whether by pesticides transferred from the soil the food is grown in or during the manufacturing process. Storing chemicals separately from food is essential to help protect against chemical contamination.

Cross-contamination occurs when bacteria or pathogens are transported from one object to another. Cross-contamination of bacterial and viral pathogen in homes and in food service establishments is thought to be a major contributing factor for sporadic and epidemic food-borne illness (Chen et al., 2001). During food handling and preparation, microorganisms on raw food can be transferred to various surfaces, such as cutting boards and water faucet spigots. Proper hand washing has been recognized as one of the most effective measures to prevent cross-contamination and minimize transfer of microorganisms to ready-to-eat food in modern homes and institutional kitchen. It is indicated that cross-contamination, from raw products via hands, cleaning cloths or sponges, and utensils to food not subjected to further cooking, contributed to the occurrence of outbreaks of food-borne salmonellosis in the United States (Kusumaningrum et al., 2003).

Therefore, HACCP principle is developed. Identification of the food contamination during processing can be done by analyzing all potential hazards that might occur at all level of processing steps. By implementing the Decision Tree from HACCP principle, the food manufacturers are able to control the product from the potential hazards. During processing, the potential hazards might occur from the selection of the raw materials. The selection of raw materials is crucial because it will ensure the quality, freshness, and the wholesomeness of the products. Supplier vetting is conducted to ensure the safety of food bought in from suppliers. This often involves detailed specifications, Certificates of Analysis, and on-site audits.

Physical hazards, on the other hand, can be introduced in the processing when the machines and tools for food production are not well-maintained. For example, rusty machine can cause heavy metal contamination. Loosen parts of the machinery also can be the physical hazard during the processing. Moreover, improper cleaning and sanitation technique may lead to chemical and biological hazards. Besides, chemical residue from the detergent or sanitizer may alter the organoleptic characteristic of the products. In addition, biological contamination might occur from the misused or abused temperature during

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ISSN: 2454-6127

the processing. The growth of microorganism is based on the optimal conditions such as source of food (protein give optimal condition to grow), acidity, temperature (danger zone at 5-60°C), time, oxygen (aerobe and aerobic microorganism), and moisture (water activity).

Apart from safe processing line, the importance of packaging cannot be ruled out. The principal roles of food packaging are to protect food products from outside influences and damage, to contain the food, and to provide consumers with ingredient and nutritional information. Food packaging can retard product deterioration, retain the beneficial effects of processing, extend shelf-life, and maintain or increase the quality and safety of food (Marsh and Bugusu, 2007). The hazards that may occur during packaging are from the materials used to package the product. Selection of the material must ascertain the safety and economic and environmental advantages, such as reduction to zero of any critical interaction with food matrices and with human health (Silvestre et al., 2011).

Consequently, suitable storage settings are needed for the properly packaged products to guarantee food security. Inadequate storage and the spread from contaminated to non-contaminated food are risk factors for transmission in sporadic cases (Kovats et al., 2004). Different categories of products shall be stored at proper condition such as, chilled temperature (0-4°C), frozen temperature (<—20°C), or ambient temperature (<30°C). Pest infestation and improper housekeeping such as cobweb in the storage area can cause physical contamination during the storage.

In addition, transporting food requires multiple steps between the point of origin and point of use. It also involves different modes of conveyance via air, land, railroad, and water. Good design and facilities of the food manufacturing facilities will reduce the potential physical contamination such as dust, hair, pest, and birds during loading and unloading the products. Food transportation must be cleaned regularly or when-ever they become soiled with wood from pallet, dust, nails, hard plastics, or metal from the container. To reduce food contamination, permanent barrier between categories of product such as meal and poultry and another packaged product is a must while transporting. Food-related outbreaks during transportation have been attributed to cross-contamination and improper refrigeration. Transportation practices including proper temperature control and other criteria had to be met to ensure that food is not transported under conditions that may render it adulterated.

Hence, implementation of good practice means the quality assurance is consistent and in control. This ensures that food products and food-related processes have adhered to the quality procedures in food systems. This too enables integration into all activities, which are important in food industries specific for each individual branch. As stated in previous section, GMP connects all factors that assure quality, safety, and effectiveness of food, according to its specification and purpose. After all, these systems are implemented to feed global population with safe food.

CODEX ALIMENTARIUS COMMISSION

The Codex Alimentarius Commission accepts that there may be minor differences in opinion in the interpretation of lawful and unlawful animals and in the slaughter act, according to the different Islamic Schools of Thought. As such, these general guidelines are subjected to the interpretation of the appropriate authorities of the importing countries. However, the certificates granted by the religious authorities of the exporting country should be accepted in principle by the importing country, except when the latter provides justification for other specific requirements.

On the other hand, Jewish dietary laws (kashrut) regulate which food are fit for consumption by observant Jews (kosher). It is a complex and extensive system with many thorough prescriptions regarding the food production, preparation, and consumption. The prescriptions are written in Jewish biblical and rabbinical sources. Kosher laws deal mainly with three issues: prohibited food (e.g., pork, shellfish, and rabbit), prescriptions for religious slaughter (shechita), and the prohibition on preparing and consuming dairy products and meat together. Besides, issues such as wine and grape juice, cooking equipment, and Passover were also discussed in some prescriptions (Havinga, 2010). In contrast to most food laws, which are enacted by society through government or other rulemaking bodies, Jewish dietary laws are believed to be conceptualizations of divine conveyed to Moses at Mount Sinai and transcribed in the Old Testament (Hutt, 1994).

As discussed earlier in previous chapters, in Kosher, Shechita must be carried out by a well-trained and licensed individual called a shohet. Jewish law requires that the shohet severs both the trachea and the esophagus in domesticated animals and beasts, while either one must be severed in birds. Continuous strokes without pressure or hesitation must be applied to cause death as rapidly and painlessly as possible. Once slaughtered, the shohet examines it and investigates whether it possesses any blemishes that would render it unfit for consumption in accordance with the Jewish dietary laws (Hutt, 1994). Other than shechita, another critical point in Kosher is prohibition of blood whether it is in liquid form or if it is part of the muscle, tissue, bone, or fat. Broiling or salting is done to extract blood from meat and poultry, known as koshering of meat. Only by doing so, the meat is rendered permissible for eating (Hutt, 1994).

CONCLUSION

Establishment of various food standards and regulations had been helpful in distribution of safe and good quality food globally. Over time, these standards have expanded to cater different needs of people around the world, and latest, in accordance to religious beliefs. However, basic practices such as HACCP, GNP, and GMP are crucial to ensure a well-controlled food processing from farm to fork, covering all quality control and critical control points at all times.

REFERENCES

1. Avermaete, T., Viaene, J., Morgan, E.J., Pitts, E., Crawford, N., Mahon, D., 2004. Determinants of product and process innovation in small food manufacturing firms. Trends Food Sci. Technol. 15, 474-483.
2. Bao, M., Y€ksel, M., Cavuoof lu. T., 2007. Difficulties and barriers for the implementing of HACCP and food safety systems in food businesses in Turkey. Food Control 18, 124-130.
3. Chen, Y., Jackson, K.M., Chea, F.P., Schaffner, D.W., 2001. Quantification cation and variability analysis of bacterial cross-contamination rates in common food service tasks. J. Food Prot. 64 (1), 72-80.
4. Codex Alimentarius, 1997. CAC/GL 24-1997 General Guidelines for Use of the Term “Halal” . Daud, S., Din, R.C., Bakar, S., Kadir, M.R., Sapuan, N.M., 2011. Implementation of MS1500:
5. 2009: A Gap Analysis Communications of the IBIMA. IBIMA Publishing.https://doi.org/10.5171/2011.360500http://www.ibimapublishing.com/journals/CIBIMA/cibima.html.
6. de Noronha Vaz, M.T., Nicolas, F.M., 2000. Innovation in small firms and dynamics of local development.Workshop ISEG, Lisbon 24-25, January.

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Available online at http://www.skyfox.co
ISSN: 2454-6127

7. Food Act, 1983. Laws of Euro Act 281.
8. Food Standards Act, 1999. http://www.legislation.gov.uk/ukpga/1999/28/pdfs/ukpga_19990028_ en.pdf (Accessed 30 January 2018).
9. Halal Hub Division, 2017. The Recognized Foreign Halal Certification Bodies & Authorities (as of September 15, 2017). Halal Hub Division.http://www.halal.gov.my/ckfinder/ userfiles/files/cb/CB%20List%20LATEST%20.pdf (Accessed 31 January 2018).
10. Halal Industry Development Corporation, 2018. Halal Standards. http://www.hdcglobal.com/ publisher/bi_halal_standards (Accessed 31 January 2018).
11. Havinga, T., 2010. Regulating halal and kosher foods: different arrangements between state, industry, and religious actors. Erasmus Law Rev. 3 (4), 241-255.
12. Hutt, P.B., 1994. The Jewish Dietary Laws and Their Foundation. http://nrs.harvard.edu/urn-3: HUL.InstRepos:8889478 (Accessed 30 January 2018).
13. ISO and Food, 2017. https://www.iso.org/files/live/sites/isoorg/files/archive/pdf/en/iso_and_ food_en.pdf. (Accessed 30 January 2018).
14. Koenig, H.G., King, D.E., Carson, V.B., 2012. Handbook of Religion and Health, second ed. Oxford University Press, New York.
15. Kovats, R.S., Edwards, S.J., Hajat, S., Armstrong, B.G., Eb, K.L., Menne, B., 2004. The effect of temperature on food poisoning: a time-series analysis of salmonellosis in ten European countries. Epidemiol. Infect. 132, 443-453.
16. Kusumaningrum, H.D., Riboldi, G., Hazeleger, W.C., Beumer, R.R., 2003. Survival of food- borne pathogens on stainless steel surfaces and cross-contamination to foods. Int. J. Food Microbiol. 85, 227-236.
17. Lupien, J.R., 2000. The Codex Alimentarius Commission: international science-based standards, guidelines, and recommendations. AgBioforum 3 (4), 192-196.
18. Kenneth Marsh and Betty Bugusu. 2007. Food packaging roles, materials, and environmental issues, J. Food Sci., Vol. 72, Nr. 3 pages 39-55
19. National Food Service Management Institute n.d. A Guide to Centralized Foodservice Systems; Chapter 1. pg 1-3 Available from: http://nfsmi.org/documentlibraryfiles/PDF/ 20080212032530.pdf.
20. Official Journal of the European Communities, 2002. Regulation (EC) No 178/2002 of the European Parliament and of the Council.
21. Oxford Dictionaries n.d. Religion Accessed 31 January 2018 https://en.oxforddictionaries.com/ definition/religion.
22. Randell, A.W., Whitehead, A.J., 1997. Codex Alimentarius: food quality and safety standards for international trade. Rev. Sci. Tech. 16 (2), 313-321.
23. Silvestre, C., Duraccio, D., Cimmino, S., 2011. Food packaging based on polymer nanomaterials. Prog. Polym. Sci. 36, 1766-1782.
24. Taylor, E., 2001. HACCP in small companies: benefit or burden? Food Control 12 (4), 217-222.
25. Trade Description Act, 2011. http://www.halal.gov.my/v4/index.php?data=bW9kdWxlcy9 uZXd/O/s7Ow&ut;im;i~p;indu;in&ids~gp8 (Accessed 31 January 2018).
26. Unnevehr, L.J., 2000. Food safety issues and fresh food product exports from LDCs. Agric. Econ. 23, 231-240.

How to cite this article
Matikka, S., & Jacob Farah, T. (2023). Food Safety Regulation and Standards for Food Processing and Incubation centres. Int J Agric Life Sci, 9(2), 399-402. doi: 10.22573/spg.ijals.023.s122000114.

CONFLICTS OF INTEREST

"The authors declare no conflict of interest".