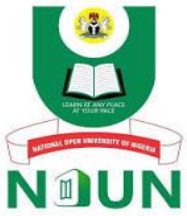

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FACULTY OF AGRICULTURAL SCIENCES

Department of Agricultural Economics and Extension

Programme: Hospitality and Tourism Management

Course Code: HTM511

Course Title: Food Safety, Hygiene and Sanitation

Credit Unit: 2 Credits

HTM 511

Food Safety, Hygiene and Sanitation

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HTM511 COURSE GUIDE

Introduction

Food safety, hygiene and sanitation is a two (2) unit degree course available to all students offering Hospitality and Tourism and tourism related courses at National Open University of Nigeria.

Food safety practices can be regarded as activities and procedures involved in ensuring that food that is consumed does not cause harm but accomplishes its desired purpose. The study of food safety, hygiene and sanitation has enabled us to know the importance of food, safety and hygiene, personal hygiene relating to personnel. It also teaches the causes and prevention of food borne illness.

The study will also assist students to understand the principles and practices involved in safe handling of food products, kitchen hygiene, reservoirs of infection and ways of spread among others.

What You Will Learn in this Course

This course consists of five modules which is sub – divided into 14 units. This course guide tells you what the course is all about. It will also informed the students on the type of course material the will be using including guidelines and amount of time that is required of them in a particular unit.

Course Aims

The course aims to provide the needed information on food safety, hygiene and sanitation with a view to prepare students on how to identify, handle and prevent any micro organism that can cause food illness in the future career in food service industry.

Course Objectives

To achieve the stated aims above, the course has outlined objectives in various units. It is expected that the students will read these objectives before they study the units.

After studying this course, you should know

1. The meaning and concept of Food Safety, Hygiene and Sanitation
2. The purpose and importance of Food Safety
3. Food Safety relating to personnel
4. Phases of food sanitation. Public health law and special problems in hospitality sanitation
5. Identification and sources of micro – organism in food service operation
6. Causes of food borne illness
7. Prevention of food borne illness
8. Kitchen Design and equipment
9. Kitchen hygiene
10. Reservoirs of infections and ways of spread
11. Vehicle of infection
12. Cleaning methods
13. Control of infestation

Working through the Course

The student is expected to devote more of his time and study this course. Each unit contains self assessment exercise and you will be required to submit the assignment for your assessment

The final examination comes at the end of the semester, so you are advised to attend tutorial with your colleagues to enable you improves on your performance.

Course Materials

You will be provided with the following materials

- Course guide

- Study units
- References
- Assignment
- Presentation schedule

Study Unit

Assessment

There are two components of assessment for this course:

· The Tutor Marked Assignment (TMA)

· The end of course examination.

Tutor-Marked Assignment

The TMA is the continuous assessment component of your course. It accounts for 30% of the total score.

You will be given four TMA's by your facilitator to answer before you can sit for the final examination.

Final Examination and Grading

This examination concludes the assessment for the course. The examination will account for 70% of total score. You will be informed of the time for the examination.

Summary

This course intends to provide you with underlying knowledge of food safety, hygiene and sanitation principles for the study of Hospitality Management and Tourism.

MAIN CONTENT

MODULE 1: MEANING, PURPOSE OF FOOD SAFETY AND FOOD SAFETY MATTERS

Introduction

After studying this module, student is expected to learn what food safety is. The student will also know the purpose and importance of food safety.

The module is divided into four units, namely:

Unit 1: Meaning, Purpose, and Importance of Food Safety

Unit 2 Food Safety Matters Relating To Personnel

Unit 3 Examination of Public health laws and special problem in Hospitality Sanitation

Unit 1: Meaning, Purpose, and Importance of Food Safety

Unit Structure

1.1 Introduction

1.1 Introduction

Food is a vital element required by man to survive. Food that is intended for human consumption must be secure and free of dangerous microorganisms that might taint food as a result. As a

result, maintaining good hygiene standards requires the cooperation of both the environment and those handling the food.

Students will comprehend the importance of food safety after completing this unit.

1.2 Learning Outcomes

At the end of this unit, student would be expected to:

- Explains the meaning of food safety
- Highlights the Purposes of Food safety
- Evaluates the importance of food safety

1.3 Meaning of Food Safety

Self-Assessment Exercises 1

1. Explain the term food safety. 2. Explain in details the purpose and importance of food safety in food service establishment.

Food safety practices, according to Lagerkvist, Amuakwa-Mensah, and Tei Mensah (2018), can be thought of as actions and steps taken to ensure that food consumed does not hurt anyone but instead achieves its intended purpose.

Producing food in a way that prevents diseases and infections while retaining enough nutrients for a balanced diet is what is meant by "food safety" (Handbook for Gambian Youth).

Food safety is a branch of science that deals with handling, preparing, and storing food to lower the risk of getting a foodborne illness (Bhavana, 2020).

The greatest frequency and/or concentration of a (microbiological) danger in food at the moment of consumption that gives the proper level of health protection, according to Hari (2006)

Food safety is all about reducing the risk of becoming ill as a result of improperly handling, preparing, or storing food. By upholding basic food safety guidelines, you can reduce this risk and protect people from illness and disease brought on by food-borne microorganisms.

Food safety refers to the processes and practices used to ensure that food consumed does not hurt anyone and serve its intended purpose.

Food safety refers to practices in handling, preparing, and storing food that are intended to reduce the risk of food-borne illness and injury. When food is cooked and/or consumed in accordance with its intended use, consumers are guaranteed that they won't suffer any negative effects.

Food safety is defined as the degree of confidence that food will not cause sickness or harm to the consumer when it is prepared, served and eaten according to its intended use (FAO/WHO, 2003)

It deals with how to handle, prepare, and store food to minimize the chance that people can contract a food-borne illness.

The index in the criteria above demonstrates that food safety occurs when customers are free of germs that cause food spoiling.

However, Two UN agencies, the Food and Agriculture Organization (FAO) and the World Health Organization (WHO), have been tasked with spearheading international efforts to promote food safety, claims Bhavana (2020). In order to keep and attract clients, food service businesses and other associated industries must ensure food safety in their facilities. By reducing the risk of food-borne infections, one may make sure that the individuals for whom they are preparing food are healthy. Whether one is cooking for the family at home or cooking on a large scale for more people, it is imperative to reduce the risk of food-borne illnesses as much as possible (www.mangolive.com)

1.4 Purpose of Food safety

The purposes of food safety are as follows:

To ensure that foods are safe for human consumption.

To make sure that food produced is up to standards and safe to consumers.

To ensure that food contaminated by virus, bacteria and parasite that cause food poisoning are eliminated.

To ensure that food poisoning that may lead to kidney failure or even death are reduced to the bearest minimum.

To ensure that babies, children, older people and pregnant women that are vulnerable to food poisoning are eliminated.

According to Njunina (2021), food safety plays a great role within the entire food chain more than we think it does. Food businesses are required to implement food safety management

systems to protect the health of consumers from any food borne disease. Beyond this concept, food safety contributes as well to important necessities in society as food security.

When properly implemented, food safety practices can help detect and control food safety risks, and contribute to economic prosperity, food security, and continuous and sustainable development. By providing safe food for consumption a continuous supply of food for everyone can be ensured. The many benefits of food safety in various aspects of life prove why food safety is important for everyone.

The concept of farm-to-fork (or farm-to-table) food safety is well-known in the food industry. This concept tells us that food safety should be observed right from the beginning when raw foods are just being produced up until the finished product reaches the consumer. Standard food safety practices for growing produce have been established in laws such as the Food Safety Management Act in the United States. The farm-to-fork concept emphasizes how food safety hazards can occur at any point in the food supply chain.

The ultimate goal of food safety is to create a sustainable and secure food supply for everyone. This goal aims to emphasize the enjoyable experience of food while being sure that the food we get is safe. When all participating parties in the entire food chain, manufacturers, suppliers, the government, and consumers, play their role in food safety, this goal can be achieved (Njunina 2021).

But for Handbook for Gambian Youth (nd) the purpose of food safety is to:

a. Prevent food –related diseases and deaths.
b. Protect against false allegations and loss of reputation
c. Improve yields and reduce post-harvest losses.

d. Reduce cost and allow better resources utilization

e. Help meet standards and technical regulation

f. Enable producing to buyer's requirement in international and regional trade.

However, in the scientific field of food safety, handling, preparing, and storing food in a manner that reduces the risk of contracting a food-borne illness is described. This comprises a variety of practices that ought to be performed to prevent potential serious health risks (www.sesotec.com)

Food safety is crucial because it helps shield consumers from the possibility of contracting food-borne illnesses. Additionally, it helps shield customers from risks of fatal illnesses and other health-related issues including allergies.

Additionally, it shields businesses that handle food against product recalls that cause financial losses due to faulty goods. Rejected products, potential legal action, and business closure by public health authorities as a result of reports of unsafe items being sold to the general public are further problems caused by unsafe products that can have an impact on a firm (www.sesotec.com).

For Lindsey (nd), the four reasons why Hospitality Industry needs food safety solutions are as follows:

1. **Consumer Demand For Traceability & Transparency**

Consumers are calling for greater openness from the companies they do business with across all industries. When this information is shared with the final consumer, supply chain transparency and food traceability play a significant role in fostering customer trust in the hotel industry. Customers today, whether they are eating at home, in a restaurant, or in a hotel, want to know

where their food comes from, how it has been handled, and how long it has been in transit before reaching their plate.

In fact, 69 percent of customers say that understanding how the food was sourced is equally vital, and seven out of ten respondents to the survey said they believe knowing where their food was created and how it was handled is among the most important facts to know about a restaurant.

2. **Consumer Trust Is Built On Food Safety**

In the hospitality industry, keeping customers' trust is crucial. Food safety problems can cause enormous harm, especially now when people are so concerned with hygiene and germs. For instance, six out of ten customers say they won't go back to a place after getting a foodborne disease there. Businesses that provide their food service staff with enterprise-class mobile laptops can monitor consumption and ingredient perishability, assisting in the prevention of future mishaps

Only 20% of consumers share the full confidence of industry insiders who fully trust businesses to assure food safety. This troubling trust gap is present throughout the survey, suggesting that consumers may not yet be aware of the investment many companies are making in food safety technology. Whether it is a fast-casual restaurant or a high-end one, customers want to know that the business is dedicated to maintaining their health.

3. **Protect The Bottom Line**

Customers have higher expectations than ever, which puts pressure on businesses to increase production to offset declining margins. Food safety might occasionally suffer as a result of systems being overworked. Potentially harmful effects can be avoided by using technology to monitor and regulate the food supply chain from the warehouse through the distributor to the final consumer.

Supply chain technology can assist companies in responding to unforeseen circumstances that disrupt the market more swiftly. The ability to develop and maintain new services, like curbside pickup or delivery, which have grown in popularity as a result of social distance is made possible by optimizing supply chain resilience. Additionally, it can spot new specifications and guarantee that the company constantly complies with legal obligations.

4. **Predict The Future**

Restaurants and other food service companies can employ predictive models to further optimize their supply chains in the long run once they have adopted the technologies required to improve real-time operations. Increased productivity, the ability to predict and prevent problems in the future, and a return on investment are all benefits of predictive analytics.

According to Zebra's Food Safety Supply Chain Vision Study, 62% of industry decision-makers surveyed intended to operate supply chains more foresightedly over the following five years, even though 93 percent of respondents intended to increase investment in food monitoring technology over the coming year. It is obvious that implementing supply chain technology will have many benefits, and predictive analytics will be essential for preserving client loyalty and assisting hospitality firms to stay competitive.

1.5 Importance of food safety

Food safety is important because it helps to ensure that consumers are protected from the risk of food borne illness. It also helps to prevent consumers from risk of health – related conditions such as allergy and even death.

It protects food processing establishment from product recalls when results in financial losses due to unsafe products. Food safety helps to prevent the spread of germs in the food service area. It is to ensure that food is safe to eat and will not lead to outbreak of food borne illness.

Effective food safety management system usually helps food handlers to manage food safety procedures which will assist in reducing risk that may arise.

Self-Assessment Exercises 2

1. State the four reasons why Hospitality Industry needs food safety solutions.
2. List four importance of food safety according to Njunina (2021)

According to David and Patricia (2011), the following are the reasons why food safety is important in any food service business, to:

a. Avoid any incidence of food poisoning
b. Build a good reputation locally
c. Give customers (and staff) confidence in the food/services provided.
d. Incur less wastage – therefore running costs will be lower
e. Provide pleasant working conditions for staff, leading to staff retention and greater job security.

f. Receive favorable press reviews.

g. To build and retain desired levels of business.

However, food safety is crucial because it protects the wellbeing and security of people who consume food produced through industrial procedures.

The financial success of an organization and its ability to continue operating as a food facility may be affected by the lack of food safety policies and initiatives. Statistics and research from throughout the world have demonstrated that eateries without a HACCP or a food safety program are at risk.

1. Recall of a food product after consumption-related disease cases were reported.
2. Revenue loss brought on either a drop in sales or a product recall.
3. Lower sales as a result of consumer loss of faith in the product.
4. Consumer lawsuits result in significant financial settlements.
5. Forced closure as a result of inadequate processing standards.
6. Falling sales revenues cause bankruptcy (www.animalcarevet.com)

However, the following are the impact of food safety in food establishment

1. The price of food recalls to businesses

Ineffective food safety protocols might result in contaminated products getting into the food supply. Food firms experience significant operational disruptions if a faulty product is found as they handle and bear the expense of product recalls.

Companies lose an average of $10 million USD in direct, observable expenses as a result of food recalls. But possibly even more costly is the long-term impact that a product recall may have on

consumer confidence. A whopping 21% of consumers claim they won't ever buy anything else from a company that has to recall one of its food goods.

2. **Unsafe food's human cost**

It would be difficult to overstate how crucial food safety is to contemporary life. Over 200 avoidable diseases are mostly caused by issues with food safety worldwide. One in ten people will become sick or hurt from food every year. More than 25% of the victims of contaminated food poisoning each year are believed to be youngsters under the age of five.

In addition to the immediate human cost, poor food safety has a larger knock-on effect that impedes socioeconomic advancement, particularly in developing countries. According to the World Health Organization, there are indissoluble ties between food security, nutrition, and safety. The absence of healthy food results in a "vicious cycle of disease and malnutrition" that burdens public health systems, stymies social and economic advancement, and lowers quality of life (https://www.sesotec.com).

Moreover, the following are the importance of food safety according to Njunina (2021):

1. **Protection from foodborne illnesses and other food-related injuries.**

The main objective of food safety is to protect consumers of food products from foodborne diseases or injuries related to food consumption. Foodborne illnesses are a major threat to food businesses and affect everyone all over the world as a result of inadequate food safety. These effects are mainly caused by foodborne pathogens that may include harmful bacteria, fungi, yeasts, parasites, or viruses. Additionally, chemical substances, heavy metals, and excessive additives can also cause foodborne illnesses and acute poisoning. Depending on the nature of

your products, a pathogen is expected to thrive with inadequate food safety control measures. Foodborne infections and injuries can also arise as a result of physical hazards such as shards of glass, pieces of metals, or any hard objects that have contaminated your food in production. With proper food safety measures, you can assure that the food you serve safe food and that the chance of infection is low.

2. Reduced cost from food safety issues.

Unsafe food with proven safety issues may be deemed unfit for consumption and may merit being disposed of. Defective product recalls cost companies more and will affect your profits and can even cause business closure. The cost of food recalls is not only seen in terms of profits. If the food safety issue has reached a widespread scale, you may be liable to pay for medical expenses or lawsuits concerning damages. On the side of consumers, proper food safety practices can reduce costly health care expenses from less risk of disease occurrence. Consuming unsanitary food may lead to hospitalization and contribute to the cost of health care.

3. Reduce waste.

Food products that have been proven to have food safety issues may be subjected to disposal. Through the use of proper food safety practices, a food business can cut waste as a result of a better food production process. Food safety management systems are also designed to detect and control food hazards even before they enter production which can lead to more waste if processed further.

4. A better way of living.

Any foodborne illness affects productivity in consumers. Once afflicted, consumers will be able to function well and may even need hospitalization in extreme cases. These events cause dramatic disruptions in everyday activities. If food safety practices are applied both in a food service establishment and at home, these cases can be prevented. Everyone can enjoy the delights that foods bring and healthy life without the inconvenience and dangers of food safety hazards.

5. Sustainable food production.

Some food production practices have already received backlash from different communities because of the negative effects they contribute to the environment. Proper food safety practices include food manufacturing processes that not only protect the consumer but also take into account the environment. Practices such as reducing synthetic fertilizers that can leach into the food products are controlled under food safety legislation. In addition, food safety practices include assurance of clean drinking water and the reduction of air, sewage, and other environmental pollutants which significantly contribute to the environment. These practices go a long way. Contaminated water can easily affect all other ingredients and enter the human body since water is a key ingredient in almost all processes.

6. Safer food globalization.

All laws about food safety are designed to protect consumers from food safety issues. Adhering to these comprehensive guidelines makes your products as competitive as possible, especially in the fast-paced globalization of the food industry. With proper food safety management systems, routes to a broader distribution channel become open for your food business.

1.6 Summary

This unit talked about the meaning of food safety in food service establishment. It is when food is free from poisonous substances and acceptable for human consumption that food can be described as safe. It is based on this that food safety is important in a food service establishment. Therefore, knowing the importance and benefits of food safety is necessary. Food safety is important because it helps to ensure that consumers are protected from the risk of food borne illness, and also helps to prevent consumers from risk of health – related conditions such as allergy and even death.

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1.8 ANSWER TO SAE 1

1. Food safety refers to the processes and practices used to ensure that food consumed does not hurt anyone and serve its intended purpose.

2. The purposes of food safety are to:

i. Ensure that foods are safe for human consumption.

ii. Make sure that food produced is up to standards and safe to consumers.

iii. Ensure that food contaminated by virus, bacteria and parasite that cause food poisoning are eliminated.

iv. Ensure that food poisoning that may lead to kidney failure or even death are reduced to the bearest minimum.

v. Ensure that babies, children, older people and pregnant women that are vulnerable to food poisoning are eliminated.

Bii) Food safety is important because:

i. It helps to ensure that consumers are protected from the risk of food borne illness.

ii. It also helps to prevent consumers from risk of health – related conditions such as allergy and even death.

iii. It protects food processing establishment from product recalls when results in financial losses due to unsafe products.

iv. Food safety helps to prevent the spread of germs in the food service area.

iii. It is to ensure that food is safe to eat and will not lead to outbreak of food borne illness.

ANSWER TO SAE 2

1. The following are the reasons why food safety is important in any food service business, to:

a. Avoid any incidence of food poisoning

b. Build a good reputation locally

c. Give customers (and staff) confidence in the food/services provided.

d. Incur less wastage – therefore running costs will be lower

2. The following are importance of food safety according to Njunina (2021):

1. Protection from foodborne illnesses and other food-related injuries.
2. Reduced cost from food safety issues.
3. Reduce waste.
4. A better way of living.
5. Sustainable food production.
6. Safer food globalization.

Unit 2 Food Safety Matters Relating To Personnel

Unit Structure

2.1 Introduction

Food safety was described by Henson and Traill as the opposite of food risk, or the likelihood of not getting sick after eating a certain food (Henson and Traill, 1993). Food safety is regarded as a notion of utmost significance since it serves a crucial role in promoting public health (WHO, 2000). Food safety refers to the assurance that when food is prepared and/or consumed in accordance with its intended use, it won't hurt the consumer.

However, in any food service establishment, for you to have a safe environment and ensure that food are safe for human consumption, the hygienic condition of the personnel involved matter a lot. This is because the personnel can contaminate the food during production period. They can carry pathogens that can infect the food during preparation, processing, packaging and transport phases.

Personnel can also contaminate the food through their saliva, breathing, cuts even with their clothes, hands, hair, touching of their nose among others. For these reasons, it is important for the personnel to maintain personal hygiene in their working place.

The employer has to inform the staff with appropriate training programme for the responsibilities that the staff must follow.

2.2 Learning Outcomes

At the end of this unit, student would be expected to:

- Discuss the responsibilities of employee (personnel) in an organization in order to ensure food safety
- Evaluates the responsibilities of employer in an organization in order to ensure personnel maintained food safety

Self-Assessment Exercises 1

1. As a caterer in hospitality industry, state five (5) responsibilities you have in the organization in order to ensure food safety
2. Food Safety Supervisors have arrays of duties which relate to maintaining and improving a business' food safety, explain.

2.3 Responsibilities of employee (personnel) in an organization in order to ensure food safety

Employees in any organization are in charge of handling food, which increases the likelihood that the food they handle will get contaminated. This is consistent with Richard (2017)'s assertion that food handlers can both cause and facilitate food contamination in Jim and Christine (2017). He argued that food handlers' personal hygiene is crucial to the prevention of food poisoning, which is primarily related to hand cleanliness. He also argued that identifying the potential ways that food handlers might contaminate food can aid in the development of effective interventions that can lower or completely eliminate the risk of contamination.

According to David and Patricia (2011), an organization's workers have the following obligations to ensure food safety:

a. Employees are forbidden from doing anything or working in a way that endangers or taints the food they handle.

b. They must support their employers' efforts to maintain food safety and work with them to implement those efforts.

c. Employees are required to attend scheduled training and instruction.

d. They must uphold strict personal hygiene standards.

e. Before starting work, employees are required to notify managers or supervisors of any diseases they may have.

f. They are also required to notify them of any breakages, shortages, or flaws that could endanger food safety.

Prevention, detection, and management of food borne risks are all made possible by food safety. Agriculture, market access, tourism, and sustainable development all benefit from this; as well as food security, human health, and economic prosperity.

However, personnel are in charge of all manufacturing phases, as well as cleaning, disinfection, control, conservation, and their own health, from the acceptance of the raw material to the shipment. The employer is required to provide the staff with the necessary training in order to inform them of the obligations they would have (Hand book 2018).

These obligations include:

- The personnel must follow these rules in order to ensure that foods the handles are safe for human consumption.
- The personnel should maintain personal hygiene and also protect their health by eating balanced diet.
- They should make sure that they are physically fit and avoid any respiratory infections.

- If there is any accident during production like cuts, burn, fall or even infectious diseases like measles, skin rashes should be reported to the employer immediately.
- Rules and regulations guiding the establishment as regards to hygienic practices must be followed by the personnel.
- The personnel should always wash their hands after:
    - ✓ Using the toilet
    - ✓ Handling raw foods
    - ✓ Touching your hair, face or nose
    - ✓ Eating or drinking
    - ✓ Sneezing or coughing
    - ✓ Clean

- Personnel should:
    - ✓ Keep nails short and clean
    - ✓ Take shower every day
    - ✓ Cover all cuts and sores with bandages and plastic gloves
    - ✓ Change their under wears every day.
    - ✓ Wear hair restraints
    - ✓ Wash your hair and bath daily
    - ✓ Wear a clean uniform and apron
- Mouth must cover during coughing and sneezing
- Smoking is not allowed

However, the measures listed below are some common good hygiene guidelines that everyone who prepares food should take into account (www.pecb.com).

1. Hands should be thoroughly cleaned with clean water and soap on a frequent basis, especially before and after using kitchen utensils, before and after using the bathroom, and before and after handling raw food, garbage, or chemicals.

2. It is best to avoid touching your hair, nose, or mouth when handling food, as well as sneezing or coughing into your hands.

Hands should be washed if these actions cannot be avoided.

3. Refrain from engaging in unhygienic behaviors while handling food, such as eating, drinking, chewing, and smoking.

4. Employees in food handling areas should dress appropriately, neatly, and, where necessary, in protective gear such an apron, hair restraints, gloves, etc

The personnel should also be trained on environmental hygiene, security measures in case of accidents, and food sanitation among others.

The employer should make sure that all the materials and facilities that will assist the personnel in providing quality services as regards to safety of food are available (Hygiene and Sanitation Hand book 2018).

A Food Safety Supervisor is an employee, licensee, manager, or external contractor nominated by a food business to manage its food safety. A business manager can also nominate themselves to perform the role of Food Safety Supervisor (www.foodsafety.com).

A Food Safety Supervisor has an array of duties which relate to maintaining and improving a business' food safety. To responsibly manage a business' food safety, a Food Safety Supervisor must:

- Demonstrate the authority to act as a Food Safety Supervisor with a Statement of Attainment from a nationally registered RTO
- Supervise staff in food handling to ensure compliance with food safety regulations
- Manage the food business' Food Safety Plan and Food Safety Program
- If away, ensure the food business is protected and maintains high standards of food safety in their absence (www.foodsafety.com)

A Food Safety Supervisor is a business' food safety encyclopedia and should keep up to date on changes to food safety regulations.

- Protect customers from food-borne illnesses
- Manage physical, chemical and biological hazards in the workplace to protect workers
- Train and supervise staff in the safe preparation of food
- Devise a Food Safety Program to improve workplace efficiency
- Build a Food Safety Plan in alignment or tailored for the business
- Ensure that all deliveries from suppliers are safe and stored correctly
- Serve as a point of contact for local government
- Prepare the business for the event of a food safety emergency (www.foodsafety.com)

2.4 Employer Responsibilities

Self-Assessment Exercises 2

1. State six (6) responsibilities of employer in an organization in order to ensure that personnel maintained food safety in an organization

2. As a food handler in Domingo hotel, explain how you can achieve food safety.

The employer has a lot of responsibilities to ensure that their personnel maintained food safety practices in their establishment. It is the responsibility of the employer to make sure that during recruitment of staff, examination of the health status of the personnel becomes one of the criteria for employment.

The employer should do series of test to determine if the personnel are in good health to prepare and serve the food to customers.

The employer should also ensure that the employees follow the lay down rules and regulations as regards to hygiene and safety measures in order to maintain a good standard that will make the food consumed by the consumers free from contamination

The employer should ensure that the personnel are trained periodically on those areas that will assist the personnel to maintain both personal hygiene and food safety in the organization

The personnel should also be trained on environmental hygiene, security measures in case of accidents, and food sanitation among others.

The employer should make sure that all the materials and facilities that will assist the personnel in providing quality services as regards to safety of food are available (Hygiene and Sanitation Hand book 2018).

2.5 Summary

Health conditions of personnel handling food in food establishment are important. This is because when food handler is ill the chances of contaminating the food which result to food

poisoning to consumers are certain, therefore, it necessary for food handlers to know their responsibilities. In order to achieve that the employers also has a lot of responsibilities to perform by training their employees periodically on those areas that will assist the personnel to maintain both personal hygiene and food safety in the organization.

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2.9 Answer to Self-Assessment Exercises

ANSWER TO SAE 1

1. The five responsibilities of employee are:

a. Employees are forbidden from doing anything or working in a way that endangers or taints the food they handle.

b. They must support their employers' efforts to maintain food safety and work with them to implement those efforts.

c. Employees are required to attend scheduled training and instruction.

d. They must uphold strict personal hygiene standards.

e. Before starting work, employees are required to notify managers or supervisors of any diseases they may have.

2. To responsibly manage a business' food safety, a Food Safety Supervisor must:

- Demonstrate the authority to act as a Food Safety Supervisor with a Statement of Attainment from a nationally registered RTO
- Supervise staff in food handling to ensure compliance with food safety regulations
- Manage the food business' Food Safety Plan and Food Safety Program

ANSWER TO SAE 2

1. The six responsibilities of employer to ensure food safety in an organization are as follows:

i. The employer should do series of test to determine if the personnel are in good health to prepare and serve the food to customers.

ii. The employer should also ensure that the employees follow the lay down rules and regulations as regards to hygiene and safety measures in order to maintain a good standard that will make the food consumed by the consumers free from contamination

iii. The employer should ensure that the personnel are trained periodically on those areas that will assist the personnel to maintain both personal hygiene and food safety in the organization

iv. The personnel should also be trained on environmental hygiene, security measures in case of accidents, and food sanitation among others.

v. The employer should make sure that all the materials and facilities that will assist the personnel in providing quality services as regards to safety of food are available

vi. It is the responsibility of the employer to make sure that during recruitment of staff, examination of the health status of the personnel becomes one of the criteria for employment.

2. As food handler in Domingo hotel the following rules are what are should follow to ensure safety in the organization:

a. My hands should be thoroughly cleaned with clean water and soap on a frequent basis, especially before and after using kitchen utensils, before and after using the bathroom, and before and after handling raw food, garbage, or chemicals.

2. It is best to avoid touching my hair, nose, or mouth when handling food, as well as sneezing or coughing into my hands. Hands should be washed if these actions cannot be avoided.

3. Refrain from engaging in unhygienic behaviors while handling food, such as eating, drinking, chewing, and smoking.

4. As an Employee in food handling areas I should dress appropriately, neatly, and, where necessary, in protective gear such an apron, hair restraints, gloves, etc

Unit 3 Examination of Public health laws and special problem in Hospitality Sanitation

Unit Structure

3.1 Introduction

According to Lawrence, Benjamin and John (2017), the primary responsibility of government is to protect the health and wellbeing of its citizens. It does this through passing and upholding laws that are intended to foster the conditions necessary for citizens to live safe, healthy lives.

3.2 Learning Outcomes

At the end of this unit, students will:

- Explain the meaning and Concept of Public Health Law
- Discuss Public Health Laws in Nigeria
- Evaluates Public Health Laws in Nigeria and Hospitality sanitation

Self-Assessment Exercises

1. define the term public health 2. what is public health law

3.3. Meaning and Concept of Public Health Law

The definition of public health is "the science and art of avoiding disease, extending life, and promoting health through the coordinated efforts and conscious decisions of society, organizations, both public and private, communities, and individuals."(Gatseva and Argirova, 2011)).

Winslow (1920) defined public health as the way of avoiding diseases, extending life, and promoting health and effectiveness through coordinated community initiatives for environmental

sanitation, infection control in the neighborhood, individual education, personal health, and, eventually, a decrease in mortality,, the planning of health care and nursing services for early disease detection, prevention, and treatment, as well as the creation of the social infrastructure necessary to guarantee every member of the community a level of life conducive to the preservation or enhancement of health. ."

The goal of public health is to "promote and safeguard the health of individuals and the communities in which they reside, learn, work, and play." according to the American Public Health Association.

The following is how the Public Health Association of Australia describes its function: "Public health involves, but transcends, the care of people, including the promotion of health, support for people with disabilities, recovery and rehabilitation, and work on disease and disability prevention."

This framework gives the Association's job specific meaning and expertly informs it, along with a focus on the social, economic, and environmental determinants of health.

The American Public Health Association defines "public health" as the practice of preventing illness and promoting good health across populations, ranging from small towns to entire nations.

All governmental, private, and nonprofit organizations that support the provision of essential public health services within a jurisdiction are typically referred to as "public health systems," according to the Centers for Disease Control and Prevention (CDC).

Public health law on the other hand is the study of the legal rights and responsibilities of the state, in cooperation with its partners (such as the health care industry, business, the community, the media, and academia), to ensure that people have access to the necessary conditions for good health (to identify, prevent, and reduce population health risks), as well as the restrictions on the state's ability to restrict for the greater good the autonomy, privacy, liberty, proprietary, and other legally protected interests of individuals. In line with the principles of social justice, the main goal of public health law is to promote the population's highest level of physical and mental health (www.content.ucpress.edu.com).

Public health law is an area of law that focuses on issues involving the government's legal obligations and powers to "ensure the conditions for people to be healthy," according to Gostin (2008), and how to strike a balance between these obligations and powers and "individual rights to autonomy, privacy, liberty, property, and other legally protected interests" (St. Paul, 2010).

Public health law covers a lot of ground. Legal difficulties pertaining to public health can range from straightforward concerns of legal interpretation to intricate issues including public health policy, social justice, and ethics.

Historical and contemporary advancements in public health, such as those in infectious disease control, food safety, occupational health, accident prevention, and emergency planning and response, have benefited greatly from the use of legal tools including statutes, regulations, and litigation. For instance, state courts have upheld vaccine requirements, local governments have created clean indoor air legislation to address tobacco as a health risk, and federal authorities have developed vehicle performance crash criteria to advance vehicle safety (Moulton, Goodman, and Parmet 2007)

A type of public health policy known as public health law combines ideas from the legal, medical, healthcare, and public health fields. Certain legal public health actions are frequently included in public health law. In order to ensure population-level health, public health law must be implemented, notably through governmental bodies. It establishes the legal foundation for and limitations on the practice of public health professionals. Both regular lawyers and public health professionals have started to specialize in public health law in recent decades. Legal competence in public health is required at both the national and international levels by international legislation such as international health rules and public health treaties (Gostin, 2000).

The Office for State, Tribal, Local and Territorial Support at CDC oversees the Public Health Law Program (PHLP) (OSTLTS). In state, tribal, local, and territorial (STLT) jurisdictions, the PHLP creates tools for the law and offers legal technical help to public health practitioners and policy makers.

The Public Health Law Program (PHLP) collaborates with other partners, including state and territory health authorities, to:

- define public health law priorities
- Investigate the legislation that affect public health.
- Analyze the legal readiness for public health
- Develop and disseminate public health law courses, recommendations, papers, studies, and toolkits.
- Conduct comparative assessments across jurisdictions.

Self-Assessment Exercises 2

1 list five examples of public health law in Nigeria 2. What is the goal of public health?

3.4 Public Health Laws in Nigeria

The following are examples of public health laws in Nigeria:

3.4.1. The National Environmental Standards and Regulation Enforcement Agency Act

The Federal Ministry of Environment administers the National Environmental Standards and Regulation Enforcement Agency (NESREA) Act, 2007, which replaced the Federal Environmental Protection Agency (FEPA) Act of 1988, in order to safeguard and encourage the sustainable use of the environment and its natural resources (Hakeen, 2013).

Through monitoring and regulating measures, the law gives authority to ensure adherence to national and international regulations on environmental sanitation and pollution prevention and control. The Agency is also given the authority under the legislation to create and revise laws on sanitary standards, dangerous substance control, effluent limitations, and other types of environmental degradation. However, it is illegal to release dangerous compounds into the environment unless you have a valid permit, according to the legislation.

The law also creates laws, such as the National Environmental Protection (Pollution Abatement in Industries and Facilities Producing Waste) Regulation on the country's environmental protection (Hakeen, 2013).

3.4.2 The Federal Solid and Hazardous Waste Management Regulations,

According to the Federal Solid and Hazardous Waste Management Regulations of 1991, industries are required to identify solid hazardous wastes that pose a risk to the environment and public health and to investigate the viability of recycling them (Hakeen, 2013).

.3.4.3 The Harmful Waste (Special Criminal Provisions) Act

According to Nigeria's Dangerous Waste (Special Criminal Provisions) Act of 1988, it is illegal to transport, deposit, or dump harmful waste in the country's air, land, or water without a permit (Hakeen, 2013).

The solid waste and refuse disposal law governing the collection, handling, and disposal of all solid and hazardous garbage and waste from homes, businesses, and other sources. Additionally, it entails maintaining the aesthetic appeal of residential areas, the environment by creating green spaces, insect and vector control, a reliable supply of water, drainage maintenance, and functional trash cans and gutters. This is permitted by Section 15 of the Federal Environmental Protection Agency Decrees No. 58 of 1988 and 59 of 1992, which amended the original Decree, which is now Act of the National Assembly. The Pollution Abatement in Industries and Facilities Generating Waste of 1991 and the National Guidelines and Standards for Environmental Pollution Control in Nigeria. In particular, the State Environmental Sanitation Legislation, as well as the numerous State Environmental Protection Agency laws, (Saka, 2019).

3.4.4 Criminal Code Law

Protection of the environment and the prevention of risks to public health are both addressed in the Criminal Code Law.

3.4.5 Regulations for National Environmental (Waste Management and Sanitation)

There are sufficient provisions for waste control and environmental sanitation in the National Environmental (Sanitation and Waste Control) Regulation of 2009, (Hakeen, 2013).

3.4.5. Regulations for the Management of Hazardous and Solid Waste

The Management of Solid and Hazardous Waste Regulations establish rules for the collection, handling, and disposal of hazardous and solid waste from municipal and industrial sources. They also provide a detailed list of chemicals and chemical waste by toxicity categories, (Hakeen, 2013).

3.4.6 Environmental national policy

On November 27, 1989, the Federal Government of Nigeria announced the creation of the National Policy on Environment. The publications outline policies, procedures, and tactics for accomplishing the policy goal of sustainable development, (Hakeen, 2013).

3.4.7 Disease notice and quarantine service laws

These are another kind of public health legislation. According to this law, all levels of government, including the international community, are required to inform the public when certain diseases, known as international notifiable diseases, are present. Some diseases must be reported to the World Health Organization in accordance with the International Health Regulations of 1969 in order to support the organization's position as a worldwide watchdog and advisor. The regulations in effect as of 1969 are rather simple and concentrate on reporting of the three major diseases, cholera, yellow fever, and plague.

The scope of the updated International Health Regulations 2005, which will go into effect in June 2007, has been expanded to cover new emerging diseases like Avian Influenza, SARS, and Ebola. The notification of certain diseases is no longer restricted to the Ebola virus and Mad Cow Disease among others. While it does include a number of particular diseases, it also establishes a constrained set of standards to help determine whether an incident needs to be reported to WHO, (Saka, 2019).

Similar to this, people who are afflicted with the disease are anticipated to be kept apart, while those who are suspected of having been exposed to it and are anticipated to contract it are quarantined in order to prevent the spread of the illness to other members of the public (Wings et al., 2007). Despite the fact that the two names are occasionally used synonymously, they have separate meanings and processes. Isolation in this situation refers to keeping a patient who is known to have an infectious illness away from other individuals. While quarantine refers to measures that limit a healthy person's movement after they may have been exposed to a contagious illness and may offer a risk of spreading it to others (Saka, 2019).

3.4.8 Air Pollution Law

The law governing air pollution forbids the release of chemicals into the atmosphere that are harmful to human health and places limits on greenhouse gas and carbon dioxide emissions. This is the next area of public and environmental law that we will look at.

These pollutants not only impair human health, but also destroy the ozone layer, causing acid rains in the United Kingdom, global warming, an increase in sea level, deforestation, and desertification, which are estimated to be 100,000km2 and 48km each year (Bell and McGillivray, 2008). A law called the Factories Act controls air pollution. Among others, the

1990 Federa l Environmental Protection Agency Act, Cap. 126 LFN, the 1987 Montreal Protocol on Substances that Deplete the Ozone Layer, the 1985 Vienna Convention for the Protection of the Ozone Layer, and the 1992 Framework Convention on Climate Change, (Saka, 2019).

3.4.9 Water Pollution Law

Water pollution laws are another kind of public health regulations that forbid the disposal of any hazardous waste that could endanger both people and marine life. Water pollution is one of the most prevalent types of pollution because industries, particularly those that explore for oil in places like the Nigerian Niger Delta, frequently discharge their waste into the water or unintentionally produce pollution. Mercury is a particularly dangerous water contaminant for humans when it is consumed as a secondary consequence of eating seafood. The Minimata Bay pollution crisis in Japan in 1959 was the first significant instance of mercury poisoning-related water contamination. Based on the level of pollution and the threat posed by mercury fishing and other marine life, this led to the death of domestic animals like cats, fish, and humans. This would continue until the following 1000 years. This demonstrates just how harmful mercury can be when released into the sea. Several laws regulate water pollution, including the 1915 Water Workers Act, the 1917 Public Health Act, the 1917 Mineral Act, the 1969 Petroleum Act, the 1990 Oil in Navigational Water Act, the 1990 River Basin Development Authority Act, the 1990 Sea Fisheries Act, the 1990 Exclusive Economic Zone Act, the 1982 Law of the Sea Convention, and the 1990 Federal Environmental Protection Act, (Saka, 2019).

4.1.10 Noise Pollution Law

Public health laws also include laws against noise pollution. Although, in its early stages, it was aimed towards factories to make sure the noise they produce would not result in hearing issues

for their personnel. However, this has changed, and now the law on noise pollution is broader and includes the production of noise by businesses, houses, households, athletic venues, recreational facilities, generators, automobiles, and even building sites. The National Environmental Protection (Pollution Abatement Industries and Facilities Generating Waste Regulation of 1991, particularly Section 2 of the regulation, is of particular relevance in this case. It is governed by the Factory Decree of 1987, Federal Environmental Protection Agency Decree of 1992, and the National Environmental Protection (Pollution Abatement Industries and Facilities Generating Waste Regulation of 1991. It enables individuals and communities to monitor as well as government agencies involved in environmental control. The law also mandates that businesses have pollution control monitoring and control units, install them, and, if possible, contract out these services to assure compliance, (Saka, 2019).

4.1.11: A legislation that controls how pharmaceuticals, food, and food products are made, produced, distributed, and sold

The legislation that controls the production, distribution, and sale of medications, food, and food-related goods is another crucial public health regulation. Clearly defining the differences between food and food products would be important. Foods are items that are already ready to be consumed, such as yogurt, bean cakes, bread, and margarines. Food items, on the other hand, are semi-finished goods that require additional processing before they can be consumed. For instance, cow milk is used to make yogurt, while wheat is used to make bread, and beans are used to make bean cakes, among other things. According to the legislation, these goods must be healthy. Therefore, it is illegal to expose food and food products that people would normally consume on the street. However, because of the law's lax enforcement, food is frequently exposed with flies perched on it, and occasionally even environmental health officers—who are

responsible for upholding the law—purchase and consume such products without raising an objection. In order to assure conformity with established criteria, medications must also be manufactured, (Saka, 2019).

3.5 Summary

The health of any public servant is important in any organization. Therefore ensuring that the health of individuals and the communities in which they reside, learn, work, and play is safeguarded is important. Public health involves, but transcends, the care of people, including the promotion of health, support for people with disabilities, recovery and rehabilitation, and work on disease and disability prevention. Public health law on the other hand is the study of the legal rights and responsibilities of the state, in cooperation with its partners (such as the health care industry, business, the community, the media, and academia), to ensure that people have access to the necessary conditions for good health (to identify, prevent, and reduce population health risks), as well as the restrictions on the state's ability to restrict for the greater good the autonomy, privacy, liberty, proprietary, and other legally protected interests of individuals. However, in Nigeria, air pollution law, noise pollution law, water pollution law, the Federal Solid and Hazardous Waste Management Regulations, and disease notice and quarantine service laws, among others are examples of public health laws in Nigeria.

3.6 References/Further Readings

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3.7 Answer to Self-Assessment Exercises

Answer to SAE 1

1. Public health is the science and art of avoiding disease, extending life, and promoting health through the coordinated efforts and conscious decisions of society, organizations, both public and private, communities, and individuals.

2. Public health law is an area of law that focuses on issues involving the government's legal obligations and powers to "ensure the conditions for people to be healthy.

Answer to SAE 2

1. Examples of public health laws in Nigeria are air pollution law, noise pollution law, water pollution law, the Federal solid and hazardous waste management regulations; and disease notice and quarantine service laws, among others.

2. The goal of public health is to promote and safeguard the health of individuals and the communities, in which they reside, learn, work, and play.

3.8 Glossary

Food safety

Food safety is a branch of science that deals with handling, preparing, and storing food to lower the risk of getting a foodborne illness

Public health

Public health is the science and art of avoiding disease, extending life, and promoting health through the coordinated efforts and conscious decisions of society, organizations, both public and private, communities, and individuals.

Public health law

Public health law is an area of law that focuses on issues involving the government's legal obligations and powers to "ensure the conditions for people to be healthy.

MODULE 2 CAUSES AND PREVENTION OF FOOD BORNE ILLNESS

Introduction

The student is expected to learn the causes of food borne illness. He will also learn how food borne illness will be prevented. He will also learn the principles and practices involved in safe handling of food products including HACCP and GMP procedures.

The module is divided into three units, namely:

Unit 1 Causes of food borne illness

Unit 2 Prevention of food borne illness

Unit 3 Principles and practices involved in safe handling of food products

Unit 1 Causes of Food Borne Illness

Unit Structure

1.1 Introduction

Food borne illness has become an issue in our society today. Food borne illness has killed a lot of people as a result of eating contaminated food. Foods that are not protected when preparing can lead to food borne illness. Therefore, understanding what can cause food borne illness is necessary.

1.2 Learning Outcomes

At the end of this unit the student would be expected to have learnt about the:

- Meaning of food borne illness
- Cause of food borne illness

1.2 Food Borne Illness

Self Assessment Exercise 1

1. As a caterer, how can you explain the term food borne illness?

2. What are the three major causes of food borne illness

1.3.1 Meaning of Food Borne Illness

Food borne illness is a situation whereby one consumed contaminated and unprotected food that results to illness. It is any sickness that results from consuming contaminated food by pathogenic bacteria, viruses and parasite that contaminate food. An educational foundation textbook (1985) defines a foodborne illness as a sickness that is spread or acquired by humans through food.

According to the author, some of the items linked to foodborne illnesses are already hazardous by nature, such as some kinds of fish or mushrooms. The index in the above definitions show that any illness that resulted when one eats food and beverages that are contaminated is food borne illness.

1. 3.2 Causes of Food Borne Illness

There are many factors that cause food borne illness. Some are as a result our body system, the chemical used in washing and preserving the food among others. However, the following are the causes of food borne illness.

1.3.2.1 Physical Hazard

Physical hazard occurs when physical object gets into the food. This is the process by which physical substances are contained in food. The physical objects include hair, fingernails, paperclips, coins, glass, stalks, garbage, plastics, dust, soil, stone, and metals among others. These objects are harmful when they come in contact with any food items which can result to illness when consumed. This is supported by David et al (2011) that some of these could well be harmful if eaten, but they are mostly objectionable and cause for customers complaint. When high amounts of physical substances are contained in food that can lead to food poisoning is food hazard. A textbook published by the Educational Foundation in 1985 claims that physical pollutants such glass chips from broken light fixtures or glassware and metal shards from kitchen and tableware are clearly dangerous. To reduce these risks, the manager of the food service department must be vigilant.

However, consumption of food tainted with environmental toxins during processing and packing typically results in the physical hazard. According to Potter and Hotchkiss (1995), the primary

materials to be concerned about as physical risks include glass shards, wood and stone fragments, small metal pieces (such as paper clips), miscellaneous trash, insulating material, and a few other personal items. Food processors utilize an electronic metal detector to test the goods for metal impurities since ingesting those particles poses a health concern, particularly for metal contaminants.

1.3.2.2 Chemical Hazard

Another risk that resulted in food poisoning is chemical hazard. This occurs when the quality of food is harmed by chemicals designed to preserve and protect it, resulting in food poisoning among customers. Chemicals used in the manufacturing of several items used in the hospitality industry (kitchen) contaminate the food, resulting in food poisoning. Chemicals that cause hazards in hotels include kitchen cleaning materials, pesticides, agricultural chemicals, disinfectants, and degreasers, to name a few. As a result of the pesticides used on farm produce such as vegetables, yams, and cassava to increase yield, the food becomes contaminated when prepared. Food poisoning can occur as a result. Chemicals can enter food through leaks, spills, and other food-related mishaps. Acid food should not be cooked or kept in equipment containing metals like antimony, cadmium, lead, zinc, aluminum, or copper, according to David et al (2011), unless the metal is specifically designed for that purpose.

According to Käferstein and Abdulsallam (1999), the food chain for humans may be impacted by harmful substances discharged into the environment by industrial operations and agricultural practices. They are also concerned about the rise in industrial waste being discharged into the environment and the excessive use of agrochemicals, especially in developing nations, which could pose a long-term threat to the safety of the food in such areas.

The three categories of chemical dangers that the manager of a food service establishment should pay particular attention to are as follows:

- Pesticide contamination of foodstuffs,
- The overuse of preservatives and additions
- Harmful metal poisoning of food

Pesticide-Induced Food Contamination

Chemical dangers such as pesticides can easily infect food. Pesticides can infiltrate the food supply in a variety of ways. The pathways include the following, per an Educational Foundation Textbook from 1985:

- Food animals and plants may absorb pesticidal chemicals throughout the growth process and incorporate them in living cells.
- Pesticides and fungicides can be given directly to the growing plant or animal to protect it from insects, fungus, and microbial attack.
- Chemical agents that are used in food production and at the food service facility have the potential to contaminate food.

Use of Excessive Amounts of Preservatives and Additives

The use of excessive amounts of addictives and preservatives is another chemical risk that impacts food. Emulsifiers, firming agents, flavorings, artificial sweeteners, dietary supplements, oxidizers, antioxidizers, stabilizers, thickeners, and anticaking agents are examples of addictive substances. Additionally included in this broad group are color additives. For example, nitrates,

which are employed as coloring and preservatives in meat, are deadly when present in high doses.

The use of ingredients to preserve food's flavor, safety, and consistency is being connected more and more to food contamination. Sulfating agents are preservatives that keep fruits and vegetables, mainly lettuce but also potatoes and coleslaw, fresh and their color vibrant. Among sensitive people, especially asthmatics, some of them have been connected to numerous fatal allergic reactions. The effects include diarrhoea, nausea, asthma episodes, and occasionally unconsciousness. (Ed. Foundation Textbook, 1985)

Metal-related food contamination

Another method for chemically contaminating food is through metals. When certain foods contact meals, contamination occurs and illnesses develop when the foods are consumed.

When very acidic foods are prepared or stored in galvanized, copper, brass, or gray enamelware containers that may have been coated with antimony or cadmium, poisoning may follow. Sauerkraut, tomatoes, fruit gelatins, lemonade, and fruit punches have all been linked to metal poisonings.

Chemical food poisoning instances have involved copper water pipes that were unintentionally exposed to fizzy beverages in dispensers. Rapid and sudden onsets of symptoms are characteristics of copper poisoning (Educational Foundation Textbook 1985).

1.3.2.3 Biological Hazard

According to a textbook produced by the Educational Foundation in 1985, the primary causes of biological risks include noxious plants and fish as well as hazardous microorganisms including

bacteria, viruses, and parasites. When a hazardous bacterium infects food, it produces sickness in the consumers.

When the hygienic conditions in the production area aren't up to par, bacteria can proliferate, leading to food deterioration. Microorganism contamination includes pathogenic bacteria that cause food poisoning or food borne illness, spores and toxins, moulds, viruses, parasites, and other microorganisms, according to Asli et al (nd). Raw materials, food handlers, and poorly ventilated areas, among other things, are sources of these germs. These germs cause hepatitis A, typhoid fever, vomiting, and stomach aches.

A foodborne infection is a sickness brought on by consuming food that includes hazardous bacteria, according to an Educational Foundation Textbook (1985), which states that when biological risks cause food-borne illnesses, these illnesses are typically classed as infections or intoxication. The infection can only take place if these microbes are still alive.

When consumed food poisons or toxins make the host, the human body, unwell, this is known as a foodborne intoxication. According to the authors, certain flora, like mushrooms, and certain animals, such puffer fish, may naturally contain toxins that can be found in food. The consumption of these plants and animals by humans could lead to disease (Educational Foundation Textbook, 1985).

Examples of bacterial-based food poisonings and intoxications

One of the most prevalent foodborne illnesses in the United States is staphylococcal food poisoning. A food service worker who is familiar with the traits of these diseases and the microorganisms that cause them will have no trouble understanding the precautions that must be taken to prevent them (Educational Foundation Textbook, 1985).

Cramps, diarrhea, nausea, and vomiting are signs of staphylococcal food poisoning. These symptoms start rapidly, typically 1 to 6 hours after consuming the contaminated meal, and they remain for 28 to 48 hours (Educational Foundation Textbook, 1985).

The staphylococcus aureus bacterium, which is round or oval in shape, is what causes staphylococcal food poisoning.

S. aureus is a gram-positive coccal bacterium with a diameter of 0.5 um (Asli et al nd). Normally, they remain in the human body (Bas 2004). Staphylococcus can also be discovered in the nose's nostrils. Humans will have S arureus on their hands and other regions of their skin, hair, and scalp, as well as in unprotected scrapes, burns, and other abrasions, and in the nose and throat (David et al 2011). Human-to-human interaction has the potential to spread the virus. This is consistent with the findings of David et al (2011), who found that S. aureus is frequently found in high-risk meals that have been handled and contaminated by food handlers, then left at appropriate temperatures long enough for the bacterium to multiply to dangerous levels. The food handler may contaminate the food. Infections in the food handler's nose, skin, or throat invariably transfer harmful bacteria to the meal. S. aureus can contaminate cooked meat, potato salad, milk-based desserts like custard and chicken, as well as fish and other meat salads. Among the symptoms of S. aureus include vomiting, nausea, stomach soreness, and diarrhea.

Clostridium Perfringens Food Poisoning

The foodborne illness caused by Clostridium perfringens was first recognized in the 1890s, and by the 1950s, outbreaks of this condition were being recorded very often. Because it resembles both an infection and a state of intoxication, the sickness is difficult to categorize. Because symptoms don't show up right away, Clostridium perfringens poisoning is occasionally

categorized as an infection (8 to 22 hours). Because C. perfringens bacteria release poisonous compounds when they enter the human body, it is occasionally categorized as an intoxication (Educational Foundation Textbook, 1985).

When compared to staphylococcal intoxication, symptoms of clostridium perfrings poisoning are typically milder and resolve within 24 hours of the initial appearance (Educational Foundation Textbook, 1985).

The poisoning results from the bacteria Clostridium perfringens. C. perfringens is a pathogenic bacterium that is gram-positive, rod-shaped, and anaerobic (Adams and Moses 2008). It can be present in humans, animals, and soil at any time (Yigit and Duran, 1999). Many occurrences of C. perfringens food poisoning are likely subclinical, according to Asli (nd), because antibodies to the toxin are ubiquitous in the population. When cooked food is not properly served or stored, spores can proliferate and form new cells, resulting in food contamination. However, raw meat is one of the most common food sources of C. perfringens, but unclean vegetables can also be a substantial source of these bacteria (David et al 2011).

Its sources Dust, soil, and the gastrointestinal systems of both people and animals all contain C. perfringens bacterium. Therefore, these viruses are likely to be present with any raw food products carried into a restaurant. The foods in question include cooked meat (often beef), poultry (often turkey), and even beans that have been allowed to sit out at room temperature for a while or that have gradually been heated, reheated, or cooled to enter the temperature danger zone (Educational Foundation Textbook, 1985).

Botulism Food Intoxication

Due to its high fatality rate and the spectacular media attention surrounding each outbreak, botulism, a foodborne ailment of bacterial origin, is probably the most well-known of them to the general public. When it manifests, this disease can be lethal and is certainly a scourge.

Botulism symptoms include nausea, vomiting, headaches, double vision, and gradual respiratory paralysis. After consuming infected food, symptoms typically start to manifest 12 to 36 hours later.

Clostridium botulinum is the responsible party. Only in the absence of oxygen can the rod-shaped, spore-forming bacterium Clostridium botulinum grow. Clostridium botulinum bacteria can be found in soil, water, and in the intestines of animals, including fish.

Foods involved include home-canned, low-acid foods (green beans, mushrooms, corn, beets, spinach, figs, tuna, among others) and smoked vacuum packedfish

Foodborne Infections Of Bacteria Origin

Salmonellosis: A Food Infection

Another disease of major concern to food service managers is salmonellosis. Since salmonellosis results from the consumption of food contaminated with pathogenic bacteria. It is classified as infection.

The symptoms of salmonellosis are slower to appear than those of a staph intoxication. The illness is marked by headache, vomiting, diarrhea, abdominal pains and fever. These symptoms show themselves within 6 to 48 hours after ingestion of contaminated food.

The causative agent of salmonellosis is salmonella (Educational Foundation Textbook, 1985). Salmenella is a rod-shaped bacterium that can be found in water, soil, food plants, and contaminated people's feces (Asli et al nd). Salmonella can be transmitted to customers by the consumption of contaminated eggs, meat, poultry, and milk, as well as green vegetables contaminated with manure. Salmonella can be found in both domestic and wild animals, as well as humans. Abdominal pain, headaches, nausea, vomiting, fever, and diarrhea are some of the symptoms.

Shigellosis: A Food Infection

This is another foodborne illness of bacterial origin. It is sometimes called bacillary dysentery. The symptoms include diarrhea, cramps, and chills, sometimes fever. The bacteria responsible for shigellosis belong to the shigella genus.

Humans are the prime reservoir for the dysentery bacillus. Many people become carriers of this pathogen for periods lasting for several weeks. Carriers excrete shigella bacteria in their feces, subsequently fail to wash their hands properly and then transmit the bacteria to food. Roaches, flies and rodents are also transmitting these bacteria.

E. coli is a rod-shaped, gram-negative, facultative anaerobic bacteria (Jay, 1998). They thrive in the intestines of both people and animals, with an incubation period of 10 to 72 hours (David et. al. 2011 and Duyfff, 2002). Failure to wash hands when preparation and after consuming food; using contaminated utensils, cutting boards, and other items; raw meat and vegetables; and unpasteurized milk, among other things, are all major causes of food poisoning (David,et al 2011 and Pittrangelo, 2015). Person to person contact is an essential mechanism of transmission through the oral–fecal pathway, according to Asli et al (nd).

1.3.2.4 Advance Preparation

Because food is allowed to cool improperly during advance preparation, food poisoning outbreaks occur. When food is prepared and then left in the risk zone for an extended period of time before being served, the food becomes contaminated. If food is left out at room temperature for an extended period of time without being reheated or appropriately cooled, and it remains in the danger zone for an extended period of time, it might cause illness in the person who consumes it (BC Cook, 2015).

1.3.2.5 Infected Persons

Many hotel employees are unknowingly carrying infections in their hands, lips, and noses while displaying no symptoms of illness. They can contaminate the food they are cooking with germs if they have diarrhea, vomiting, fever, or a sore throat, for example (BC Cook, 2015).

1.3.2.6 Contaminated Raw Ingredients

Some meals are served uncooked, and the majority of germs are present. Raw egg, for example, is a food that may be served raw and is used in numerous cuisines such as Caesar salad, veggies, and hamburgers. However, simply inspecting or tasting the food will not reveal whether or not it contains infections. As a result, while employing raw food in a menu, one must be particularly cautious (BC).

1. 3.2.7 Cross-contamination

When one person distributes pathogenic bacteria to another, this is known as cross-contamination. These can occur in areas where food is processed, such as the kitchen.

When raw and cooked foods come into contact, equipment used for raw and cooked foods, and raw meat dripping on cooked ready-to-eat items, cross contamination can occur, resulting in food poisoning (David et al 2011).

Self Assessment Exercise 2

. Explain the following micro-organisms that cause food poisoning:

i. Staphylococcus aureus

ii. Clostridum perfringens

iii. Salmonella

1.3.2.8 Allergenic Hazard

Food allergies occur when a person consumes foods to which his or her body is allergic, resulting in itching, swelling of the lips, mouth, and tongue, vomiting, coughing, and other symptoms. Food allergies are unique to each person and can be avoided by understanding the substances used in food production, including pre-preparation and meals. It's a good idea to include enough information on the menu so that customers may choose foods that are healthy for them (BC Cook, 2015).

1.4 Summary

In a food service facility, food poisoning has become an issue. The cause of food borne disease has been linked to a number of factors. Physical, chemical, biological, and allergic risks are among them.

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1.6 Answer to Self-Assessment Exercise

SEA 1

1. As a caterer, food borne illness is defined as a situation whereby one consumed contaminated and unprotected food that results to illness.

2. The three major causes of food borne illness are physical, chemical and biological hazards.

SAE 2

1. Staphylococcus aureus

S. aureus is a gram-positive coccal bacterium with a diameter of 0.5 um (Asli et al nd). Normally, they remain in the human body (Bas 2004). Staphylococcus can also be discovered in the nose's nostrils. Humans will have S arureus on their hands and other regions of their skin, hair, and scalp, as well as in unprotected scrapes, burns, and other abrasions, and in the nose and throat (David et al 2011). Human-to-human interaction has the potential to spread the virus.

2. Clostridum perfringens (C. perfringens)

C. perfringens is a pathogenic bacterium that is gram-positive, rod-shaped, and anaerobic. It can be present in humans, animals, and soil at any time (Yigit and Duran, 1999). Many occurrences of C. perfringens food poisoning are likely subclinical, according to Asli (nd), because antibodies to the toxin are ubiquitous in the population. When cooked food is not properly served or stored,

spores can proliferate and form new cells, resulting in food contamination. However, raw meat is one of the most common food sources of C. perfringens, but unclean vegetables can also be a substantial source of these bacteria (David et al 2011).

3. Salmenella

Salmenella is a rod-shaped bacterium that can be found in water, soil, food plants, and contaminated people's feces (Asli et al nd). Salmonella can be transmitted to customers by the consumption of contaminated eggs, meat, poultry, and milk, as well as green vegetables contaminated with manure. Salmonella can be found in both domestic and wild animals, as well as humans. Abdominal pain, headaches, nausea, vomiting, fever, and diarrhea are some of the symptoms.

Unit 2 Prevention of Food Borne Illness

Unit Structure

2.1 Introduction

Prevention of food borne illness is necessary in any food service industry. The prevention of food borne illness will go a long way in safe guarding the people that consumed food and also assist food handlers on what are expected of them when handling food.

2.2. Learning Outcomes

At the end of this unit the student will:

Discuss the Prevention of food borne illness

2.3. Food Borne Illness

Self Assessment Exercise 1

1. As a caterer, how can you prevent physical hazards, chemical hazards and cross contamination of food?
2. Explain how food handler can prevent contamination of food

2.3.1 Prevention of food borne illness

There are **different** ways in which food illness can be prevented in the food service establishment. It can be prevented through maintenance of personal hygiene, avoiding chemical contact with food, even making sure that food ingredients that are allergen to guests are avoided when preparing food. However, the following are ways to prevent food illness:

2.3.1.1 Prevention of Physical Hazard in food

Bennion (1992) and Potter and Hotchkiss (1995) recommended that food processors and manufacturers employ strong manufacturing techniques and carefully analyze the essential control points in their production line to decrease the hazards of those physical pollutants. The well-known Hazard Analysis Critical Control Points (HACCP) system, of which this program is a component, was developed.

If materials like glass, nails, or other objects are discovered in foods and they appear to have been put there on purpose, the management should notify the supplier, according to Educational Foundation Textbook (1985). It might only be a singular occurrence.

2. 3.1.2 Advance Preparation

The problems that resulted in advance preparation of food can be prevented in the following ways:

- It is better to prepare, cook and serve food the same day than leaving it to remain for the
- Left over should consumed after re heated.
- Food prepared in advance should be properly refrigerated.
- Food prepared in advanced should cover properly after cooling.

2.3.1.3 Infected Person

To prevent infected person from contaminating the food, the following precaution should maintained:

- Food handlers should always use hand clove to avoid contact with the food.
- Food handlers that have symptoms of cough, vomiting, diarrhea, should not allow to touch any utensils used in preparing food. It is advisable to allow the staff to go home.

- Food handlers must maintain personal hygiene by making sure that their hair, fingers, toes among others are cut and kept neat.
- Food handlers must wash their hands after making use of toilet, even after handling raw meat, fish or poultry.
- Food handlers with cuts should bandage it properly to avoid contamination of food (BC Cook, 2015).

2.3.1.4 Prevention of chemical Hazard

Chemical hazards can be prevented in the following ways:

- Training of staff on how to use chemicals that can be dangerous to health.
- To avoid spraying of chemicals in an uncovered food.
- To purchase food from reliable sources that is good in terms of food storage, processing, preservation and packaging.
- Making sure that chemicals/ rodents killers used in the kitchen did not touch any food.
- Safe storage of food.

The above is in line with David et al (2011) that chemical food poisoning can be prevented by:

- Purchasing food from reliable sources with good farming practices and suppliers with proper storage procedures.
- Using containers (especially metal containers) only for their intended use.
- Safe storage of kitchen chemicals well away from food.
- Accurate dilution of chemicals used in the kitchen
- Not spraying chemical such as sanitizer or fly spray around open food

- Dilution of chemicals safely with care according to regulations.
- Only professionals should use pesticides and germicides in the facility, according to Educational Foundation Textbook (1985). If they are kept in the operation, they must be correctly labeled, kept in their original containers, and kept apart from food and materials that come into touch with food.
- Operators of food services should check the labels of all processed goods to see if any sulfating agents are present. Managers of food services should be knowledgeable about the substances they utilize. Chemicals are employed to maintain and enhance the nutritional value and security of food. However, an intelligent manager can take precautions to prevent chemical contamination by being aware of which compounds are potential dangers (Educational Foundation Textbook, 1985).
- Management must make sure that no equipment used in food service preparation, storage, or service contains dangerous metals. It should go without saying that food service should never involve the use of lead or products containing lead.

2.3.1.5 Prevention of contaminate raw food

Contamination of raw food can be prevented in the following ways:

- Make sure that all food materials are purchased in approved suppliers.
- Buy food materials from suppliers that have safety plans
- Never serve contaminated food to children, aged, sick persons in the hospital, nursing mothers because the chances of becoming ill after food consumption is high.

2.3.1.6 Prevention of Cross-Contamination

Contamination of food can be prevented in the following ways:

- Make sure that food handlers separate cutting boards, knives,/utensils. Sinks. Preparation areas used for raw and for ready – to – eat foods
- Store raw and ready – to – eat food separate.
- Always wash hands after using raw foods before handling any food
- Do not use your hand to handle ready – to – eat foods.
- Maintain personal hygiene when handling food.
- Be careful when handling raw meat, fish and poultry to avoid contamination of food
- Proper cleaning of the environment and utensils are necessary
- Wash raw fruits and vegetable thoroughly
- Clean methodologically and frequently in line with the cleaning schedule; train staff in clean as you go procedures
- Unpack food delivery boxes away from open food
- Protect food from food contamination while it is cooking in the kitchen.

Self Assessment Exercise 2

Explain how to prevent the following micro-organisms that food poisoning:

i. Staphylococcus aureus

ii. Clostridum perfringens

iii. Salmonella

2.3.1.7 Prevention of biological Hazards

Biological hazards can be prevented in the following ways:

- Food handlers should maintained personal hygiene
- Management of food service establishment should make all the food handlers must undergo test to determine their health status before handling food.
- S. aureus can be prevented by keeping the cooked food in the fridge. The food handlers should use aprons and gloves when preparing food to reduce skin – to – skin contact. The rules and regulations as regards to hygiene practices among staff should maintain (Hayes 1995).
- According to Educational Foundation Textbook (1985), prompt refrigeration of food, notably of sliced and chopped meats, custards, and cream fillings) at 45^{o} F (7.2^{o} C) or below, is a control measure in the prevention of staphyloccal intoxication.
- Workers with respiratory diseases, acne, boils, infected cuts, and burns are prohibited from handling food.

- Refraining from touching food with bare hands or properly using disposable gloves.
- Handling leftovers with care, either by throwing them away or carefully warming them to 165° F (73.9° C) or above.
- C. perfringens can be avoided by quickly cooling cooked food, preserving leftovers in shallow containers, and storing food in a suitable environment (Yisit et al 1997 and WHO, 2012).
    - Control measures for the prevention of C. perfringens, according to Educational Foundation Textbook (1985), include: Serving meat and poultry dishes hot or as soon as they are cooked, and avoiding preparing food a day in advance.
    - Meat meals that need to be quickly chilled before eating; food shouldn't be allowed to cool at room temperature.
    - No frozen food should be allowed to thaw at room temperature.
    - To avoid cross-contamination, keep raw foods separate from cooked foods.
    - Reheating food at 165° F (73.9° C) or higher will totally heat it rather than just warming it.
    - To facilitate quick refrigeration, divide large batches of food into smaller amounts.
- When using a steam table or other hot-holding equipment, proceed with utmost caution and take precautions to guarantee correct time and temperature management.
- Salmonella can be prevented by storing food in adequate temperature. Rodents and flies should be eradicated by maintaining good sanitation and hygiene in the work environment (Duyff, 2002, Yigit et al 1997 and WHO, 2013)

According to Educational Foundation Textbook (1985), it is challenging to take control measures to prevent salmonella contamination of publicly available food. Managers of food services are responsible for making sure that customers are not exposed to harmful microorganisms. Therefore, in order to accomplish the goal, the following procedures must be taken: Protect yourself from cross-contamination, which is the spreading of dangerous microorganisms from one food item to another via a non-food medium like tools, utensils, or human hands. Avoid using the same utensils for both raw and cooked poultry without thoroughly cleaning and sanitizing them in between uses since salmonella bacteria are usually found in raw poultry. Cutting boards for raw and cooked foods should be kept separate.

Watch out for tainted materials. Pasteurization is necessary for dry milk and dried eggs. In addition, only whole eggs - not dried or frozen eggs - should be used in goods like meringues and custards that do not require rigorous extra cooking. Never use eggs that have unclean, cracked, or broken shells.

The above preventions are supported by David et. al (2011) that the following are the good practices to avoid pathogenic food poisoning:

- Food handlers practicing the highest standard of personal hygiene and being meticulous about reporting any illness or infection thing may have before entering the food area.
- Planned processes for dealing with raw foods, especially raw meat and poultry
- Planned and monitored storage, preparation, cooking and hot holding of all food.
- Monitoring and supervision of temperature control and the time food is at temperature
- Recorded pest control measures and planned pest control
- Planned and recorded training of staff in food safety matters.

2.3.1.8 Prevention of Allergenic hazard in food

Allergenic hazard in food can be avoided in the following ways:

- Make sure that adequate information about the ingredients used in preparing the food are made available to guest.
- Menu should provide adequate information for guest on ingredients
- Staff training is necessary on menu planning. This will help the staff on explaining to guest on what the ingredients are.

2.3.1.9 Prevention of E, coli

According to David el. al (2011), the following are the prevention of E. coli

- Through cooking
- Good personal hygiene
- Avoiding cross-contamination from raw to cooked food
- Proper temperature control

This is supported by World Health Organization (2011) the prevention of infection requires control measures at all stages of food chain from agricultural production on the farm to processing, manufacturing and preparation of food in both commercial establishments and households.

2.4 SUMMARY

Prevention of food borne illness is proper in our food service establishment. This is because the inability to prevent it in the food service industry will to contamination of food and spoilage of

food. Among the measures adopted in prevention include: maintenance of personal hygiene by the food handlers, training of staff on how to use chemical, ensuring that all food materials are purchased in approved suppliers.

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2.6 Answers to Self-Assessment Exercises

Answer to SAE1

1. Physical hazard can be prevented by ensuring that items such as glass, nails, or other objects are not found in foods during and after processing of food.

Chemical hazards can be prevented in the following ways:

- Training of staff on how to use chemicals that can be dangerous to health.
- To avoid spraying of chemicals in an uncovered food.
- To purchase food from reliable sources that is good in terms of food storage, processing, preservation and packaging.
- Making sure that chemicals/ rodents killers used in the kitchen did not touch any food.
- Safe storage of food.

Contamination of food can be prevented in the following ways:

- Make sure that food handlers separate cutting boards, knives,/utensils. Sinks. Preparation areas used for raw and for ready – to – eat foods
- Store raw and ready – to – eat food separate.
- Always wash hands after using raw foods before handling any food
- Do not use your hand to handle ready – to – eat foods.
- Maintain personal hygiene when handling food.

Answer to SAE 2

Staphylococcus aureus can be prevented by:

Keeping the cooked food in the fridge. The food handlers should use aprons and gloves when preparing food to reduce skin – to – skin contact. The rules and regulations as regards to hygiene practices among staff should maintain. Avoidance of hand contact with food, or proper use of

disposable gloves. Careful handling of leftovers- either by disposing of them or reheating them thoroughly to 165^{o} F (73.9^{o} C) or above.

C. perfringens can be prevented by

- cooling the cooked food rapidly, saving leftover food in shallow containers and storing food in appropriate condition
- Serve meat and poultry dishes hot or as soon as they are cooked, avoid preparing food a day in advance.
- Quick-chill meat dishes that will be eaten later; foods should not be allowed to cool at room temperature.

Salmonella can be prevented by:

- Storing food in adequate temperature.
- Rodents and flies should be eradicated by maintaining good sanitation and hygiene in the work environment.
- Guard against cross-contamination, the transfer of harmful micro-organisms from one item of food to another by means of a nonfood medium such as equipment, utensils, or human hands. Salmonella bacteria are frequently present in raw poultry, so do not use the same utensils for both raw and cooked poultry without cleaning and sanitizing the utensils between uses. Separate cutting boards should be maintained for raw and cooked products.

Unit 3 Principles and Practices Involved In Safe Handing Of Food Produce

Unit Structure

3.1 Introduction

Safe handling of food products in any food service establishment is important. This is because when the food handlers failed to know all those practices and principles of handling food, it will lead to deterioration of the food products and at the same time cause food poisoning.

The principles and practices will help in identifying and evaluating the hazards that are important to food safety. This unit will in details explain all those principles and practices one after the other which will help to ensure that all the food products produced in an establishment will be safe for human consumption.

3.2 Learning Outcomes

At the end of this unit, the student must have known the following about the principles and practices involved in the safe handling of food products:

Discuss Hazard Analysis and Critical Control Point (HACCP)

Explain Good Hygienic Practices (GHP)

Evaluate Good Manufacturing Good Practices (GMP)

Know Good Agricultural Practices (GAP)

3.3 Hazard Analysis and Critical control point (HACCP)

Self-Assessment Exercises 1

1. List four Principles And Practices Involved In Safe Handing Of Food in a food establishment
2. Explain the Factors to Put In Place before Setting HACCP
3. List the Steps in the Good Hygiene Practices (GHP) Implementation

3.3.1 Meaning and concept of Hazard Analysis and Critical control point (HACCP)

HACCP is an internationally approved technique for food management practices, according to Stephen and Carolyn (2020). HACCP is a method that identifies, evaluates, and manages the hazards that are crucial to food safety, according to the Hygiene and Sanitation Handbook (2018). According to David and Patricia (2011), hazard analysis examines all aspects that could cause injury to the customer, including all ingredients, stages in the food manufacturing process, environmental conditions, and human factors that could lead to dangerous food being served. HACCP is a systematic means of examining potential risks in a food operation, identifying the points in the operation where the hazards may arise, and deciding which are crucial to customer safety, according to Robert (2007). HACCP is a science-based approach that systematically identifies, evaluates, and controls important food safety hazards, according to the Handbook for Gambian Youths Entrepreneurs (nd).

However, as the index in the above definitions illustrates, HACCP is a technique in which food is examined to determine when hazards may develop and to determine if the food is safe or harmful for human consumption.

HACCP is a common sense technique to control food safety hazards. It is a preventive system of hazard control rather than a reactive one. Food establishments can use it to ensure safer food products for consumers. It is not a zero-risk system, but is designed to minimize the risk of food safety hazard. The success of a HACCP program is dependent upon both people and facilities. Management and employees must be properly motivated and trained if a HACCP programme is to successfully reduce the risk of food-borne illness. Education and training in the principles of food safety and management commitment to the implementation of a HACCP system are critical and must be continuously reinforced (2002).

3.3.2 Factors to Put In Place before Setting HACCP

According to David et al (2011), the following should be in place before implementing HACCP in any establishment.

Suppliers:

The establishment should advertise here by specifying the quantity of what they desire. The finest quotation should be chosen from all those who submit one.

Traceability

It is critical for the establishment to put in place a method that will allow them to monitor the supplier and know exactly where all of the food supplied comes from. This will aid them in producing high-quality goods.

The location, the structure, and the equipment

It is important to mention that the company should guarantee that the entire atmosphere is well kept by providing the necessary amenities for keeping the region clean. The work flow should be structured in such a way that it does not interfere with the delivery of service. All equipment should be kept in good working order to avoid rusting, which can lead to food poisoning.

Storage and inventory management

The food items in the store should be kept at a reasonable temperature. The practice of FIFO should be maintained. The management should put in place an effective stock control system. This can be accomplished if the storekeeper is well-trained in the areas of inventory control, stock rotation, and stock balance.

Hygiene for Employees

Because of the function that workers played in the handling of food goods, staff cleanliness is extremely crucial. It is the obligation of the establishment's employer to guarantee that the

employees under their supervision maintain appropriate personal hygiene in order to avoid contaminating food. Paul (2007) supports this by stating that the goal of personal hygiene is to guarantee that persons who come into direct or indirect touch with food do not contaminate it.

This can be accomplished by, among other things, washing hands after using the restroom, touching raw meat, touching the nose, washing and ironing their uniforms, cutting their fingers and toes, and training and retraining of employees.

Control of Pests

This is a procedure that is carried out in a business to get rid of pests. When performing these tasks, care must be taken to avoid contaminating the food products. The establishment can enlist the help of an expert to help with pest management.

These goals can be accomplished if the pest management sector has a well-written pest control policy.

Cleaning/Disinfection/waste

This is in a case where the management has a documented system in place that specifies how the cleaning and garbage removal schedules will be controlled. This would help to ensure the safety of the food as well as the people who work in and patronize the sector.

Staff training is a procedure by which management ensures that their employees are properly trained. As a result, a thorough list of the names of the employees, as well as the dates of their training, is required. This will allow the personnel to be aware of the exact day and prepare accordingly.

3.3.3 Steps in the HACCP System Implementation

When implementing a HACCP system, there are seven steps to follow (David and Patricia, 2011 and Paul, 2002)

1. Perform a hazard analysis.

In this first principle, one needs to understand his operation and determining what hazards are likely to occur. This stage requires the creation of a conversational flow diagram that depicts the flow of products from receipt to completion. It is the manager's obligation to identify potential dangers and ways to mitigate them at each stage of the process.

At this point, one will try to understand how the people, equipment, methods, and foods all affect each other.

2. Figure out where the important control point is (CCPs).

The critical control points are determined in this stage two. Where can a hazard be prevented, eliminated, or reduced to an acceptable level?

The team will discover the point that ensures the product's safety. When the risk is decreased to an acceptable level, this can be accomplished. It is important to know that not all steps are CCPs.

3. Define critical limitations

Each CCP must have boundaries that define safety. Critical limits are the measurements that define safety and can usually be found in Food code. Food must be the critical limit for all control measures related to each defined CCP, such as temperature, duration, speed, PH, and moisture content.

4. Establishing the CCP's system control

Once you have decided which operational steps are critical and have set the critical limits, someone needs to keep track of the CPPs in the flow of foods through your operation. The team must decide how, where, and when the monitoring will take place, as well as how the findings will be monitored.

5. Determine the appropriate course of action to be done if monitoring data show that a CCP is out of control.'

The team must guarantee that the deviations are remedied in this situation. This can happen if the affected product created during the diversion is disposed of improperly.

6. Develop methods for verification to ensure that one system is functioning properly.

To guarantee that the HACCP plan is effective, the team must design verification processes. Period audits, random sampling and analysis, and a review of the HACCP system and its records can all help with this.

7. Document and keep track of all procedures related to the HACCP principles and their implementation.

Preparation and execution of procedures and work instructions for each control measure, including those required to maintain hygiene. To demonstrate that food safety is being handled, documentation is required.

3.4 Good Hygiene Practices (GHP)

Practicing of good hygiene in our foodservice industry is essential. This is because food can be contaminated at the point of preparing, processing or cooking of the food. Even in the farm, during slaughtering of animals, food can be contaminated.

Therefore, there are need for the food handlers to know what hazards (chemical, physical, microbiological) are and the best way to prevent or control them. The reasons for practicing good hygiene are to ensure that food is not contaminated but free from hazard. Here in this unit, student will know what GHP is and the procedure of achieving it.

3.4.1 Meaning and Concept of Good Hygiene Practices (GHP)

Codex Alimentarius Commission defined GHP as the fundamental measures and conditions applied at any steps with the food chain to provide safe and suitable food.

Sreelekhak et al (nd) viewed GHP to include all practices regarding the conditions and measures necessary to ensure that food from primary to final stage are safe.

3.4.2 Steps in the Good Hygiene Practices (GHP) Implementation

According to Codex Alimentarius Commission and Sreelekhak et al (nd) the areas in which GHP should be implemented are:

i. Primary Production
ii. Establishment: Design and facilities
iii. Control of operation
iv. Establishment: Maintenance and sanitation
v. Establishment of personal Hygiene
vi. Transportation
vii. Product information and consumer awareness
viii. Training

I. Primary Production

In this stage, it should be a practice to ensure that food hazards are reduced. This is supported by Sreelekhak et al(nd) that in primary production, hygienic practices should reduced the likelihood of introductory hazards that maybe difficult to control at later stages of the food chain. However, food should be prepared in an environment that is not polluted. Therefore, the environment in

which the primary production is taken place should be devoid of offensive odour that can contaminate food. The hygienic production, handling, storage and transport of the food should be in a way that it encourages food safety.

Cleaning and maintenance of equipment and ensuring that food handlers maintain personal hygiene is necessary in primary production stage. This will ensure that human and equipment used in harvest are not sources of contamination.

II. Establishment Design

In this stage, the design, the premises, equipment, surfaces and facilities should construct in a way that contamination of food will be minimized, easy to wash, well ventilated, protect against pests infestation, among others.

The premises of the establishment should put into consideration the location, equipment and facilities in the environment.

On the location, it should be sited in the area that will be free from flooding and the drainage of the area should be considered.

The equipment should be installed in a way that it will be easily clean and

III. Establishment – Practice.

In this stage, the establishment should maintain a good housekeeping, by ensuring that both the house and the surrounding are kept clean.

Cleaning of walls with the removal of dust from the roof of the establishment is necessary. Pest control in the premises should be observed in the establishment. This can be achieved by closing

all the possible areas rodents can use to have access to the establishment. Closing of food, disposing of refuge bin often, use of insecticide or rat killers among others can be used to prevent and eliminate pests in the premises.

Water management in the establishment is an important factor to look into in an environment. This can be achieved when water used in the establishment and the one going out is monitored. Ensuring that water used in the establishment is not contaminated and getting them from a reliable source is proper in an establishment.

The windows and the internal surface of the establishment should be constructed in a way that closing and cleaning them will be easy. When internal surfaces are not smooth, it will be difficult to clean which can result to contamination of food.

The floors, ceiling and drainage system should also be constructed in a way that cleaning them will not be difficult.

IV. Control of Food Hazard through HACCP.

In this stage, proper control of food hazard through HACCP is very important. This can be achieved through food that entering the area is not contaminated. The time, temperature and humidity of the area must be put to check. Ensuring that potential contaminated materials are separated from uncontaminated ones is necessary. Assurance of effectiveness of treatment and cleaning of the area is mandatory. Assuring reliability of measurement, test and recording and reform hazard analysis when changes occur is important.

V. Establishment: Maintenance and Sanitation

Maintenance and sanitation of an establishment is important in the premises. To have adequate maintenance in an establishment, the management should ensure that the equipment and other working tools are kept in a good condition. Proper checking of the equipment and keeping them where they will not rust and ensuring that they are clean after making use of them is necessary.

Maintaining a good sanitation in the premises is important. This can be achieved by cleaning, sweeping, dusting, mopping and ensuring that grasses in the premises are controlled.

Prevention of contamination of food in the premises is also necessary. This can achieve by removing of debris, chemicals, pests, dusts etc, in the establishment.

Another important factor to look into in this stage is cleaning of the premises.

Cleaning procedures involves the follow:

Removal of gross debris from surface

Application of detergent solutions

Rinsing with water

Disinfection where necessary

Dry cleaning

VI Transportation

During the time of transporting the products, adequate measure should be taken to protect food from contamination. When the food is contaminated, it will be unsuitable for consumption.

The management should provide an environment which controls the growth of pathogens or spoilage microorganisms and the production of toxins in food.

VII. PRODUCT INFORMATION AND CONSUMER AWARENESS

It is important for consumers to be aware of products they are consuming and know every information about the products. With the help of label, the consumer will use it to know about the products, how to use them, the precautions to adopts when in use. Educating the consumers about the products is also necessary. The consumers should be educated about the products so that misuse of the products will not be entertained.

Consumers should know enough about food hygiene to be able to understand the importance of the product information

They should also be educated on how to prevent contamination and growths or survival of food borne pathogens by storing, preparing and using it correctly.

VIII. TRAINING

Training and retraining programs is important. During training, that is when to expose them on how to preserve and prevent contamination of food. Refreshers training should be given on Good Hygiene Products (GHP) which deals with safety and suitability requirements to be followed worldwide. Food safety codes for specific food should be exposed to staff. These will help them to adapt existing codes to their specific set of conditions; food operators should also decide which practices are critical for the safety of a product and thus have to be included in the HACCP plan.

3.5 Good Manufacturing Practice (GMP)

GMP refers to the **Good Manufacturing Practice** regulations promulgated by the US Food and Drug Administration under the authority of the Federal Food, Drug, and Cosmetic Act (See Chapter IV for food, and Chapter V, Subchapters A, B, C, D, and E for drugs and devices.). GMP according to Shukla, (2017) is that part of quality assurance which ensures products are consistently produced and controlled to the quality standard appropriate to their intended use and as required by the marketing authorization. These regulations, which have the force of law, require that manufacturers, processors, and packagers of drugs, medical devices, some food, and blood take proactive steps to ensure that their products are safe, pure, and effective (www.ispe.org and Shukla, 2017).

Shukla (2017) maintained that GMP are regulations that describe the methods, equipment, facilities and controls required for producing human and veterinary products, medical devices and processed food.

GMP regulations require a quality approach to manufacturing, enabling companies to minimize or eliminate instances of contamination, mix ups, and errors. This protects the consumer from purchasing a product which is not effective or even dangerous. Failure of firms to comply with GMP regulations can result in very serious consequences including recall, seizure, fines, and jail time (www.ispe.org).

GMP regulations address issues including record keeping, personnel qualifications, sanitation, cleanliness, equipment verification, process validation, and complaint handling. Most GMP requirements are very general and open-ended, allowing each manufacturer to decide individually how to best implement the necessary controls. This provides much flexibility, but

also requires that the manufacturer interpret the requirements in a manner which makes sense for each individual business (www.ispe.org and Shukla, 2017).

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3.6 Summary

The principles and practices involved in safe handling of food produce are necessary in the food service establishment. It is when the food handlers know these principles that one is sure of food safety in our food service area. This is because when the food handlers failed to know all those practices and principles of handling food, it will lead to deterioration of the food products and at the same time cause food poisoning. Examples of these principles and practices include Hazard Analysis and Critical Control Point (HACCP), Good Hygienic Practices (GHP), Good Manufacturing Good Practices (GMP), and Good Agricultural Practices (GAP), among others.

3.7 References and Books for Further Readings

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Shukla, J. (2017). Goods Manufacturing Practices (GMP). Available at https://www.reseacggate.net/publication/32037355

David and Patricia (2011). The theory of hospitality catering (12th edition). London Hodder Education, An Hachete UK company

3.8 Answer to Self-Assessment Exercises

1. The four principles and practices Involved In Safe Handing Of Food in a food establishment are:

i. Hazard Analysis and Critical Control Point (HACCP)

ii, Good Hygienic Practices (GHP)

iii. Good Manufacturing Good Practices (GMP)

iv. Good Agricultural Practices (GAP)

2. Factors to Put In Place before Setting HACCP

According to David et al (2011), the following should be in place before implementing HACCP in any establishment.

Suppliers:

The establishment should advertise here by specifying the quantity of what they desire. The finest quotation should be chosen from all those who submit one.

Traceability

It is critical for the establishment to put in place a method that will allow them to monitor the supplier and know exactly where all of the food supplied comes from. This will aid them in producing high-quality goods.

The location, the structure, and the equipment

It is important to mention that the company should guarantee that the entire atmosphere is well1 kept by providing the necessary amenities for keeping the region clean. The work flow should be structured in such a way that it does not interfere with the delivery of service. All equipment should be kept in good working order to avoid rusting, which can lead to food poisoning.

Storage and inventory management

The food items in the store should be kept at a reasonable temperature. The practice of FIFO should be maintained. The management should put in place an effective stock control system. This can be accomplished if the storekeeper is well-trained in the areas of inventory control, stock rotation, and stock balance.

Hygiene for Employees

Because of the function that workers played in the handling of food goods, staff cleanliness is extremely crucial. It is the obligation of the establishment's employer to guarantee that the employees under their supervision maintain appropriate personal hygiene in order to avoid contaminating food. Paul (2007) supports this by stating that the goal of personal hygiene is to guarantee that persons who come into direct or indirect touch with food do not contaminate it.

This can be accomplished by, among other things, washing hands after using the restroom, touching raw meat, touching the nose, washing and ironing their uniforms, cutting their fingers and toes, and training and retraining of employees.

Control of Pests

This is a procedure that is carried out in a business to get rid of pests. When performing these tasks, care must be taken to avoid contaminating the food products. The establishment can enlist the help of an expert to help with pest management.

These goals can be accomplished if the pest management sector has a well-written pest control policy.

Cleaning/Disinfection/waste

This is in a case where the management has a documented system in place that specifies how the cleaning and garbage removal schedules will be controlled. This would help to ensure the safety of the food as well as the people who work in and patronize the sector.

Staff training is a procedure by which management ensures that their employees are properly trained. As a result, a thorough list of the names of the employees, as well as the dates of their training, is required. This will allow the personnel to be aware of the exact day and prepare accordingly.

3. The Steps in the Good Hygiene Practices (GHP) Implementation

According to Codex Alimentarius Commission and Sreelekhak et al (nd) the areas in which GHP should be implemented are:

i. Primary Production
ii. Establishment: Design and facilities
iii. Control of operation
iv. Establishment: Maintenance and sanitation
v. Establishment of personal Hygiene
vi. Transportation
vii. Product information and consumer awareness

Training

3.9 Glossary

1. **Food borne illness** is the process through which contaminated foods are ingested by consumers, resulting in illness.
2. **Physical contact** occurs when physical contaminants such as stone, dust, or garbage penetrate the meal and cause illness in the person who ate it.
3. **Chemical risks** refer to a process in which chemicals employed in food processing or preservation cause food to decay, resulting in food disease after consumption.
4. **Biological hazard** is a process in which hazardous microorganisms such as S. aureus, Shigella, and Salmenella infect food, causing food poisoning when consumed.

5. **Food allergies** occur when a person eats foods to which his or her body is allergic.

MODULE 3: FOOD SAFETY LAWS AND REGULATIONS IN NIGERIA; AND KITCHEN DESIGN

Introduction

The module is divided into two units, namely:

Unit 1 Food safety laws and Regulations in Nigeria

Unit 2 Kitchen Design and Equipment

Unit 1 Food safety laws and Regulations in Nigeria

Unit Structure

1.1 Introduction

One of the most widely exchanged commodities on the planet is food, which if uncontrolled can pose a serious risk to public safety. Due to globalization, the supply chain needs to be closely watched to make sure imports adhere to food safety laws and are unaltered. Generally speaking, laws governing the manufacturing, processing, packing, labeling, distribution, and sale of food fall under the purview of safety regulations. As a result, it addresses relevant facets of the food trade as well as the regulation of food control and safety. The food regulations include minimum quality standards to guarantee that the products are unspoiled and not subject to any dishonest

activities aimed at misleading the public. Additionally, regulations governing food should cover the entire supply chain, starting with provisions for animal feed, farm management, and early processing, and continuing through ultimate distribution and consumer usage. To this end, the Nigerian government issued several regulations about food safety and standards.

Along with this legislation, the Nigerian government introduced the National Policy on Food Hygiene and Safety as a component of the Nigerian National Health Policy in 2000. In terms of production, handling, storage, processing, preservation, trading, transportation, and marketing, this strategy aims to encourage and promote laws governing food. It also aims to raise the standard of healthcare by making sure that all food consumed in Nigeria, regardless of whether it is imported or exported, is hygienic, nourishing, free from contamination, and available to customers at reasonable costs. **(https://www.businesscompilerng.com/2021/07/food-safety-standards-legislations-laws.html)**

1.2 Learning Outcomes

At the end of this unit, student would be expected to:

- Explain the National food control
- Discuss National Laws about Food Safety
- Bodies or Agencies Responsible For Regulating and Monitoring Food Safety Standards

1.3 National food control

Self-Assessment Exercises 1

1.Briefly explain five efforts for controlling of food

2. list five National Laws about Food Safety

The goals and needs of each nation are taken into consideration when designing their national food control regimes. They may vary from nation to nation, but to be effective, they must have essential elements including food laws and regulations, institutional and policy frameworks, food monitoring and inspection, food laboratory services, participation of all stakeholders, and information dissemination.

Food control efforts are underpinned by several ideas, including:

1. The understanding that food control is a broadly shared duty and necessitates interaction between all stakeholders in the farm-to-table continuum,
2. Implementing a comprehensive, integrated, and preventive strategy to lower contamination risks throughout the food supply chain, which is the most efficient way to manufacture safe food,
3. Creating scientifically sound control measures,
4. Setting priorities for tasks based on risk analysis and the efficiency of risk management measures
5. Creating emergency protocols for handling particular risks or failures (such as product recalls), etc (Omojokun, 2013)

1.4 National Laws about Food Safety

The following are the important national laws about food safety:

1. Public Health Ordinance Cap 164 of 1958, which replaced the Public Health Laws of 1917,
2. The Food and Drugs Decree, No. 35 of 1974
3. Decree No. 56 of 1971 of the Standards Organizations of Nigeria (SON)
4. The Animal Disease Control Decree, No. 10 of 1988
5. Decree No. 41 of 1990 on the Marketing of Breast Milk Substitutes
6. Federal Laws of the Federation Decree No. 15 of 1993 from the National Agency for Food and Drug Administration and Control (NAFDAC). **(https://www.businesscompilerng.com/2021/07/food-safety-standards-legislations-laws.html)Self-Assessment Exercise 2.**

1. List five Bodies or Agencies Responsible For Regulating and Monitoring Food Safety Standards and Practices In Nigeria 2. What are the roles of the following in Regulating and Monitoring Food Safety Standards and Practices In Nigeria i. Federal Ministry of Environment ii. Federal Ministry of Agricultural and Rural Development iii. Federal Ministry of Trade and Investment

1.5 Bodies or Agencies Responsible For Regulating and Monitoring Food Safety Standards and Practices In Nigeria

The following are the Bodies or Agencies Responsible For Regulating and Monitoring Food Safety Standards and Practices In Nigeria

1.5.1 Federal Ministry of Health

The Federal Ministry of Health is in charge of creating national standards for food safety and cleanliness as well as overseeing how they are put into practice. Additionally, it is in charge of setting standards for the nutritional content of food, monitoring food settings and handlers, preventing the spread of foodborne illnesses, ensuring the safety of the public water supply, and dealing with national and international food-related issues. **(https://www.businesscompilerng.com/2021/07/food-safety-standards-legislations-laws.html)**

The Federal Ministry of Health is in charge of developing national policies, standards, and laws about food safety, as well as conducting monitoring and evaluation. Additionally, it oversees environmental cleanliness, food handling environments, the prevention of food-borne illnesses, the quality of public water from taps, as well as domestic and international food-related issues (Omojokun, 2013)

1.5.2. Federal Ministry of Agricultural and Rural Development

The Federal Ministry of Agriculture and Rural Development has the responsibility for promoting good agricultural practices and new agricultural technologies in conformity with food safety

policies and regulatory standards. **(https://www.businesscompilerng.com/2021/07/food-safety-standards-legislations-laws.html).**

In addition to supervising its departments and parastatals, such as research institutes, colleges of agriculture, colleges of fisheries, etc., the Federal Ministry of Agriculture and Rural Development is in charge of developing policies on primary agricultural production and practices that cover plants, animals, pests and diseases, among other things, **(Omojokun, 2013).**

1.5.3. The National Food and Drug Administration and Control Agency (NAFDAC)

The Federal Ministry of Health's parastatal NAFDAC is in charge of overseeing the regulation and control of bottled water, imported and locally produced goods, and pharmaceuticals in Nigeria. **(https://www.businesscompilerng.com/2021/07/food-safety-standards-legislations-laws.html)**

The National Agency for Food and Drug Administration and Control is responsible for overseeing and regulating the production, distribution, sale, and use of food, pharmaceuticals, cosmetics, medical equipment, chemicals, packaged water, and detergent in Nigeria (NAFDAC). To effectively manage the quality of food, bottled water, raw materials, and their manufacturing processes in factories and other institutions, appropriate tests are carried out, and compliance with standard standards is maintained. The Agency conducts appropriate investigations into food production facilities and raw ingredients, sets up pertinent quality assurance systems, including certification of the production facilities and the regulated products, and makes decisions regarding the quality and safety of food, bottled water, and chemicals. The Agency's responsibilities also include inspecting imported food production facilities to determine whether

they have the essential quality control procedures in place for the product's certification, (Omojokun, 2013)

1.5.4. Standards Organization of Nigeria (SON)

For the creation and implementation of established standards for the composition of imported and locally produced food, Nigeria's Standards Organization is in charge, (Omojokun, 2013)

The task of developing standards for the ingredients of imported and domestically produced foods and other products in Nigeria falls under the purview of SON. The Standards Organization of Nigeria has created 100 standards on food and food products as well as a sizable number of codes of hygienic procedures for food and food products. Periodically updated to reflect modern industrial and technical trends, these standards and codes (**https://www.businesscompilerng.com/2021/07/food-safety-standards-legislations-laws.html)**

1.5.5. The States and Local Governments

The States and Local Governments Authorities collaborate with National Primary Healthcare Development Agency — an agency under the Federal Ministry of Health — to monitor and regulate street food vending and outlets, catering establishments, and traditional markets food services. (**https://www.businesscompilerng.com/2021/07/food-safety-standards-legislations-laws.html)**

1.5. 6. The Federal Department of Fisheries

In accordance with the requirements of the Sea Fisheries (Fish Inspection and Quality Assurance) Regulation of 1995, the Federal Department of Fisheries is in charge of making sure

that fish and fishery products produced in, imported into, or exported from Nigeria meet international standards for wholesomeness. All of these are designed to make sure that the 1995 Fish Quality and Quarantine Services Regulation is followed, (Omojokun, 2013)

1.5. 7. Nigeria Plant Quarantine Service (NPQS)

The Agriculture (Control of Importation) Act No.28 of 1959, which established the NPQS in 1960, gave the Division the authority to establish quarantine rules, infrastructure facilities, trained personnel, scientific equipment, and regulations to enable her to achieve the goal of preventing the introduction of harmful and destructive foreign plant pests (insects, fungi, bacteria, virus, nematodes, and weeds) of plants and other vegetation. This mandate is in line with the language of the International Plant Protection Convention (IPPC), which was signed by Nigeria in 1959 and updated in 1979 by the Food and Agriculture Organization (FAO). In order to meet worldwide standards, the enabling legislation for the NPQS has been reviewed, and the Nigeria Plant Protection Act, also known as the Agricultural Control of Importation and Exportation Act Amendment 2003, has been written. Nigeria Plant Quarantine Service is speaking on behalf of Nigeria, one of the founding members of the Inter-African Phytosanitary Commission, (Omojokun, 2013).

1.5.8. Consumer Protection Council

The government organization known as the Consumer Protection Council is in charge of guarding customers against unethical practices and supporting them in seeking remedies for unethical behavior and exploitation. The agency supports the creation and enforcement of quality standards that are intended to protect the interests of consumers by trade, industry, and professional organizations, (Omojokun, 2013)

1.5.9. Federal Ministry of Environment

Controlling environmental food contamination, persistent organic pollutants, environmental pollution, waste disposal, etc. is the responsibility of the Federal Ministry of Environment, (Omojokun, 2013)

1.5. 10. Federal Ministry of Trade and Investment

The Federal Ministry of Trade and Investment is Nigeria's Notification Authority for WTO Sanitary and Phytosanitary Rules, and as such, it has a part to play in promoting international trade in nutritious foods, (Omojokun, 2013)

1.5.11. Federal Ministry of Education

The Federal Ministry of Education has a role to play in enlightenment and manpower development by including lessons on safe food handling in the school curriculum and courses on Food Safety Management Systems in tertiary institutions, such as Good Agricultural Practices (GAP), Good Hygienic Practices (GHP), Good Manufacturing Practices (GMP), Hazard Analysis Critical Control Points (HACCP), etc. (Omojokun, 2013).

1.5.12. Local Government Areas (LGAs)

The Local Government Areas are in charge of traditional markets, neighborhood butcheries, bukaterias, and catering businesses, (Omojokun, 2013)

1.5.13. Universities and Research Institutes

In addition to providing the necessary training programs for capacity building and personnel development, tertiary and research institutes are in charge of conducting research and providing the scientific foundation for policy creation and program design, (Omojokun, 2013)

1.5.14. Private sector

The manufacturing, importation, exportation, distribution, and sale of food intended for human consumption must all adhere to the necessary food safety rules and regulations. This is done by the food processing/service business, which also applies a variety of standards, regulations, and guidelines. To guarantee product safety and consumer protection, they should maintain an effective internal quality assurance program based on HACCP principles. It is also anticipated that the business sector will cooperate with and support government initiatives in particular areas of education and awareness raising regarding the necessity for all employee categories to acquire and cultivate safe food handling habits. It is advised that small and medium-sized business owners form umbrella associations (such as packaged water producers, cocoa farmers associations, etc.) that will use self-regulatory practices to supplement the efforts of the regulatory bodies, (Omojokun, 2013)

This makes it simple for the group to schedule consultation meetings with the regulatory agencies, which allows them to discuss and take into consideration their opinions, concerns, and capacities. The regulatory agencies can organize focused capacity-building training programs for the group by forming such associations. Along the entire food chain, numerous organizations are involved in activities related to food safety; consequently, proper coordination of these organizations' efforts is essential for a successful food control system. An inadequate food control system can result from poor or absent coordination of activities, which can also increase

business costs and discourage businesses. The global trend in food safety control emphasizes a multidimensional and interdisciplinary approach with effective coordination and collaboration between regulatory organizations, the industry, academia, research institutions, professional morganizations, consumer associations, and the general public. A successful food safety control system requires a national food safety policy that outlines the duties and responsibilities of all stakeholders, (Omojokun, 2013).

1.6 Summary

This unit discussed Food safety laws and Regulations in Nigeria. It is important for food supply to be monitored in order to ensure safety of food. In Nigeria, a lot of national laws have been enacted for food safety, examples include Public Health Laws of 1917, Food and Drugs Decree No. 56 of 1971 of the Standard Organizations of Nigeria, (SON) etc. However, there are several agencies responsible for regulating and monitoring of food safety standards and practices in Nigeria; among them are Federal Ministry of Health; Federal Ministry of Agriculture and Rural Development; SON; NAFDAC; etc

1.7 References / Further Reading

Omojokun J. (2013). National Agency For Food And Drug Administration and Control (NAFDAC), Nigeria. Available at: https://cdn.intechopen.com/pdfs/44083/intech-regulation_and_enforcement_of_legislation_on_food_safety_in_nigeria.pdf

Food Safety Standards Legislations (Laws) and Enforcement Agencies in Nigeria (How to Get Approvals) Available at: https://www.businesscompilerng.com/2021/07/food-safety-standards-legislations-laws.html

1.8 Answers to Self-Assessment Exercises

Answer to SAE 1

The following are the Food control efforts underpinned by several ideas, including:

1. The understanding that food control is a broadly shared duty and necessitates interaction between all stakeholders in the farm-to-table continuum,
2. Implementing a comprehensive, integrated, and preventive strategy to lower contamination risks throughout the food supply chain, which is the most efficient way to manufacture safe food,
3. Creating scientifically sound control measures,
4. Setting priorities for tasks based on risk analysis and the efficiency of risk management measures

5. Creating emergency protocols for handling particular risks or failures (such as product recalls), etc

Answer to SAE 2

i. The list of five Bodies or Agencies Responsible for Regulating and Monitoring Food Safety Standards and Practices in Nigeria are:

1. NAFDAC

2. SON

3. Federal Ministry of Environment

4. Federal Ministry of Agricultural and Rural Development

5. Universities and Research Institutes

ii. The following are the roles of the following Regulating and Monitoring Food Safety Standards and Practices bodies In Nigeria

i. Federal Ministry of Environment

Controlling environmental food contamination, persistent organic pollutants, environmental pollution, waste disposal, etc. is the responsibility of the Federal Ministry of Environment,

ii. Federal Ministry of Agricultural and Rural Development

The Federal Ministry of Agriculture and Rural Development has the responsibility for promoting good agricultural practices and new agricultural technologies in conformity with food safety policies and regulatory standards.

iii. Federal Ministry of Trade and Investment

The Federal Ministry of Trade and Investment is Nigeria's Notification Authority for WTO Sanitary and Phytosanitary Rules, and as such, it has a part to play in promoting international trade in nutritious foods

Unit 2 Kitchen Design

Unit Structure

2.1 Introduction

In the food service industry, the kitchen is crucial. This is due to the fact that all food is prepared in the kitchen. A well-planned and designed kitchen is required to produce and cook high-quality meals that would be loved by customers. Again, the inability to properly acquire and install good kitchen equipment contributes to food cross contamination. It is possible to avoid loss and enhance earnings when you're working place is a well-equipped kitchen. As a result, an organization must guarantee that a kitchen is constructed and equipment is installed in the appropriate location in order to make the most use of kitchen space by lowering operating costs or increasing productivity.

The significance of kitchen design, variables influencing kitchen design, kitchen design, kitchen equipment and the elements to consider when selecting it, and varieties of equipment will all be examined in this course.

2.2 Learning Outcomes

At the end of this unit, student would be expected to:

- Explain the meaning of kitchen design
- Discuss the factor to consider when designing and equipping kitchen
- Evaluate the Physical Design of Kitchen
- Know the Kitchen Layout
- Discuss work Centers in the Kitchen
- Evaluate the storage and maintenance in the Kitchen
- Discuss the Operation and Financial Aspect

2.3 Kitchen Design

2.3.1 Meaning of Kitchen Design

Self-Assessment Exercises 1

1.Briefly explain the term kitchen design 2. when designing your kitchen, there are some factors you need to consider, explain

Kitchen design, according to Bello and Bello (2010), focuses on the size, shape, style, and decorating of the building or areas utilized for food preparation, cooking, and services, as well as the relationship between these areas. Kitchen design is the design or plan that you give a specific room in a food production area, which includes things like size, lighting, decorating, and shape, among other things, where the chef prepares and cooks meals.

Kitchen design, according to Costas Chris (2009), refers to the total space planning of the kitchen; it dictates the size, form, style, and décor of the space and equipment.

In the hospitality sector, a kitchen is the decoration, size, and shape of a structure used for food preparation, cooking, and portioning.

The layout of the facilities within the kitchen and their location for completing work in a food service facility is known as the kitchen layout (Bello et al 2010).

The layout is a thorough plan for the kitchen's floor and counter space, including where each piece of equipment will be placed and where each work center would be positioned (Costas Chris, 2009).

The index in the preceding definitions demonstrates that any design or plan applied to a kitchen, such as color, size, lighting, and so on, is referred to as kitchen design.

2.3.2 Factors to Be Considered When Designing and Equipping Kitchen

The following are the factors to be considered when designing and equipping kitchen

i) Size and the type of menu

It is the obligation of management to know who their target market is and how the business will operate within their setting when planning and building a kitchen. This will assist in determining which products to produce as well as the quantity of potential clients. According to David et al (2011), before a kitchen can be planned, management must understand its goals and objectives in connection to market strategy.

When constructing a kitchen, the type and number of products on the menu will decide the sort of equipment that must be installed.

ii) The Type of Equipment

The sort of food prepared and cooked in a kitchen will dictate the equipment that should be installed. This is reinforced by Mohini (2011), who states that equipment is dependent on the cooking methods necessary for the foods on the menu. For example, if a canteen menu consists primarily of fried snacks and beverages, the choice will be between purchasing a fryer and purchasing a fryer. As a result, when adding food to the menu that requires modern equipment,

management must consider how to obtain the equipment as well as the space it will take in the kitchen.

iii) Capital

The capital budgeted for a kitchen must be considered while designing and equipping it. The budgeted capital may be insufficient in comparison to the amount needed to complete the project. As a result, capital on hand must be considered so that the planned design does not come to a halt halfway through.

Equipment is costly to purchase and maintain. As a result, it is preferable to design equipment and install it in such a way that cleaning and maintaining it is easy. According to David et al (2011), labor is a big cost component, hence equipment is designed to be simple to operate, maintain, and clean.

iv) The staff and their skills

When constructing your kitchen, keep in mind the type of people and their talents that you intend to use in your restaurant. This is due to the fact that their aptitude and skills in using current equipment to make menu items must be evaluated. The sort of individuals and their skills will have an impact on the technology and equipment to be implemented, according to David et al (2011). As a result, before installing such equipment during the kitchen design, management should consider the talents of their personnel.

2.3.3. Physical Design of Kitchen

In physical aspects of kitchen design, the location, structural features and the layout of kitchen spaces will be discussed.

a)**. Location**

When designing a kitchen the first thing that will come to your mind is a good position to locate the kitchen. The kitchen is positioned close to food service area. It is usually situated in over ground to avoid flooding and drainage

b). **Structural Features**

Under the structural features, drainage, electricity, gas connections and water supply systems will be discussed. Design and finish of floors, walls, ceilings and work surfaces, lighting and ventilation are also part of structural features that student will learn.

i). Drainage

Drainage systems are built-in to enhance free flow of solid and liquid waste from the kitchen. Therefore, appropriate installation of a drainage system in any kitchen is critical since failure to do so can result in an unsanitary kitchen environment, which can lead to food contamination, especially if the drainage system is clogged. The drainage system should be constructed in a way that discharge waste water and solid are channel to a waste tank for control of odour. In the kitchen, it is important to laid appropriate pipe for provision of cold and hot water supply for sanitary use. According to Mohini (2011), the efficiency of the drainage system has a significant impact on the hygiene and sanitation of the kitchen area. As a result, appropriate care should be taken during the layout planning to ensure that the required diameter is employed to avoid drainage system blockage.

However, it is important to maintain adequate hygiene in the kitchen by ensuring that waste disposal is located where it will not cause cross – contamination and

ii). Electricity and Gas Connection

Electrical and gas connections must be considered while building a kitchen. One, two, three, or four points of light should be considered depending on the size and functions performed in the kitchen. Gas piping that is metered is ideal for a larger kitchen. However, a gas cylinder can be used in a small enterprise (Mohini, 2011). Concrete wiring is superior to surface wiring in terms of safety. Cabinets must be built beneath the work surface to keep the cylinder hidden and away from heat and dirt sources. In case of damage, the gadgets that will be installed must be conveniently accessible.

According to Paul (2007) in Jim et al (2007), all plumbing, electrical, and gas lines should be concealed as much as feasible within the building structure. All runs must be at least 1/2 inches away from the walls or ceiling and six (6) inches off the ground if this is not possible. Conduit or pipe lines should not be positioned across an aisle, traffic area, or door opening, according to the author

iii). Water Supply

During structural design for the kitchen, both hot and cold running water should not be left out.

The water supply in the kitchen must purified to avoid contamination of food and rusting of pipe.

iv). Walls

Food preparation and dishwashing facilities should have smooth, non-absorbent walls with a light colored, readily cleanable surface. In addition, brick, concrete block, rough concrete, and rough plaster are not permitted in the kitchen (Paul, 2007 in Jim et al 2007).

When selecting wall coverings, look for ones that are sturdy, easy to clean, smooth, strong, washable, and have a good color that complements the kitchen. The color of the paint should also be considered depending on the type of the kitchen. The color of the paint should also be considered depending on the type of the kitchen. The colour should be light. When picking wall coverings, keep in mind the smoke and steam that generally flow from the kitchen. All surfaces must be sealed with a gloss or semigloss enamel, epoxy, varnish, or another approved sealer, according to Paul (2007 in Jim et al 2007), and additional surface materials must be evaluated and meet the same or similar requirements prior to installation.

v). **Ceilings**

When purchasing a ceiling for your kitchen, it is critical to select one that will last. In terms of reducing loss and maximizing profit, choosing now and having it spoil tomorrow is not a good idea. As a result, choosing a heat-resistant ceiling that will not make working conditions in the kitchen unsanitary is desirable. Ceilings in kitchen preparation spaces should be smooth and non-absorbent, with a light colored, washable surface. In the food and utensil handling area, acoustic plaster is not an acceptable ceiling finish (Paul 2007 in Jim et al 2007).

However, ceiling should be free from dirt and webs, constance wiping and dusting with broom or vacuum machine is necessary.

vi). Work Surface

When designing kitchen, it is better to know that ensuring that all the work surfaces are smooth, hard and look good in the eye is necessary. For you to achieve that it is better one use stainless steel in the work surface of the kitchen. Stainless steel used for a countertop can look quite sophisticated, especially with a wood trim. When buying choose one with thick-gauge stainless steel that will not dent easily. If stainless steel is taking care of it will last for more than 15 years

Ceramic tiles, laminated plastics can also be used to cover some section of the surface in the kitchen. Ceramic tiles are a perennial favorite. It is durable and it doesn't scratch, burn or stain. Ceramic tiles add colour, pattern and texture of the kitchen.

Hardwood though expensive to maintain can also be used especially in an area where sharp implements need to be used.

vii).Lighting

A suitable lighting system is a vital consideration when building a kitchen. This is due to the fact that a badly lighted kitchen can result in an accident. The type of lamps you pick while designing your lighting system is critical. According to Costas and Chris (2009), effective kitchen lighting considers glare and shadows in addition to light levels. When lighting is inadequate, fatigue sets in and errors rise; also, good lighting is required to monitor food, surfaces, and utensils for hygiene.

Due to lower maintenance costs, fluorescent lighting is less expensive and more cost-effective than filament bulbs Fluorescent lighting lasts longer and offers more illumination for the same

amount of electricity as filament lighting. Low-light-output fluorescent tubes are more suitable for color than high-efficiency fluorescent bulbs (Mohini, 2011).

Fashion and ambiance take a back seat to efficiency when it comes to lighting a foodservice kitchen. The goal is to remove glare while retaining a strong enough light output to ensure that employees are safe while at work (Costas and Chris 2009).

Mercury lamps can be used in the kitchen and range in power from 80 to 400 watts. Color, look, light, and longevity are all identical in white fluorescent tube lamps. Enclosed fixtures provide diffused light, are more visually appealing, and can be installed on false ceilings. The seal protects the lamp from moisture and dirt, and it's also simple to clean (Mohini, 2011).

All food preparation spaces, dishwashing areas, and bars and fountain glass washing stations (excluding where alcoholic beverages utensils are washed) must have at least 20 footcandles of light, measured 30 inches above the floor, (Paul 2007 in Jim et al 2007).

All fixtures must be installed on top of the work surface, not behind the workers. To minimize throwing shadows on work surfaces, strip lights should be set parallel to the surfaces, not at an angle. Completely enclosed, water-resistant, and easy-to-clean light fixtures are ideal (Mohini, 2011).

viii). Ventilation

When constructing a kitchen, ventilation is a crucial issue to consider. The reason for this is that when a kitchen is effectively ventilated, it allows free air to enter and heat from the kitchen is removed. If a kitchen isn't sufficiently aired, food can become contaminated, resulting in food poisoning after consumption. According to Mohini (2011), kitchen ventilation is critical in

preventing condensation on equipment, food, and surfaces. He said that condensation causes the growth of mold and germs, resulting in food contamination. As a result, it is vital to include the required amount of windows and materials in the kitchen design to ensure that it is effectively ventilated. This will go a long way toward ensuring that food cooked and stored in the kitchen is safe to eat. Ronald et al. (2005) confirm this by stating that the working environment must be adequately illuminated and ventilated.

In the kitchen, materials such as vapour extractors and exhaust fans should be installed. Fresh air from outside will enter through the windows and openings while the extract removes air. This will aid in the removal of odors, fumes, and vapours from the kitchen (Mohini, 2011). This can be used to keep contamination from spreading in the kitchen. A decent lighting system that improves sight while also adding color to the kitchen is preferable. This is in line with Paul (2007) in in Jim et al 2007that mechanical exhause ventilation shall be required at or above all cooking equipment such as ranges, griddles, ovens, deep fat fryers, barbecues and rotisseries to effectively remove cooking odors, smoke, steam, grease, and vapors.

ix). Designing for Safety

When designing kitchen, it is necessary for the management to make provision for where security gadgets will be installed. Installation of fire-fighting equipment and emergency exits is compulsory. This is because in a situation where accident or fire outbreak occurs, the employees and customers will see a way of escape. Fire-fighting equipment including alarm system should be installed in strategic places in the food service establishment.

Self-Assessment Exercise 2.

1. When designing a kitchen layout, it is vital for you to seek professional counsel or assistance. Lists any three of these professionals 2. Kitchen section should arrange such that the available area is utilized to the fullest. List and explain three ways kitchen can be arranged

x). Layout of Kitchen Spaces

When creating a kitchen, it's crucial to think about the layout first. The organization of the various facilities and equipment in the kitchen that will help to ensure effective work flow in the kitchen is known as kitchen layout. According to Mohini (2011), layout refers to the placement of work centers and their arrangement in relation to equipment and necessary kitchen services such as drainage, water, and fuel supply. Kitchen design and planning necessitated skill and knowledge. As a result, it is vital for management to seek professional counsel or assistance. Among those who are qualified to give advice include:

- Manager of the kitchen

  This is a competent manager who is capable of managing and organizing all of the kitchen's human and material resources. He will help to minimize loss and maximize profit in the kitchen by supervising, planning, and initiating ideas, as well as implementing all of the establishment's rules and regulations.

  It is vital for the management to guarantee that the employees under his direction have practical skills and can operate with minimal supervision during the preparation and cooking of food. During the layout planning, the management must ensure that good planning is done for food preparation and service sections. Even if the manager is not a

food specialist, according to Mohini (2011), he must be able to examine the kitchen in terms of functional, efficiency, and satisfying the catering establishment's aims.

Architects

- An architect's services are required while planning and creating a kitchen. Make certain you hire a commercial architect with experience in restaurant planning and design (Susan, 2003). The architect's knowledge is essential since the manager's ideals will be converted by the architect into drawings that can be interpreted by the structural engineer.
- Certified Kitchen Designers

These are experts that have received extensive training and certification in the field of kitchen design and remodeling. They are experts who are up to date on the latest kitchen items and trends. They provide expert advice on the optimal layout as well as materials, fixtures, and appliances for a typical kitchen (Susan, 2003).

- Designers of Interiors

Professionals who assist in the creation and integration of styles in the kitchen are known as interior designers. They only work with kitchen color, patterns, texture, shape, and furnishings. When it comes to kitchen design, he always consults with managers and other experts (Susan, 2003).

- Engineers of Structural Design

The structural engineers are professionals who can advise on the best materials to use in the kitchen's building. With their knowledge, they may recommend the best materials for the project that are both durable and meet the project's requirements. They advise project managers on

project timelines, quality requirements, and appropriate materials for kitchen design. This is reinforced by Mohini (2011), who states that advice is required on building features, contract timing, and equipping the facility with structures and equipment that meet the standards established for user safety.

2.3.4 Kitchen Layout

A kitchen's layout should be designed so that raw food items arrive at one place, are processed in the cooking part, and then delivered to the server. The kitchen section should arrange such that the available area is utilized to the fullest.

a. Island Grouping

Equipment is positioned back-to-back in the center of the cooking area in an island setup. There will need to be enough room for this, including enough gangways around the equipment and room to install other goods along the walls (Ronald, Victor and David, 1999). If plumbing and ventilation hookups permit, an island can serve as a great site for a stove or second sink, according to Susan (2003). It might also be the perfect area for a wine rack or cooler, a wet bar, warming drawers, modular refrigerator units, or more general storage, according to her.

b. WALL SETTING

Sitting equipment along the walls is an alternative arrangement. This arrangement is possible when travel distances are short, and it is most common in smaller establishments (Ronald, et al 1999). Susan (2003) supports this by stating that this configuration places all of the equipment, sink, and cupboards along one wall.

Sitting equipment along the walls is an alternative arrangement. This arrangement is possible when travel distances are short, and it is most common in smaller establishments (Ronald, et al, 1999). Susan (2003) supports this by stating that this configuration places all of the equipment, sink, and cupboards along one wall.

c. L- OR U-SHAPED LAYOUT

The L- or U-shaped structure creates huge self-contained portions that prohibit non-authorized personnel from entering and can enhance efficient functioning by reducing distances between work centers (Ronald et al 1999).

Susan (2003) defines a U-shaped arrangement as "a logical progression of work centers with minimum distances between them." She claimed that the sink is usually found at the bottom of the U, with the refrigerator and stove on opposing side walls.

When considering the arrangement of the kitchen sector, keep in mind the requirement to leave enough room for access to equipment like the oven (Ronald et al 1999). This agrees with Susan's observation that the U-shape takes up a lot of room — at least 8 feet along the length and width of the kitchen.

The L-shape, on the other hand, positions the kitchen on two perpendicular walls, usually one long and one short leg, allowing for an efficient work triangle without the issue of through traffic (Susan, 2003).

2.3.5. Work Centers in the Kitchen

During the design for work centers in the kitchen layout, smooth work flow, avoidance of congestion at work tables and sinks; comfort environment, and hygienic and sanitary conditions should be considered (Mohini, 2011).

a. Smooth Work Flow

One can maintain a smooth work flow when one planned and outlined the flow of work in the kitchen.

When designing kitchen, the movement of the staff in the kitchen matters a lot. Kitchen should design in such a way that it will allow staff to move around without any congestion. Therefore proper space requirement for staff working in the kitchen must be considered. This is supported by Ronald et al (1999) that 15 sq. ft. is the required space per person and a little space can cause staff to working close proximity to stove, steamers, cutting blades, etc which can cause accident. The authors maintained that a space of 1.37M from equipment is desirable and aisles must be adequate to enable staff to move safely.

Again the manager must know that the scheduling of work with proper timing is important in the kitchen to avoid congestion in the kitchen. Over utilization of some equipment and over staffing may lead to congestion in the kitchen. To avoid that a balance in use of equipment and ensuring that staff on duty are allowed into the kitchen is important. To avoid congestion at work table and sinks, proper placement of equipment must be considered. This is because if planners refused to place major equipment properly it can lead to congestion in the kitchen.

b. Comfort Environment

For a kitchen to be smooth for workers when carrying out their duties, it is necessary for the management to provide a comfortable work environment. When the environment is comfortable for workers, it will boost their morale and their work will be less stress. This can be achieved when the structural area of the kitchen, like flooring, ceiling, furniture and wall fitting are in order. These will be an assurance to staff that their lives are safe in the kitchen environment.

The décor of the kitchen and relationship of people at work also contribute to good working environment. When a décor of kitchen is good, and colourful, it make the staff to feel relax and comfortable when discharging their duties. Use of a single colour helps to create a feeling of greater space. Light colour makes the environment feel clean, bright and efficient. Too many colour should be avoided because it makes one to withdraw attention from the colourful food and ingredients handled in the kitchen. There should be good working relationship among workers and employers. The workers should maintain a harmonious relationship among them in the establishment. This can achieved if the management can create an environment that can affect the workers both mentally and socially (Mohini, 2011).

2.3.6. Storage in the Kitchen

Another factor to look into in the physical aspect of the kitchen design is the storage area. The storage area is a place where all the necessary tools or equipment both large and small including ingredients are kept. The storage area can be in form of wall cupboard which can be used to store both perishable and non perishable items.

The storage area should be maintained to avoid any rodents or insects to have access to the stored materials. According to Paul (2007) in in Jim et al (2007) adequate and suitable floor space shall be provided for storage of food, beverage and related products. Cabinets over and

beneath food handling equipment, as well as wall-mounted shelves positioned in and utilized in conjunction with the food preparation area, are called working storage (Paul 2007 in Jim et al 2007).

2.3.7. Maintenance of Kitchen

When planning for physical aspect of kitchen, how the kitchen should maintain should be considered. Maintenance of kitchen will be an assurance to customers that foods consumed are free from pathogens that can contaminate food. In order to achieve that, a schedule for kitchen maintenance is necessary in the hospitality industry. This kitchen maintenance will ensure that floors, walls, ceilings, work surfaces, windows and doors, lights, fans and other fittings, equipment and drainage system are maintained and kept clean.

2.3.8. Operation Aspects

During planning and designing kitchen, the operation of the kitchen must be considered. The way in which the kitchen will be run and operate should be known. The purchasing methods, storage, distribution of materials and production must be specified. The number of personnel to be employed, their experiences, skills and number of hours to be worked must be considered.

2.3.9. Financial Aspects

This is a major point to be considered when designing a kitchen. Equipping and designing a kitchen required a lot of finance. Therefore budgeting of finance that will enough to carry out both designing and equipping of a modern kitchen must be considered.

2.4 Summary

This unit discussed kitchen design and for one to have a well designed kitchen, the type of equipment, menu, capitals, staff and their skill must be considered. In order to have a good kitchen layout, qualified professional such as Architects, certified kitchen designers, Engineers of Structural Design, among others must be consulted. For one to have enough space that can accommodate equipment and other items in the kitchen, consideration of the shape of the kitchen, such as Island space, wall setting, L or U shape is necessary when designing kitchen.

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2.6 Answer to Self-Assessment Exercises

Answer to SAE 1

1. Kitchen design is the design or plan that you give a specific room in a food production area, which includes things like size, lighting, decorating, and shape, among other things, where the chef prepares and cooks meals.

2. The following are the factors to be considered when designing and equipping kitchen

i) Size and the type of menu

It is the obligation of management to know who their target market is and how the business will operate within their setting when planning and building a kitchen. This will assist in determining which products to produce as well as the quantity of potential clients. When constructing a kitchen, the type and number of products on the menu will decide the sort of equipment that must be installed.

ii) The Type of Equipment

The sort of food prepared and cooked in a kitchen will dictate the equipment that should be installed. This is reinforced by Mohini (2011), who states that equipment is dependent on the cooking methods necessary for the foods on the menu. For example, if a canteen menu consists primarily of fried snacks and beverages, the choice will be between purchasing a fryer and purchasing a fryer. As a result, when adding food to the menu that requires modern equipment, management must consider how to obtain the equipment as well as the space it will take in the kitchen.

iii) Capital

The capital budgeted for a kitchen must be considered while designing and equipping it. The budgeted capital may be insufficient in comparison to the amount needed to complete the project. As a result, capital on hand must be considered so that the planned design does not come to a halt halfway through.

Answer to SAE 2

1i. Architects

ii. Certified kitchen designers

iii. Engineers of structural design

2a. Island Grouping

Equipment is positioned back-to-back in the center of the cooking area in an island setup. There will need to be enough room for this, including enough gangways around the equipment and room to install other goods along the walls (Ronald, Victor and David, 1999). If plumbing and ventilation hookups permit, an island can serve as a great site for a stove or second sink, according to Susan (2003). It might also be the perfect area for a wine rack or cooler, a wet bar, warming drawers, modular refrigerator units, or more general storage, according to her.

b. WALL SETTING

Sitting equipment along the walls is an alternative arrangement. This arrangement is possible when travel distances are short, and it is most common in smaller establishments (Ronald, et al 1999). Susan (2003) supports this by stating that this configuration places all of the equipment, sink, and cupboards along one wall. Sitting equipment along the walls is an alternative arrangement. This arrangement is possible when travel distances are short, and it is most common in smaller establishments (Ronald, et al, 1999). Susan (2003) supports this by stating that this configuration places all of the equipment, sink, and cupboards along one wall.

C. L- OR U-SHAPED LAYOUT

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2.6 Glossary

Automatic boilers: These boilers have automatic waterfeeds and can give freshly boiled water at intervals.

Bodily composition is a health-related aspect of physical fitness that refers to the proportions of muscle, fat, bone, and other body elements

Cardiovascular fitness refers to the ability of the circulatory and respiratory systems to supply oxygen during prolonged physical exertion

Conventional ovens: These ovens use a motorized fan to quickly pump a circulating circulation of hot air across the interior of the oven.

Flexibility refers to the range of motion accessible at a joint and is a health-related aspect of physical fitness

Food mixers: are electrically powered devices used in meals service establishments for mixing food and other tasks

Fry plates: These are medium-sized cooking utensils constructed of metal plates that can be used to prepare a variety of dishes, including meat, hamburgers, eggs, and bacon.

Kitchen design refers to the total space planning of the kitchen; it dictates the size, form, style, and décor of the space and equipment.

Kitchen equipment: Are all the tools, utensils, machinery, cutlery and furniture that are used for preparing, cooking and storage of food in the production area.

Muscular endurance is a health-related aspect of physical fitness that refers to a muscle's ability to work without becoming fatigued

Ranges are industrial cooking stoves that are frequently used in commercial kitchens; they include anywhere from six (6) to twelve (12) burners.

Strength is a health-related component of physical fitness that refers to a muscle's ability to exert force.

MODULE FOUR KITCHEN HYGIENE, RESERVOIR AND VEHICLE OF INFESTATION

Introduction

After studying this module, student is expected to learn what kitchen hygiene is. The student will also know the reservoir and vehicle of infestation.

The module is divided into the following units:

Unit 1: Kitchen Hygiene

Unit 2: Reservoir of infestation

Unit 3: Vehicle of infestation

UNIT 1 Kitchen Hygiene

Unit Structure

1.1 Introduction

As a result of not keeping our environment and the location where food is produced clean, food poisoning has caused a great deal of damage to our ecosystem. Food poisoning has increased as a result of this. To avoid this, proper attention should be paid to ensuring that the kitchen is well-organized, maintained, and cleaned. This is in accordance with Codex (2009), which states that it is critical to reduce the risk of contamination in the location and layout of kitchen equipment.

Kitchen hygiene, on the other hand, should be considered while planning and building a kitchen.

1.2 Learning Outcomes

At the end of this unit student should have learnt

Meaning of Kitchen Hygiene

How kitchen Hygiene can be achieved

Maintaining Personal Hygiene

Food Availability

Food Storage

Air Pollution Control

Inventory Management

Preparing food

Importance of kitchen hygiene

1.3 Meaning of Kitchen Hygiene

Self-Assessment Exercise 1

1. What is kitchen hygiene?
2. Explain how you can achieve kitchen hygiene in your establishment

Kitchen hygiene, according to Gifter (2020), is the upkeep of a high level of cleanliness and sanitation in the kitchen. Keeping the kitchen clean effectively avoids or reduces the spread of hazardous bacteria that can contaminate food.

Kitchen hygiene, according to Anyanwu in press (2022), is a procedure that ensures that the place where food is prepared and produced is clean, ventilated, and that food handlers maintain personal hygiene so that the food produced is not contaminated.

The index in the preceding definitions, show that kitchen hygiene is a process in which a kitchen is kept clean and well-organized, and the food produced there is safe for human consumption.

Having defined what kitchen hygiene is, it is important to understand how kitchen hygiene can be achieved.

1.4 How Kitchen Hygiene can be achieved

For kitchen hygiene to be achieved, food handlers must be aware of personal cleanliness, ensure that the food supplied is safe, and store it in a suitable storage facility. Gifter (2020) supports this by stating that the following must be in place for kitchen hygiene to be achieved:

1.4.1 Maintaining Personal Hygiene

Food handlers, according to Gifter (2020), must practice and maintain appropriate personal hygiene, which includes routinely washing hands with soapy water and wearing clean personal protective apparel. This is corroborated by Richard (2007), who claims that food workers' personal hygiene is crucial in preventing food poisoning, which is primarily linked to hand cleanliness. According to Kafferstien and Abdussalam (1999), kitchen workers should maintain personal hygiene by ensuring that their uniforms are maintained clean at all times and that a changing facility is available to them. The lockers where they keep their clothes in the changing area should be big, and it is unsanitary for workers to put food in the locker.

One of the most significant causes of food contamination in a kitchen is the kitchen workers, as well as anyone who accesses the culinary environment, such as management, delivery personnel, and visitors.

However, because food handlers are constantly in contact with food, it is their responsibility to ensure that they clean their hands, noses, and lips, wash and iron their clothes, and clip their nails and toes on a regular basis. This is because failing to do so will have an adverse effect on their health, resulting in food poisoning.

1.4.2 Food Availability

When it comes to food in the kitchen, make sure it's safe and comes from a respected source. It is vital to inspect the food for quality and safety (Gifter, 2020). It is vital, according to Adebayo and Anyanwu (2010), to ensure that food delivered in the food service industry is pest-free and safe for human consumption.

1.4.3 Food Storage

Food must be stored in a ventilated and pest-proofed environment, away from the ground, ceilings, chemicals, and physical items (Gifter, 2020). According to David and Patricia (2011), a high level of hygiene is required in the store, thus the walls and ceilings should be free of cracks and painted or tiled to make cleaning easier.

1.4.4 Air Pollution Control

Smoke must be removed from the kitchen in order to preserve proper hygiene and eliminate odors. This is corroborated by Mohiti (2011), who claims that if the kitchen is sufficiently aired, this can be accomplished.

As a result, the kitchen should have enough light to illuminate the entire space, even if a pin falls to the ground. In order to suck out bad air and stink and replace it with fresh air, kitchen extractors and exhaust fans should be installed.

When it comes to maintaining kitchen hygiene, insect control and the design of a drainage system are critical. It is vital to seal all possible entry points for rodents into the kitchen. The drainage system should be built in such a way that it is simple to clean (Anon, 2011).

1.4.5 Inventory Management

According to Gifter (2020), the approach of ensuring that the food that enters the kitchen first is used first, often known as FIFO, is better. This will aid in the efficient use of the food that enters the kitchen. Adebayo et al (2010) argue that with each new delivery, all old items in the kitchen should be brought forward.

1.4.6 Preparing food

According to Kaferstein et al (1999), in the food preparation area, employing materials that are durable, easy to clean, and care for is a good idea. This is because materials that are not long-lasting and quickly attacked by pathogenic microorganisms, as well as materials used in the production of food items tainted with foreign elements, should be avoided.

According to Gifter (2020), when preparing food, food handlers should constantly keep the area clean and maintain personal hygiene to prevent food contamination. In order to maintain kitchen hygiene, the surface should be designed in such a way that it does not collect dirt and is easy to clean, preventing food contamination and infestations (Ali, Mustafa, and Funda, nd). Food must be cooked at the correct temperature and surface areas and equipment should be cleansed and disinfected (Gifter 2020)

1.5 Summary

Kitchen hygiene is important in any food service establishment. This can be achieved if food handlers keep proper personal hygiene always. Storage of food in a good place that is well ventilated and proper inventory in the kitchen will contribute to kitchen hygiene;

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1.7 Answer to Self-Assessment Exercises (SAE)

1. Kitchen hygiene, according to Anyanwu in press (2022), is a procedure that ensures that the place where food is prepared and produced is clean, ventilated, and that food handlers maintain personal hygiene so that the food produced is not contaminated.

2. For kitchen hygiene to be achieved, food handlers must be aware of personal cleanliness, ensure that the food supplied is safe, and store it in a suitable storage facility. Gifter (2020) supports this by stating that the following must be in place for kitchen hygiene to be achieved by:

- Maintaining Personal Hygiene
- Food Availability
- Food Storage
- Air Pollution Control
- Inventory Management
- Preparing food

Unit 2 Reservoir of Infestation

Unit Structure

2.1 Introduction

Infectious agents have caused a lot of problems in our lives by increase in infectious diseases. These infectious agents live in human, animals and environment. Knowing where the infectious agents live and ways they can spread is important in this unit. Therefore, student after studying this unit will be able to know what reservoir of infectious disease is, their types and examples.

2.2 Learning Outcomes

At the end of this unit, the student is expected to:

- Explain the meaning of Reservoir of Infestation
- Discuss the types of Reservoir of Infestation and ways of spread

2.3 Meaning of Reservoir of infestation

Self-Assessment Exercises 1

1. Reservoir of infestation is …….
2. The type of reservoir occurs when a person becomes a host for infectious diseases is called ……..

According to CDC (1992), the habitant in which the agents generally reside, mature, and reproduce is known as the reservoir of an infestation agent.

The normal area or host where disease-causing agents live and multiply, according to Jim (2007), is the reservoir of infestation.

Haydon, Sara, Louise, and Laurenson (2002), opined that a reservoir of infestation is one or more epidemiologically related populations or habitats in which pathogens can be persistently maintained and infection transmitted to the stated target population.

The habitat in which an infectious agent generally lives, matures, and multiplies is known as the reservoir. Humans, animals, and the environment all have reservoirs. The reservoir might be the source of an agent's transmission to a host or it could not. For example, dirt is the reservoir for Clostridium botulinum, yet inadequately canned food containing C. botulinum spores is the source of most botulism cases (Centre for Disease Control, 1992).

The aforementioned definitions illustrate that a reservoir of infestation is a place or area where infectious disease agents reside.

2.4 Types of Reservoir of infestation

Self-Assessment Exercises 2

1. list three types reservoir of infestation 2. what is Zoonotic diseases?

The following are the types of Reservoir of infestation Agents:

a. Human
b. Animals
c. Environment

2.4.1 Human Reservoir

Human reservoirs are areas within humans where the majority of infectious illnesses thrive (CDC, 1992). According to Jim (2007), a human reservoir occurs when a person becomes a host for infectious diseases. Food-borne infections can enter the gastrointestinal tract through the mouth, according to the author. However, pathogens can be carried by humans and animals without causing illness, and the nose and throat are the organs where these pathogens can reside for a long time (Jim, 2007; CDC, 1992). According to Sagar (2022), a case is a person in the population who has been identified as having the disease, health disorder, or condition under investigation, whereas a carrier is an infected person or animal that harbors infectious agents in the absence of clinical disease and serves as a potential source of infection for others.

Man can be a passive carrier, incubatory carrier, convalescent carrier, or chronic carrier, according to the CDC (1992). Passive or healthy carriers are persons who, although being sick, have no symptoms. Those who can transmit the agent throughout the incubation period are known as incubatory carriers. Chronic carriers, for example, are people who continue to carry a pathogen such as the hepatitis B virus or Salmonella Typhi.

Carriers, on the other hand, frequently transmit disease because they are unaware that they are afflicted and hence take no additional care to prevent transmission. Symptomatic people who are aware of their sickness, on the other hand, may be less likely to spread infection because they are either too sick to go out, take care to prevent transmission, or are receiving therapy that reduces disease transmission

2.4.2 Animal Reservoir

Animals, such as pests, domestic and wild animals, serve as hosts for disease-causing agents to thrive and multiply. Almost all diseases that are spread by polluted water or food can also be

transferred through animals, according to Jim (2007). Most pathogens, on the other hand, can contaminate crops as a result of food-borne infectious agents discharged in animal feces. According to Jim (2007), germs can survive in raw meat and milk after animal slaughter. The majority of bacteria had access to the meats that caused food poisoning. Clostridium perfringens, Toxoplasma gondii, and Escherichia coli are pathogens found in red meat, chicken meat, and eggs, respectively.

Zoonotic diseases are diseases that are transmitted from animals to people, according to Streikauskas et al (2010). According to the CDC (1992), zoonotic diseases are infectious diseases that are transmitted naturally from vertebrate animals to humans. Rabies, which is transmitted from a rabid animal to a human, and lyme disease are two well-known Zoonotic diseases, according to Streikauskas et al (2010). Brucellosis (Cows and Pigs), authrax (Sheep), plague (Rodents), trichinellosis / trichosis (Swine), tularemia (rabbits), and rabies are examples of long established Zoonotic illnesses, according to the CDC (1992). (Bats, Raccons).

2.4.3 Reservoirs in the environment

Some infectious agents can be found in the environment's plants, soil, and water. In the soil, many fungal agents, including those that cause histoplasmosis, survive and grow. Legionnaires' disease outbreaks are frequently linked to water supplies in cooling towers and evaporative condensers, which serve as reservoirs for the pathogenic bacteria Legionella pneumophila (CDC, 1992)

2.5 Summary

Reservoir of infestation is an important topic that has been discussed in this unit. Agents that cause illness always live in human, animal or the environment. Since human handles the food in the food service establishment, food-borne infections can enter the gastrointestinal tract through the mouth. Moreover, animals, such as pests, domestic and wild animals, serve as hosts for disease-causing agents to thrive and multiply.

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2.7 Answer to Self-Assessment Exercises

Answer to SAE 1

1i. A reservoir of infestation is one or more epidemiologically related populations or habitats in which pathogens can be persistently maintained and infection transmitted to the stated target population.

ii. Human Reservoir

Answer to SAE 2

2i.. The following are the types of Reservoir of infestation Agents:

d. Human
e. Animals
f. Environment

ii. Zoonotic diseases are infectious diseases that are transmitted naturally from vertebrate animals to humans.

Unit 3 Vehicle of Infection

Unit Structure

3.1 Introduction

Pathogens are transmitted by vehicles such as water, food, and air. Waterborne disease transmission occurs as a result of contaminated water caused by poor sanitation. In many parts of the world, waterborne disease continues to be a severe issue. According to the World Health Organization (WHO), polluted drinking water causes over 500,000 fatalities every year. Foodborne disease transmission can also be caused by contaminated food due to improper handling or storage (WHO, 2015)

3.2 Learning Outcomes

At the end of this unit, student would be expected to have learnt about

- Meaning of vehicle of infection
- Vehicle of Infection

3.3 Meaning of vehicle of Infection

Self-Assessment Exercise 1

1. list three ways by which infectious agent can spread

2. What is vehicle of infection?

A mechanism or medium through which disease-causing substances are conveyed is known as a vehicle of infection (Jim, 2007).

This refers to the transmission of disease-causing agents from one person to another.

This is a method through which an infectious agent spreads to a host, which can happen through person-to-person transmission, food transmission, or vector-borne transmission, among other things. It's the spread of infectious diseases from a single source to all cases of a disease via a medium or vehicle like water, food, air, or blood. Having defined what vehicle of infection is, it is important to how infection on can spread.

Self-Assessment Exercise 2

1. Explain three ways dairy products can serve as vehicle of infection

2. When water contains germs that might cause water-borne illness when swallowed, it can act as ……..

3.4 Vehicle of Infection

Food, water, biologic products (blood), and fomite are all vehicles that may indirectly convey an infectious pathogen (inanimate objects such as handkerchiefs, bedding, or surgical scalpels). A pathogen can be carried by a vehicle in the same way as the hepatitis A virus can be transmitted by food or water. Alternatively, the vehicle may offer an environment in which the agent thrives, multiplies, or produces toxin, such as the environment in which Clostridium botulinum produces botulinum toxin when inadequately canned goods are present (CDC, 2000).

3.4.1 Food as a vehicle for transmission

Food contaminated by infected people is a common way for infections to spread. Diarrhea, vomiting, open skin sores, boils, fever, dark urine, or jaundice are signs of infection by a pathogen that could be spread to others through food handling. Foodborne transmission of these

pathogens is caused by food workers failing to wash their hands in particular conditions (such as after using the restroom, handling raw meat, cleaning spills, or transporting rubbish), use clean disposable gloves, or use clean utensils (CDC, 2017).

The following are the several ways food can serve as vehicle of infection

3.4.1.1 Dairy Products

a. Milk

Sheep, cows, goats, buffalos, horses, and donkeys are just a few of the animals that produce milk. A common infection reservoir has been identified as milk. Only a few examples of the ailment include typhoid, bovine tuberculosis, and paratyphoid. Microbial hazards can be transferred through three main routes in milk:

• Fecal contamination: During the production of milk, excrement from cows that are more liquid in nature than other animals might contaminate the product.

E. coli, salmonella, and Listeria monocytogenes are some of the pathogens found in feces (Jim 2007 in Jim et al 2007)..

• Mammary gland inflammation: S. aureus has induced mammary gland irritation in some animals. This S. aureus, as well as a few other diseases, is found in large quantities in raw milk. S. aureus can produce and develop enterotoxin if it is not kept cool enough (Jim 2007 in Jim et al 2007).

V. cholerae O1 can, however, live for more than two weeks in a variety of dairy items, such as milk, milk products, soft desserts, and cakes. Bacterial survival is improved when sugar and eggs

are added. Although pasteurization of milk kills V. cholerae, the organisms can survive for up to four weeks in raw milk, even if refrigerated (WHO, 2000).

b. Cream

This is another dairy product. The cream may become contaminated during pasteurization in the bottle. The cream can cause infections such as S. aureus, VTEC, and S. Typhimurium when used with cakes and sweets.

c. Butter

When contaminated, butter is another dairy product that can cause food poisoning. Cultured butter and sweet – cream butter are both available. S. aureus, staphylococcus intermedius, salmonella, and L. monocytogenes, among others, are microorganisms that cause food poisoning outbreaks when eating tainted butter. Butter is another dairy product that can cause food poisoning if it becomes contaminated (Jim 2007 in Jim et al 2007).

Cultured butter and sweet cream butter are both available. Microorganisms such as Staphlococcus aureus, Staphylococcus intermedius, Salmonella, and Listeria monocytogenes, among others, cause food poisoning outbreaks when tainted butter is consumed (Jim 2007 in Jim et al 2007).

g. Cheese

Another dairy product made from pasteurized milk and bacterial cultures with coagulation. Hard, semi-soft, and soft cheeses are available.

Staphylococcal enterotoxins and aflatoxin are two microorganisms that are linked to cheese. During the maturing or production process, they are created.

B. melitensis, B. rucella abortus, VTEC, L. monocytogenes, and Salmonella are some of the bacteria that can be found in cheese (Jim 2007 in Jim et al 2007).

3.4.1.2 Fruits and vegetables:

Another way infections can be transferred is through fruits and vegetables. This is due to the possibility of contamination during production or storage. Plant-based meals and food components, like most other food commodities, can get contaminated with microbial dangers throughout their growth in fields and orchards, harvesting and post-harvest processing, storage, and distributions, according to Jim (2007) in Jim et al (2007). Cholera outbreaks have been widespread in many nations, according to Rabbani and Greenough (1999), as a result of the habit of fertilizing gardens with untreated night soil and the ingestion of raw vegetables. Vegetables can become infected if they are washed in dirty water. When polluted water is injected into fruits like watermelons in order to maintain their weight and flavor, this can happen (Feachem, 1981). V. cholerae infection is strongly influenced by the pH of a particular fruit. Sour fruits, such as lemons and oranges, have a lower pH (below 4.5) and so do not promote the growth of V. cholerae, offering no cholera danger.

Wild animals that naturally defecate in areas where food is grown, gathered, processed, or stored, as well as cattle, can cause direct fecal contamination (Jim, 2007 in Jim et al 2007). Long et al (2002) found that 85 of the 1518 food poisoning outbreaks of intestinal infectious illness in England and Wales between 1992 and 2000 were caused by salad vegetables or fruits.

3.4.1.3 Sea Food

Fishes are more likely to be infected by V. cholerae when the surrounding water is contaminated by sewage or other V. cholerae O1 environmental sources, according to Rabbani and Greenough

(1999). In the presence of zooplankton, V. cholerae has been found to survive in seawater (copepods). When the surrounding water is contaminated by sewage or other environmental sources of V. cholerae O1, fish are more likely to be infected with V. cholerae. Plankton-feeding seafoods such as mollusks, crustaceans, crabs, and oysters can become infected with V. cholerae (Huq, Small, West, Huq, Rahman and Colwell, 1983). Even if refrigerated, clams and oysters, in particular, can carry V. cholerae for weeks once infected (Depaola, 1981).

3.4.1.2 Meat and Poultry

Meat and poultry are two of the most popular foods in the United States. These are meats that have had their surfaces infected during the slaughtering and butchering process. Cross-contamination is a common method of disease transmission during butchery. It can also spread from raw to cooked foods and throughout storage periods before and after cooking. This is supported by Kolvin and Roberts (1982) that contamination of meat of animal origin occurs exogenously during processing, cooking, storage, or consumption and it has been shown that V. cholerae can live and grow on cooked chicken, an increase in numbers of V. cholerae from 103 to 106 within 16 hours has been demonstrated. According to Jim (2007) in Jim et al (2007), the movement of organisms from raw to cooked meals, as well as the time spent in storage between preparation and consumption, play a significant role in contamination. Food poisoning would be significantly decreased, according to Jim, if freshly prepared, roasted, boiled, or fried meats were always eaten hot.

In the processing, retailing, and cooking steps, viruses can spread. Pathogens can be disseminated by hand, as well as by using surfaces such as chopping blocks, cutting boards, and

slicing machines. Food handlers aren't immune; by touching the food, they can contaminate it (Jim, 2007 in Jim et al 2007).

Eating prepared foods cold or warm might potentially transmit food sickness. During long durations of slow cooking and storage, C. perfringens spores survive, germinate, and multiply fast. Hamburgers and sausages, perishable cooked uncured meats, perishable cooked cured meats, canned and pickled cured meats, dried meats, pies and pastries are just a few examples of meat items that can be used as pathogen spreaders (Jim, 2007 in Jim et al 2007).

3.4.1.2.1 Egg

Poultry is a significant source of infections such as Salmonella. Contact with feces in the nest, barn, or cages can contaminate the shells of hen eggs, even during storage, packing, processing, distribution, and preparation.

Under certain humidity and temperature circumstances, Salmonella can enter the shell. Contamination can occur when using it as a liquid or dried product, as minute shell pieces drop into the liquid egg for freezing or drying (Jim, 2007 in Jim et al 2007).

3.4.3 Air as a vehicle for transmission

Another mode of disease transmission from one infected individual to another is through the air. This can happen when an infected person laughs, coughs, sneezes, etc., and the disease spreads into the air and stays there for a time, causing airborne transmission if an individual comes into touch with the agents. According to the Centers for Disease Control and Prevention (CDC), airborne transmission occurs when infectious organisms are transported by dust or droplet nuclei suspended in the air. Material that has settled on surfaces and been resuspended by air currents,

as well as infectious particles carried from the soil by the wind, are examples of airborne dust. Droplet nuclei are dried residues with a diameter of less than 5 microns. Droplet nuclei, unlike droplets that fall to the earth within a few feet, can stay suspended in the air for lengthy periods of time and be blown long distances. Because the measles virus stayed suspended in the air after a child with measles had departed, measles has arisen in children who came into a doctor's office after that child had left (Remington, Hall, Davis, Herald and Gunn, 1985). An individual with a typical cold may sneeze, causing droplets to land on a fomite such as a tablecloth or carpet, or she may wipe her nose and then transfer mucus to a fomite such as a doorknob or towel, according to CDC (2000).

3.4.5 As a mode of transmission, water is used.

When water contains germs that might cause water-borne illness when swallowed, it can act as a vehicle for transmission. According to Nwabor, Nnamonu, Martins, and Ani (2016), waterborne infections are diseases spread by drinking contaminated water. When contaminated drinking water is used to prepare food, the same germs can cause food poisoning. Diarrhoea is a symptom of most waterborne infections, and it is characterized by excessive stooling, which can lead to dehydration and mortality (Nwabor, Nnamonu, Martins, and Ani 2016). Water-borne transmission, according to Macy and Quick (nd), is the acquisition of disease by intake of water contaminated with feces or inorganic chemicals, which can become polluted at the source, during delivery to the residence, in storage containers, or through incorrect treatment. A disease that enters a population through water, according to Jeffrey (2017), can spread through additional pathways, such as person-to-person transmission or wastewater pollution of crops. Similarly, a disease that transmits from person to person can infiltrate water supplies via the feces stream and become waterborne.

The World Health Organization estimates that diarrheal disease accounts for 4.1 percent of the total daily global burden of disease and kills 1.8 million people each year. According to further estimates, 88 percent of the burden is due to inadequate water supply, sanitation, and hygiene, with the majority of the load falling on children in underdeveloped nations (WHO, 2000; WHO, 2005; and Pruss-Ustun , Bos , Gore , Bartram 2008 in Nwabor et al. 2016). According to the World Health Organization (WHO, 2013), children under the age of five die annually as a result of unclean water and a lack of basic sanitation. This figure shows a remarkable improvement above the predicted 2.2 million fatalities from diarrheal illnesses in 1998, which included both adults and children. According to Prüss-Üstün and Corvalán (2006), insufficient water, sanitation, and hygiene are responsible for at least 88 percent of diarrheal episodes worldwide.

Most waterborne infections, on the other hand, are commonly transferred by the fecal-oral channel, which happens when human feces is swallowed through contaminated water or food, which is primarily caused by poor sewage management and sanitation. Drinking-water feces contamination can be intermittent, and the level of feces contamination can be minimal or fluctuate substantially. In places with modest levels of contamination, supplies may not pose a life-threatening threat, and residents may have relied on the same source for years (Nwabor et al. 2016).

Cholera, Amoebic dysentery, Bacillary dysentery (shigellosis), Cryptosporidiosis, Typhoid, Giardiasis, Paratyphoid, Balantidiasis, Salmonellosis, Campylobacter enteritis, Rotavirus diarrhoea, E. coli diarrhea, Hepatitis A, Leptospirosis, and Poliomyelitis are only a few of the organism (Cheesbrough 2006)

3.5 Summary

This unit discussed how infestation can spread. Food, water, biologic products (blood), and fomite can serve as a vehicle of spread. Diarrhea, vomiting, open skin sores, boils, fever, dark urine, or jaundice are signs of infection by a pathogen that could be spread to others through food handling. Dairy products such as milk, cream, butters, cheese, also serve as vehicle of infestation. However, meat and poultry products, fruits and vegetables including air and water serve as mode of transmission.

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3.8 Answer to Self-Assessment Exercises (SAE)

Answer to SAE 1

i. Food, water, biologic products (blood), and fomite can serve as a vehicle of spread.

ii. A mechanism or medium through which disease-causing substances are conveyed is known as a vehicle of infection

Answer to SAE 2

1. The three ways dairy products can serve as vehicle of infection

    h. egg, ii. Cream and iii. Milk.

2. Vehicle of Infection

3.4 Glossary

Airborne transmission: occurs when infectious organisms are transported by dust or droplet nuclei suspended in the air.

Animal Reservoir: This is when animals, such as pests, domestic and wild animals, serve as hosts for disease-causing agents to thrive and multiply

Human reservoirs are areas within humans where the majority of infectious illnesses thrive. A human reservoir occurs when a person becomes a host for infectious diseases.

Kitchen hygiene is a procedure that ensures that the place where food is prepared and produced is clean, ventilated, and that food handlers maintain personal hygiene so that the food produced is not contaminated.

Reservoir of infestation is one or more epidemiologically related populations or habitats in which pathogens can be persistently maintained and infection transmitted to the stated target population.

Vehicle of infection: is a mechanism or medium through which disease-causing substances are conveyed

Waterborne disease transmission occurs as a result of contaminated water caused by poor sanitation.

Zoonotic diseases are infectious diseases that are transmitted naturally from vertebrate animals to humans.

MODULE 5: CLEANING AND CONTROL OF INFESTATION

Introduction

After studying this module, student is expected to learn what food safety is. The student will also know the purpose and importance of food safety.

The module is divided into three units, namely:

Unit 1 Disinfection and Sterilization

Unit 2 Cleaning Methods

Unit 3 Control of Infestation

Unit 1 Disinfection and Sterilization

Unit Structure

1.1 Introduction

1.2 Learning Outcomes

1.3 Disinfectant

1.3.1 Meaning of Disinfectant

1.3.2 Method of Disinfectant

1.3.2.1 Cleaning Disinfection

1.3.2.1.1 Factors to be consider when choosing cleaning agents

1.3.2.2 Heat Disinfection

1.3.2.3 Chemical disinfection

1.3.2.3.1 Disinfectants

1.4 Sterilization

1.4.1 Method of Sterilization

1.4.1.1 Heat Sterilization

1.4.1.1.1: Moist Sterilization

1.4.1.1.2: Dry Heating Sterilization

1.1 Introduction

Ensuring that the environment and work surface of where food are prepared and served as free from germs and harmful microorganisms is important to be discussed in this unit. The unit will highlight how both disinfection and sterilization have assisted in preventing both food poisoning and spoilage. Therefore, meaning and concept of disinfection and sterilization, including methods used in achieving them will be discussed.

1.2 Learning Outcomes

After this unit, student will know:

Know the meaning of disinfection

Discuss method of disinfection

Explain Sterilization

Evaluate method of sterilization

1.2 Disinfectant

Self-Assessment Exercises 1

1. What do you understand by the term “sterilization?”

2. What is the difference between sterilization and disinfection?

1.3.1 Meaning of Disinfection

Peter (2007) in Jim & Christane (2007) sees disinfection as the killing removal of microbe with the help of heat or chemical during cleaning. Disinfection is the killing of microbes to the level it will be safe, which can be possible by using senti chemical in order to remove microbe except bacterial spores (Fahmi, Antonulla & Penelope 2020).

Puga (2008) defined disinfection as a process of killing of infectious agent that is outside one body with the help of heat or chemicals. He maintained that with disinfection one can reduce the level of microorganism in the environment in which one makes our food safe.

The index in the above definitions shows that disinfection can be described as the process in which microorganism are eliminated, living only bacteria spore, with the aid of chemical or heat.

1.3.2 Method of Disinfectant

The following are the three methods of disinfection, according to Peter (2007) in Jim & Christine (2007).

1. Cleaning
2. Heat
3. Chemical

1.3.2.1 Cleaning Disinfection

Cleaning is when one uses detergent that is suitable in removing food soil completely, (Ronald, 2018). For William et al (2008) cleaning is the removal of foreign materials (soil and organic

material) from objects and is normally accomplished using water with detergents or enzymatic products.

Peter (2007) in in Jim et al (2007) sees cleaning as a hygienic process which assists in eliminating those entire microorganism that affect the quality of food. Spoilage and food poisoning at the same time remove dirt. However, cleaning play important role in food hygiene. It is when the food hander and the environment where the food are prepared are free from food borne illness that one can sure of his safety. This can be achieved by maintaining cleanliness and cleaning must taken place before disinfection sterilization. This is supported by Williams et al (2008) thorough cleaning is required before high-level disinfection and sterilization because inorganic and organic materials that remain on the surfaces of materials interfere with the effectives of the processes of cleaning.

However, during cleaning use of required materials like detergents and equipment, are necessary in order to get best result at the end of cleaning.

1.3.2.1.1 Factors to be consider when choosing cleaning agents

- The type of material to be cleaned
- The type of impurities that is to be removed
- Procedures to be used
- The frequency of sanitation
- Temperature, PH and hardness of water
- The type of material to be cleaned

When one is choosing any cleaning agent, consideration of materials to be cleaned is necessary. This is because most of the cleaning agents contain chemicals that are highly concentrated and can attack kitchen equipment. Some cleaning agents can also affect the colour of materials to be clean due to the content of it. Therefore, it is advisable to check the materials to be clean before selecting the cleaning agents.

- The type of impurities that is to be removed

Another factor to be considered when choosing cleaning agents is to know the type of impurities to be removed. When a material is stain with fat-based soil, the cleaning agents you will use will be different from material soiled with, you can used cleaning agents that contain a strong alkaline to clean fat-based soil materials.

- Procedures to be used

The procedure one uses in cleaning matters a lot when selecting cleaning agent. It might be mechanical cleaning, clean-out-of-place, and manual cleaning. So, if it is mechanical cleaning you choose cleaning agents that will give good result and cannot attack the materials. Remember, that the type of cleaning agents choosing when using manual method should be mild in order not to attack your hands.

- The frequency of sanitation

- Temperature, PH and hardness of water

The type of soil the material you want to clean will determine the level of PH that will be in the cleaning agents you will select. This is because some cleaning agents contain high level of acid that can fight any heavy soiled materials.

Consideration of hardness of water is another point one should consider. This is because hard water deposits are insoluble in water and one should choose cleaning agents that can give perfect cleaning.

Self-Assessment Exercises 2

1. List different methods of disinfection,

2. List four (4) main disinfection agents (Disinfectants) used in food industry

3. Explain three (3) factors to be consider when choosing cleaning agents

1.3.2.2 Heat Disinfection

Heat disinfection is one the ways one can used to maintain food hygiene Heat is one of the methods of disinfection. This is because heat is uses make food safe to eat, by killing all the pathogens that are available. This is in line with Peter (2007) in Jim et al (2007), cooking is used to make foods palatable and safe and also kill all the pathogens except bacteria spores.

Heat can also be used in making our utensils and other tools used in the kitchen free from pathogens. This is supported by Peter (2007) that the method of heat disinfection can also be used for utensils, crockery, cuttey, chopping board etc. examples of when one uses dish washer that involves washing and heating. During stage, all the micro-organisms are eliminated except bacterial spores at 80^0c (Peter 2007 in Jim et al (2007).

1.3.2.3 Chemical disinfection

Chemical disinfection is the process of using chemical to destroy pathogens except bacterial spores. When using chemical adequate care should be taken in ensuring that chemical used is suitable, required and will reliable in elimination or killing the microbes.

According to Peter (2007) in Jim et al (2007) the following factors should be considered when choosing an appropriate disinfectant

- Microbicidal range of the disinfectant

Before one chooses any disinfectant one should know the one that can kill the type of microbes that is available. This is because there are some types of disinfectant you purchase and it will not eliminate the microbe available.

- The ability of a disinfectant to withstand inactivation by a variety of organic matter.

When one is choosing disinfectants there is need to know the type of dirt or organic that is in it. This will guide him in choosing one that is suitable. For instance, if a table cloth is soiled with grease, or oil, the disinfectant with high concentration will be used because failure to do that will inactivate other disinfectant that is not highly concentrated.

This is in line with Peter (2007) in Jim et al (2007) that one can choose a disinfectant that will withstand inactivation or a higher concentration can be used to compensate for inactivation, or one can consider pre-cleaning to remove excess.

- Ability to reach and make contact with their target micro-organisms.

When a material is soiled or too dirty, the chances of the microbes being protected by the dirt are certain. Therefore, when choosing any disinfectant, choose the one can reach the target

microbes no matter how they are protected. This can be achieved, when choosing one with properties that can penetrate the property. This is supported by Peter (2007) in Jim et al (2007) that some disinfectants claims to have detergent properties in addition to disinfection action –in which case their capacity for disinfection is likely to be exhausted by penetration of organic layers.

- Room Temperature

When one is disinfecting, the person need to consider the temperature at which the work will come out one. This is because disinfectants work best at room temperature. If the material you are disinfecting is below room temperature either you use highly concentrated disinfectant or you always it to reach room temperature before working on it, which may consumed more time.

Toxicity, taint and corrosion

When one is choosing any disinfectant, one should ensure that the one chosen is suitable in food establishment. Choosing the one that will not affect the food and the utensils when diluted is better. Anyone that is highly concentrated and corrosive to the utensils should be avoided.

1.3.2.3.**1 Disinfectants**

According to William et al many disinfectants are used alone or in combinations e.g. hydrogen peroxide and pevacatic acid) in the health-care setting. But for Peter (2007 in Jim et al (2007) all disinfectants used in food production areas must not taint to food even when they are used on non-food contact surfaces,

Anas and Tareg (2020) in Fahm et al (2020), opined that the main disinfection agents (Disinfectants) used in food industry include

Hypochlorite,

Chlorine dioxide

Ladophor,

Peroxyacetic

Quaterrary

Ammonium compounds (QAC).

This is supported by Peter (2007) in that chlorine based disinfectants are also disinfection agents that chlorine-based disinfectants has both advantages and disadvantages, one of the advantages is that chorine-based disinfectants is low toxicity at use dilutions and cheap, while the disadvantages is it can be corrosive to some metals and low concentrations are inactivated by organic matters.

Other disinfection agents according to Peter are Peroxygen and hydrogen peroxide compounds, that are formulated with a compatible detergent for use as a combined cleaner-disinfectants.

One of the advantages is that it has how toxicity when use at dilutions and the **disadvantage** is that it low concentrations inactivated by organic matters.

For effective disinfection, it is important to first clean the surface by and remove visible dirt, food particles and debris, and then rise to remove any residue. After this step, application of a disinfectant is done using one correct dilution and contact time, according to the manufacturers' instructions, and then rising with drinking water, (Puga, 2018).

For QAC are surface active agents which are free of and colour, are highly stable and have little corrosive action on metals when used in recommended concentrations.

1.4 Sterilization

Sterilization is a process that involves the full elimination or destruction of all forms of microbial life (including vegetative and spore forms) using a variety of physical and chemical means (Hemanshu, 2017). Sterilization, according to Sridhar (2008), is the process of killing all living germs, including bacterium spores, using physical, chemical, or physiochemical methods. Sterilization is the process of removing all microorganisms, including bacterium spores, from a specific substrate by chemical or physical techniques (Giuliano et al 2007).

Sterilization, according to Kumar et al (nd), is the process of destroying all microorganisms (bacterial, viral, and fungal) by physical or chemical agents. There is no such thing as fully sterile skin. Sterilization in a microbiological laboratory refers to the sterilization process used in the preparation of culture media, reagents, and equipment when the work requires it (Kumar et al nd).

Prior cleaning of the object, organic and inorganic load present, type and level of microbiological contamination are all elements that affect the efficacy of both disinfection and sterilization, the physical nature of the object (e.g., fissures, hinges, and lumens); the existence of biofilms; the temperature and pH of the disinfection process; and, in some situations, the relative humidity of the sterilizing process (e.g., ethylene oxide) (William and David 2008).

However, to prevent disease transmission related with the usage of an object, sterilization eliminates all microorganisms on the surface of the item or in the fluid. While using insufficiently sterilized critical things poses a substantial risk of disease transmission,

documented pathogen transmission linked to an improperly sanitized critical item is extremely rare (Singh et al 1998 and Eickhoof, 1962).

1.4.1 Methods of Sterilization

The various methods of sterilization are:

1.4.1.1 Heat Sterilization

Heat is considered to be the most reliable way of sterilizing of goods that can endure heat, according to Sridhar (2008). Heat causes denaturation and coagulation of proteins, as well as oxidative consequences. Those items that cannot survive high temperatures can be sterilized at a lower temperature by extending the exposure time (Kristina, 2016). According to Mamta(nd), heat sterilization is the most effective and extensively used form of sterilizing because enzymes and other important cell elements are destroyed, resulting in bactericidal activity.

Because the heat employed eliminates all microorganisms, this is the most common kind of sterilization. The time of heating and the temperature of the heat have an effect on the extent of sterilization; as the temperature rises, so does the duration of heating (Kristina, 2016). This type of sterilization, according to Mamta (nd), is suitable to thermostable products and may still be used on both moisture-sensitive and moisture-resistant products, which are sterilized using dry (160–180°C) and wet (121–134°C) heat sterilization processes, respectively.

The heat sterilization method, on the other hand, can be classified into two categories:

1.4.1.1.**1: Moist Sterilization**

An autoclave is a device that works on the principle of moist heat sterilization through the generation of steam under pressure (Mamta, nd). Moist heat sterilization is one of the most

effective methods of sterilization where the steam under pressure (at Temp. in the range 121–134°C) acts as a bactericidal agent (Mamta, nd). According to Sridhar (2008), sterilization can be effectively achieved at a temperature above 100^{o}C using an autoclave. Water boils at 100^{o}C at atmospheric pressure, but if pressure is raised, the temperature at which the water boils also increases. This is supported by Mamta, (nd) that high pressure increases the boiling point of water and thus helps achieve a higher temperature for sterilization. According to Mamta (nd), germs are killed by coagulating their proteins in this process, which is far more effective than dry heat sterilization, which kills pathogens via oxidation. Sridhar (2008) pointed out that in an autoclave, water is cooked in a closed room, and the boiling point of water rises as the pressure rises. The temperature inside the autoclave is stated to reach 121^{o} C at a pressure of 15 lbs, according to the author. Sterilize articles by exposing them to this temperature for 15 minutes. Higher temperatures or longer timeframes are employed to eliminate the infective agents linked to spongiform encephalopathies (prions); 135^{o} C or 121^{o} C for at least one hour is advised (Sridhar, 2008).

At temperatures below 100°C, moist heat is preferred.

Pasteurization is a sterilizing procedure used at temperatures below 100°C. All mesophilic non-spore producing microorganisms in milk are killed in this technique by heating it to 63°C for 30 minutes (the holder approach) or 73°C for 20 seconds (the flash method) (Mamta, nd).

The milk is not heated past its boiling point because it could curdle and lose its nutritional value. Other fluids and equipment, such as vaccines against non-sporing bacteria, are pasteurized in special water baths at 60°C for 1 hour (Mamta, nd). According to Sridhar (2008), this approach is currently used in the food and dairy industries, and there are two methods of pasteurization:

the holder method (heated at 63°C for 30 minutes) and the flash method (heated at 72°C for 15 seconds, then swiftly cooled to 13°C). According to Sridhar (2008), other pasteurization methods include Ultra-High Temperature (UHT), 140^{o} C for 15 seconds, and 149^{o} C for 0.5 seconds. Serum and bodily fluids containing congealable proteins are also sterilized in water baths at 56°C for 1 hour, according to Mamta (nd).

Most milk-borne pathogens, including as Salmonella, Mycobacteria, Streptococci, Staphylococci, and Brucella, are killed by this approach, according to Sridhar (2008), while Coxiella may survive pasteurization. According to the author, efficacy is determined using the phosphatase and methylene blue tests.

1.4.1.1.2: Dry Heating Sterilization

Dry heat causes protein denaturation, oxidative degradation, and toxic consequences from high electrolyte levels, according to Sridhar (2008). Dry sterilization is the removal of germs using moisture-free heat, which is ideal for moisture-sensitive materials (Mamta, nd). Microorganisms are destroyed by dry moisture-free heat, which causes denaturation of proteins and lyses proteins in many organisms, causes oxidative free radical damage, causes cell drying, and can even burn them to ashes (Mamta, nd).

Flaming, cremation, hot air ovens, and radiation sterilization are all used to sterilize substances (Kristina, 2016).

Flaming is a type of dry sterilization that involves exposing metallic objects to flame for an extended period of time, during which the flame burns microbes and other dust present in the instrument (Mamta, nd). Metallic objects, such as needles or scalpels, are placed over a flame for several minutes during burning. All bacteria will be killed by the flame (Kristina, 2016). In the

case of flaming, the instrument is dipped in alcohol or spirit before being burned in a gas flame (Mamta, nd). Flaming is a process of passing an article over a Bunsen flame without heating it to redness, according to Sridhar (2008). Scalpels, test tube mouths, flasks, glass slides, and cover slips are all passed through the flame several times. Even though most vegetative cells are killed, Kristina believes there is no certainty that spores will die after such a brief exposure. This procedure is also restricted to items that can be exposed to flame. It's possible that the glassware will crack.

Incineration is particularly useful for inoculating loops used in microbial cultures. The metallic end of the loop is red-hot on a flame, destroying all bacteria (Kristina, 2016). For a variety of reasons, incineration dry heat sterilization is used to sterilize materials that are difficult to sterilize using moist heat sterilization (Mamta, nd). Incineration, according to Mamta (nd), is the process of sterilizing combined with a large reduction in the volume of wastes. Incineration, according to Sridhar (2008), is a process of eliminating hazardous materials by burning them in an incinerator. Soiled dressings, animal carcasses, pathological material, and bedding, among other items, should be incinerated. According to the author, because this technique results in the loss of the article, it is only appropriate for articles that must be discarded. Polystyrene materials produce copious smoke when burned; hence they should not be cremated.

Infrared radiation (IR) is a thermal sterilizing technique in which the radiation is absorbed and then transformed into heat energy (Mamta, nd). The instruments will be exposed to the radiation during this procedure, which will result in a temperature of around 180°C for roughly 17 minutes, according to Mamta. The radiation approach, according to Kristina (2016), entails exposing packed materials to radiation. There are two types of radiation sterilization, according to Kristina (2016): non-ionic and ionizing radiation sterilization. The former is risk-free for the

individual doing the technique, whereas the latter necessitates the use of protective equipment by the operator. Dry materials such as glassware and powder are appropriate for the hot air approach. They are disinfected in a hot air oven by being placed inside the racks (Kristina 2016).

1.4.1.**2 Chemical Sterilization**

Chemical sterilization is the process of removing bacteria using bactericidal chemicals (Anupama, 2021).

Even though physical methods of sterilization are more appropriate for effective sterilization, it is not always appropriate to use for heat-sensitive materials like plastics, fiber optics, and biological specimens, according to Anupama(2021). In such cases, chemical sterilization in either a liquid or gaseous state can be used.

It is critical, however, to ensure that the materials being sterilized are compatible with the chemical being utilized. Furthermore, it is critical to follow safety procedures in the workplace when using chemical agents.

The chemical method of sterilization can be categorized as liquid and gaseous sterilization.

1.4.1.3 **Gaseous Sterilization**

Gaseous sterilization involves the process of exposing equipment or devices to different gases in a closed heated or pressurized chamber. Gaseous sterilization is a more effective technique as gases can pass through a tiny orifice and provide more effective results. Besides, gases are commonly used along with heat treatment which also facilitates the functioning of the gases.

However, there is an issue of release of some toxic gases during the process which needs to be removed regularly from the system.

The mechanism of action is different for different types of gases.

1.5 Summary

Disinfection and sterilization is important factors that are relevant in any food service establishment that are used in preventing both food poisoning and spoilage. Sterilization is a process that involves the full elimination or destruction of all forms of microbial life (including vegetative and spore forms) using a variety of physical and chemical means. The various methods of sterilization are heat sterilization, chemical sterilization,

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1.7 Answer to Self-Assessment Exercises

Answer to SAE 1

1. Sterilization is a process that involves the full elimination or destruction of all forms of microbial life (including vegetative and spore forms) using a variety of physical and chemical means

2. Sterilization is the process of killing all living germs, including bacterium spores, using physical, chemical, or physiochemical methods, while disinfection as a process of killing of infectious agent that is outside one body with the help of heat or chemicals.

Answer to SAE 2

1. The following are the three methods of disinfection:

i. Cleaning ii. Heat iii Chemical

2. The main disinfection agents (Disinfectants) used in food industry include

i. Hypochlorite, ii. Chlorine dioxide iii. Ladophor, iv. Peroxyacetic iv. Quaterrary

3. **Factors to be consider when choosing cleaning agents**

- The type of material to be cleaned,
- The type of impurities that is to be removed
- Procedures to be used
- The frequency of sanitation
- Temperature, PH and hardness of water

Unit 2 Cleaning Methods

Unit Structure

2.3.2.2.2 Buffing with a spray

2.3.2.2.3 Polishing

2.3.2.2.4 Scrubbing

2.3.2.2.5 Stripping

2.3.2.2.6 Laundry

2.3.2.2.7 Dry Cleaning

2.4 Summary

2.5 References

2.1 Introduction

Knowing the cleaning procedures is vital in our environment since failing to utilize the proper cleaning method may cause a lot of damage to the areas cleaned while also causing difficulties with the cleaning equipment. As a result, students will learn about cleaning methods and their classifications in this unit.

2.2 Learning Outcomes

At the end of this unit, student would be expected to:

Discuss the meaning of cleaning methods

Explain the classification of cleaning methods

2.3 **Cleaning Methods**

2.3.1 Meaning of Cleaning Methods

Cleaning with a manual approach involves processes such as dusting, shaking, sweeping, mopping, washing, or polishing to remove dirt, dust, and grime. Certain areas should be cleaned on a regular basis, while others should be cleaned only once or twice a year (Anyanwu and Ukabuilu, 2013).

Self-Assessment Exercises 1

1.Explain the term cleaning method 2. Cleaning methods are classified into two, explain with three examples each

2.3.2 Classification of Cleaning Methods

Cleaning methods are classified into two namely:

Manual methods of cleaning and

Mechanical methods of cleaning

2.3.2.1 Manual methods of cleaning

Manual methods of cleaning: these are all those methods of cleaning that are performed manually. This kind of method does not require the use of electricity. They do not required mechanized tools.

2.3.2.1.1 Dusting

The removal of dust and dirt particles from above-ground surfaces is known as dusting. Almost anything, from mantles to tables and even furniture, can be dusted. A duster, as you might expect, is the best dusting instrument, but look for one with a microfiber cloth that holds the dust rather than pushing it around. Although traditional, a feather duster is not the best instrument for the job (Timothy, 2022).

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Duster

Source: (Timothy, 2022)

2.3.2.1. 2 Sweeping

Sweeping is the process of pushing a broom back and forth in short strokes to push dust in one direction, usually in the direction of a long-handled dustpan, in order to remove it from a room. After the dust has been pushed into a single pile, sweep the dirt into a dustpan with your broom for quick and easy cleanup.

A push broom is better for cleaning larger floors because it has a bigger brush head and stiffer bristles that capture more dust every pass, whereas regular brushes are best for cleaning specific rooms or smaller areas.

Sweeping too vigorously might cause dust to become airborne. When sweeping the floors, take your time.

Self-Assessment Exercises 2

1. According to Igbojekwe, (2004), there are a few things to keep in mind when mopping, list any three. 2. list four example of manual method of cleanin

2.3.2.1 .3 Damp Dusting

Traditional dusting is virtually comparable to damp dusting, with the exception that a tiny amount of water or cleaning solution is used. Old, sticky stains on above-ground surfaces can be removed with a dusting solution. Damp dusting can be applied to any above-ground surface that has food or liquids on it.

Damp dusting is a simple method that involves only a microfiber cloth, water, and a dusting solution. To cut through oil, mix a cup of water with 14 cup of vinegar to make your dusting solution, (Timothy, 2022).

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Damp dusting

Source: (Timothy, 2022)

2.3.2.1. 4 Dust Mopping/Dry Mopping

The best way to remove sand and grit from floors is with dust or dry mopping. To avoid scratching your flooring's surface and destroying its lustrous shine, you should remove these abrasive floor impurities as soon as feasible.

Pushing a dust mop around the room like a push broom is how dust mopping is done. A dust mop is a mop with a larger head that lifts and eliminates any impurities in its path with a microfiber cloth. To collect the sand and grit, you'll also need a dustpan (Timothy, 2022)

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Mop

Source: (Timothy, 2022)

2.3.2.1.5 Mop Sweeping

Mopping is the process of collecting dry spoilage using static, impregnated, or disposable dry mops (Igbojekwe, 2004).

Timothy (2022) compares mopping to dust/dry mopping, with the exception that it removes sticky patches from the ground with a little water and a floor cleaning product. After dusting or dry mopping, it's also an excellent way to pick up and remove any residual particles.

According to Igbojekwe, a mop-sweeper with a dry mop head, impregnated (cotton head drenched with oil to keep the dust at bay), static head (nylon head that emits static electricity when brushed over the floor to keep the dust at bay), or disposable head (2004).

According to Timothy, a microfiber dust mop with a broad head, a bucket of water and cleaning solution mix, and elbow grease are all required (2022). Wring the mop head to remove as much water as possible to avoid puddles that could ruin the polish on your floorboards.

According to Igbojekwe, there are a few things to keep in mind when mopping (2004)

1. Make sure the mop-head sweeper's is always flat on the floor. You can easily clean around furniture legs because the head swivels around.

2. In open areas, clean in straight long lanes, going up and down, until the entire floor surface has been covered.

3. Using a vacuum cleaner or dust pan and hand brush, gather any trash, grit, or dust that hasn't stuck to the head at the end of the last lane. Mop-sweepers do not distribute dust when used in this manner.

4. After each usage, suction-clean the heads and launder them (usually once a week.)

2.3.2.1.6 Spot Mopping

Spot mopping entails sweeping a small area of your floors. If liquid or food spills on your flooring, the acids from the spills can permeate the finish and destroy the shape and texture of the material underneath if they are not cleaned up very once.

A mop, a pail of water, and some floor cleaning solution are all you need to spot-mop a floor. Also, wring out your mop as much as possible to allow it to absorb spills on your floor. Make sure you have barriers or signage in place to keep people from treading on the freshly scrubbed area (Timothy, 2022).

2.3.2.1 .7 Wet Mopping / Damp Mopping

Sweeping your entire floor surface using a slightly dampened mop or cloth is known as wet/damp mopping. This method is used after sweeping, dusting, and dry-mopping the floor to prevent soil and spills from sticking to the surface and leaving permanent stains (Timothy, 2022).

To wet-mop a floor, all you need is a mop, a bucket of water, and some floor cleaner. Use essential oil droplets to intensify the aroma once the floor has had time to air-dry (Timothy, 2022). When damp-mopping, a mop – bucket with a wringer (some are expressly constructed for certain types of mops), a natural detergent, and water are necessary, according to Igbojekwe (2004).

According to Igbojekwe, (2004), there are three varieties of mops, each of which is utilized in a distinct way.

i. The fixed head of the short-tailed mop is wrung out in a bucket with an unique conical wringer. Using a push and pull action is recommended. Rinse the mop and bucket in clean water after each use, wring out the mop, and hang them to dry.

ii. The long-tailed mop's head is removable, making it easy to wash after each usage. The heads are available in a variety of sizes and are designed to be used standing up. When using it, keep the weight on your arms rather than your back and swing the mop from side to side in a figure-eight motion while working backwards. The mop can be used with a variety of buckets that have varying wring systems

iii. A wringing system is commonly installed on a sponge-mop or a mop with replaceable heads. After each usage, thoroughly rinse and allow to air dry.

You'll have to resume the cleaning process if you don't alert pedestrians that the floor has been freshly mopped (Timothy, 2022).

2.3.2.1 .8 Manual Scrubbing

Scrubbing by hand involves more effort than the preceding cleaning procedures. Scrubbing is done on grooved surfaces, like as tile grout, where mops fibers have trouble reaching. Scrubbing is utilized to get rid of tougher stains from these types of surfaces.

Scrubbing floors with a long-handled scrubbing brush is ideal, while cleaning vertical surfaces like bathroom and kitchen walls with a portable scrub brush is ideal. Also, for optimal cleaning results, acquire a bottle of tile and grout cleanser.

Scrubbing is a time-consuming but important procedure for giving your flooring that extra wow factor, but applying a strong grout solution in confined spaces can cause disorientation. Ascertain that the room is properly ventilated (Timothy, 2022).

2.3.2.1 .9 Polishing by hand

To provide a surface an extra boost in shininess, manual polishing is applied after dry and wet cleaning. Apply a small amount of polish on a cotton rag and rub the surface in tight circles to allow it to adhere.

To determine how much time to allow between polishing and buffing with a dry cloth, see the directions on the floor or counter polish. Make sure you buy the right polish for your floor. Polish can either strip or not strip the finish of your flooring, so make sure you purchase the right one. Buffing floors by hand is not only time-consuming but also inconvenient. Furthermore, if the wax isn't properly buffed, you risk having greasy streaks results (Timothy, 2022).

2.3.2.1.10 Spot Cleaning

Spot cleaning is the process of removing localized stains from soft and hard surfaces using either a dry or wet cleaning method. To make this, you don't need a big bucket and a mop; use as much or as little water and cleaning solution as necessary to completely remove the stain.

Use the right tools for the job, such as brushes for tile grout and soft-bristle brooms for flooring, when spot cleaning an area. Depending on how severe the stain is, you can apply a cleaning product or not. To avoid oils from seeping into your floor, spot cleaning should be done as soon as possible after you discover the stain (Timothy, 2022)..

2.3.2.2 Mechanical methods of cleaning: these are all those methods of cleaning that are performed mechanically. This kind of method requires the use of electricity. They do required mechanized tools.

2.3.2.2 .1. Vacuum Cleaning / Suction Cleaning

Suction cleaning, often known as vacuuming, is the practice of using a vacuum cleaner to remove loosened dirt and debris from a surface. Vacuum cleaners can be equipped with a variety of attachments that allow you to clean above-floor surfaces such as curtains, stairs, upholstery, and even car interiors.

Select the vacuum cleaner that is best suited to your needs. A handheld vacuum is great for cleaning small, enclosed places, whereas a stick or upright vacuum is better for cleaning large areas. You may have the best of both worlds with a convertible stick vacuum or upright vacuum (Timothy, 2022). Some vacuum cleaners include abrasive brush rolls that, if left in the same position for too long, can scrape the floorboards.

2.3. 2.2.2. Buffing with a spray,

Spray buffing is the process of applying a floor solution or wax to the floor and then buffing it using a high-speed floor buffer. It's the go-to procedure for attaining the gleaming appearance of high-end restaurants and hotels. Floor buffers are expensive and should only be used in business structures. There are, however, residential-grade floor buffers with less frills that provide comparable buffing results (Timothy, 2022).

2.3.2.2.3. Polishing

After vacuuming and cleaning your floor, give it a deep polish to remove ingrained dust and dirt and restore its natural gloss. You don't need to include polishing in your everyday floor cleaning regimen because a little shine goes a long way.

The same high-speed floor buffer can be used for spray buffing. When polishing floors, liquid cleaning solutions should not be used because they may remove the finish. You should polish your floors on a regular basis if you can find a low-cost, home-level floor buffer (Timothy, 2022).The polishing process can be defined as this is a finishing process in which we get a smooth and shiny surface of the work piece by rubbing it or by applying a chemical treatment. It is one of the oldest processing methods, first used in the making of stone implements (Amrit, 2016).

Polishing Process:

The polishing process is described by Amrit (2016) as follows:

Polishing removes minor imperfections from a surface, making it smoother and brighter. The work piece's surface is rubbed to achieve this smoothness.

Today, polishing is one of the most effective ways to achieve the greatest possible finish. Today's polishing requires ultra-precision technology.

For effective material removal, polishing employs a larger number of multi-points.

The polishing process is employed in a wide range of sectors, including aerospace, automotive, mechanical seals, fluid management, and many others.

It's the last step in the lapping process, and it determines the size and roughness of the finished surface. From steel to composite ceramics, it's found in a variety of materials.

2.3.2.2.4 **Scrubbing**

Scrubbing is done with abrasive pads or brushes attached to the end of a long-handled tool. These brushes reach deep into the grout to remove accumulated dirt and debris. Cleaning is usually done on toilet floors, however scrubbing equipment can be found in business organizations' public areas (Timothy, 2022).

Electric scrubbers are inexpensive and simple to use. A modest amount of floor cleaning solution should aid in the removal of stubborn material from hard-to-reach areas. Scrubbing equipment includes a scouring machine (equipped with a tank, drive disc, and scrubbing pad, or a scrubbing brush), a suction drying machine, a neutral detergent solution, a mop, and a pail for tricky corners, according to Igbojekwe (2004).

Dry-scrubbing poses a substantial danger of scratching, so make sure the scrubbing pads or brushes you choose are gentle on your floor (Timothy, 2022).

Igbojekwe (2004) noted that when one is scrubbing he should note the following:

• Scrubbing is done backwards, while the majority of machines work in a side-to-side motion. Two persons should ideally work together to operate the suction drying equipment that follows the cleaning machine.

• After each usage, clean and empty the machines' tanks, remove and wash the drive disc and pad, wipe the float of the suction dryer (which alters the tone of the motor when the tank has to be emptied), and clean the squeegee blade, exterior casing, wheels, and cable..

2.3.2.2.5 Stripping

If the polish on your flooring has become dull over time or due to sand and grit redistribution, you'll need to strip them down to the bare wood. Following the exposure of your flooring's natural materials, you can conduct minor touch-ups or completely refinish it.

With the same floor buffer you used for spray buffing and polishing, you may remove the finish from your floors, however you'll need an abrasive pad. You'll also need a bottle of floor finish that matches the type of flooring you have.

Because you'll be removing the finish from your flooring, keep the floor buffer moving so it doesn't dig into the real floor (Timothy, 2022).

2.3.2.2.6. Laundering

Even though we focused on cleaning the floors and walls, you must also clean the materials in your home. This includes bed sheets, clothing, upholstery materials, and any other soft object that may be safely washed in a washing machine.

You'll need a washing machine that can handle heavy loads of laundry, as well as a good soap or bleach, to keep colors from fading. Although having a dryer is convenient, air-drying your garments will prevent them from shrinking.

Clothing, bedsheets, and pillowcases are examples of products that require frequent laundering. Make sure to wash all fabrics as soon as they become filthy to avoid long-lasting stains (Timothy, 2022).

2.3.2.2.7. Cleaning using a dryer

Dry cleaning refers to the process of removing dirt and stains from clothes. Instead of water and detergent, dry cleaning uses a chemical medium, most often kerosene or hydrocarbon. The fabrics get wet, yet there is no water in the equation (Timothy, 2022)..

Dry cleaning is an expensive service that is only offered on a regular basis by large Laundromats and hotels. You may accomplish dry cleaning at home using the correct amount of chemical cleaning agents and your washing machine's delicate wash setting. DIY dry cleaning is not a guaranteed technique and can ruin clothes if done incorrectly. We recommend that you delegate this task to the professionals (Timothy, 2022).

3.4 Summary:

It is necessary for one to know the method required when cleaning. These methods can perform manually or mechanically. Manually method of cleaning is the process by which one cleans an area with cleaning equipment that does not required electricity or mechanical tools. Examples are dusting, sweeping, mopping among others. Mechanical methods of cleaning on the other hand

are the processes by which one cleans an area with cleaning equipment that required electricity or mechanical tools which include polishing, vacuum cleaning, etc.

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3.6 Answer to Self-Assessment Exercises (SAE)

Answer to SAE 1

1. Cleaning method involves processes such as dusting, shaking, sweeping, mopping, washing, or polishing to remove dirt, dust, and grime.

2. Cleaning methods are classified into two namely:

Manual methods of cleaning and

Mechanical methods of cleaning

Manual methods of cleaning: these are all those methods of cleaning that are performed manually. This kind of method does not require the use of electricity. They do not required mechanized tools. Examples include sweeping, mopping, dusting

Mechanical methods of cleaning: these are all those methods of cleaning that are performed mechanically. This kind of method requires the use of electricity. They do required mechanized tools. Examples include polishing, buffing with a spray, vacuum cleaning / suction cleaning

Answer to SAE 2

1. According to Igbojekwe, there are a few things to keep in mind when mopping (2004)

a. Make sure the mop-head sweeper's is always flat on the floor. You can easily clean around furniture legs because the head swivels around.

b. In open areas, clean in straight long lanes, going up and down, until the entire floor surface has been covered.

c. Using a vacuum cleaner or dust pan and hand brush, gather any trash, grit, or dust that hasn't stuck to the head at the end of the last lane. Mop-sweepers do not distribute dust when used in this manner.

d. After each usage, suction-clean the heads and launder them (usually once a week.)

2. Sweeping, mopping, dusting, Scrubbing among others are examples of manual method of cleaning

Unit 3 Control of Infestation

Unit Structure

3.1 Introduction

Pests have caused a lot of damages in the hospitality industry. Knowing how these pests can be controlled is important in this course. The student will learnt what infestation is, their type and how these pests will be prevented and controlled.

3. 2 Learning Outcomes

At the end of this unit, the student is expected to:

Discuss the meaning of infestation

Evaluate the type of pest and their control

Examine the guidelines for the selection and use of Rat exterminators (insecticide)

3.3 Infestations

Self-assessments Exercises 1

1. Briefly explain the term Infestation
2. In the hospitality industry, there are different pest that attack food products and also infect the food, list three of these pest.
3. List and explain three factors to be considered when selecting and using insecticides.

3.3.1 **Meaning of Infestation**

Infestation is the process by which pests are inhabited in a food service industry

Infestation is the state of being invaded or overrun by parasites or other pests.

Infestation is the state of being invaded or overrun by pests or parasites, (*Dorland's Medical Dictionary*). It can also refer to the actual organisms living on or within a host (*Free Merriam-Webster Dictionary*)

3.3.2 **Pests and Their Control And Prevention**

3.3.2.1 Cockroaches

These are nocturnal insects (Anyanwu and ukabuilu, 2017). They always in crevices and dark places during the day, but always come out at night in search of food. They normally contaminate the food with their faces. They live in and around drains and sewers (Richard,(2007). They feed on almost everything, including all types of food stuff, paper and garbage. They are normally found in toilets and food stores.

When egg cases and fecal deposits of Cockroaches are found in the kitchen, it shows signs of infestation, (Richard 2007)

3.3.2.1.1 Prevention /Control of Cockroaches

1 When kitchen is designed very well and maintained good environment that can prevent infestation.

2 Maintenance of food hygiene and ensuring that where foods are kept are clean always prevent Cockroach infestation.

3 Cover all cracks and holes where cockroaches can hide.

4 Good hygiene is very important in preventing cockroach infestation.

5 Cover all foods properly

6 Keep the kitchen properly ventilated.

7 Spray recommended insecticide in the crack and holes in the kitchen but adequate measures must observed to ensure that the insecticide does not set in contact with food and cooking utensils, which can cause food poising.(Anyanwu et al 2017)

Self-assessments Exercises 2

1. Briefly explain how you can control the following:

    i. Rat. ii. Flies. iii. Cockroaches

3.3.2.2 FLIES

Flies are pests that are found in the food service establishment that can carry pathogens that can infect food. They normally feed on feces and refuges. Flies especially houseflies breed in rubbish heaps refuse bins and dirty latrines. They carry many disease-causing micro-organisms on their hairy bodies and deposited them on food. This is in line with Ronald et al (2005) that flies legs, wings and bodies always contaminate food because the carry harmful bacteria that if the touch food it will now become problem.

Signs of infestation are the presence of adult flies, larvae or pupae in or around food premises, Richard, 2007, Anyanwu et al (2017)

3.3.2.2.1 PREVENTION/ CONTROL

- Disposing of refuse in the kitchen without allowing it to stay always prevent flies in the premises.
- Refuse in the food premises should be covered.
- Keep shutters and drains clean
- Cover all food properly
- By eliminating their breeding places
- Put suitable wire-netting on doors and windows to prevent the entry of flies.
- Apply insecticide where necessary, but ensure that all food are covered (Richard, 2007, Anyanwu et al 2017)

3.3.2.3 Ants

These are pests that normally found in the kitchen. Pharaoh's ant is the type of ant that transmits human pathogens and constitutes a health hazards in hospitals. This occurs when the roam from open wounds and soiled dressing to sterile equipment and dressings or to food.

3.3.2.3.1 Prevention /control

- By making the environment clean and numeral of waste food.
- Any food that always attract ants to food premises should be covered properly in a tightly covered tins and plastics,
- Use of insecticides
- By repairing all the structural crack and crevices in walls and floors (Igbojekwe, 2004 Anyanwu et al 2017, Richard 2007)

3.3.2.4. Rats and mice (Rodents)

Rat and mice are commonly rodents found in food premises. They can spoil food and spread diseases. Rats and mice always found in dark corners, cupboards and always enter the premises through the holes, doors, and when packing food from the suppliers to the kitchen.

When the premises are full with rat droppings, rat odours, holes in the surrounding, smears among others, it shows the presences of rats and mice.

Rats and mice droppings if come in contact with food or utensils will lead to food borne illness after consumption, (Basset,2004; Ronald et al 2005; Richard 2007).

3.3.2.4.1 Prevention /control

- Maintaining environment hygiene
- By maintaining good house keeping

- Ensuring that access routes for rodents are blocked
- Use of traps in controlling mice and rats
- By use of rodenticides
- Use of cats to control rats and mice
- Examination of food stock before entering in the store
- Buildings must kept clean
- The repair of the building must be frequent
- Dustbins should be covered with tight-fitting lids

(Igbojekwe, 2004, Ronald et al, 2005; and Anyanwu and Ukabuilu, 2007)

3.4 Guidelines to follow when selecting and use of pest exterminators (Insecticide)

The following are the guidelines to follow when selecting insecticides.

3.4.1 Use the right types of insecticide.

Before choosing any insecticides, it is important for you to know the type of insecticides to use for you gets best result. This can be achieved by identifying first the type of pest to eliminate. This will now guide you on the one that is required for the job. The services of an expert can also be of help to you on the best one to choose.

3.4.2: Study the instructional label on the precaution to follow when using the insecticides.

It is advisable to follow instructional manual when of using any chemical. The reason is that there are some precautions that always guide someone on the best way to achieve good result and failure to do that will affect the exercise. Therefore adherent to instructional manual is necessary.

3.4.3 Ensure that the chemical are properly kept so that children will not have access to it.

Insecticide has cause a lot of death because of the carelessness of the users. It is important those chemicals are labeled, and avoid putting them in transparent bottles that will attract the attention of children. Therefore it is proper to keep the chemical out of the reach of children.

3.4.4 Do not buy anyone that is not labeled.

Labeling of any product is important. This is because the supplier might supply wrong chemical that is not required that can cause a lot of damages to the industry. Again some of the instruction on how to mix and use the chemical is always written on the label, so if the chosen is not labeled, the user will find it difficult during usage.

3.4.5 Cover all the food in tight container properly when spreading the insecticide.

Food can be easily contaminated. Insecticide is a product that can affect the quality and also causes food poisoning. Therefore, in order to avoid contamination of food, it is advisable to cover all the food in tight container during spreading of the insecticides.

3.4.6 Avoid naked light when spreading insecticides so that fire outbreak will not occurs

Insecticide is highly inflammable. Therefore, it is wise to avoid any naked light when in use. Refusal to do so can lead to explosion of the insecticides with can result fire outbreak which will lead great loss to the establishment. Therefore, it is better to avoid naked light during spreading.

3.4.7 To ensure good result, make sure that all windows and doors are properly closed.

Doors, windows and other opening in the kitchen should be closed during spreading of insecticide. The reason is that, failure to it will allow the chemical to escape which will make it ineffective. Therefore, for good result, closing of windows, doors and other opening is better.

3.5 Summary

Infestation of pest has caused a lot of problems in our food service establishment. These pests include cockroaches, flies (House flies), ants, rats and mice among others. Several methods of

controlling them includes maintaining environment hygiene, use of insecticides, covering of food properly, eliminating of flies breeding places and putting suitable wire-netting on doors and windows to prevent the entry of flies among others. The factors to be considered when selecting and using insecticides include use of the right types of insecticide, studying the instructional label on the precaution, and avoid naked light when spreading insecticides so that fire outbreak will not occurs.

3.4 References/

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3.5 Answer to Self-Assessment Exercises (SAE)

Answer to SAE 1

1. Infestation is the process by which pests are inhabited in a food service industry

2. The type of pests that are found in the hospitality industry include:

i. Flies, Cockroaches, iii. Rats and mice iv. Ants

3. The following are the guidelines to follow when selecting insecticides.

Use the right types of insecticide.

Before choosing any insecticides, it is important for you to know the type of insecticides to use for you gets best result. This can be achieved by identifying first the type of pest to eliminate. This will now guide you on the one that is required for the job. The services of an expert can also be of help to you on the best one to choose.

Study the instructional label on the precaution to follow when using the insecticides.

It is advisable to follow instructional manual when of using any chemical. The reason is that there are some precautions that always guide someone on the best way to achieve good result and failure to do that will affect the exercise. Therefore adherent to instructional manual is necessary.

Ensure that the chemical are properly kept so that children will not have access to it.

Insecticide has cause a lot of death because of the carelessness of the users. It is important those chemicals are labeled, and avoid putting them in transparent bottles that will attract the attention of children. Therefore it is proper to keep the chemical out of the reach of children.

Do not buy anyone that is not labeled.

Labeling of any product is important. This is because the supplier might supply wrong chemical that is not required that can cause a lot of damages to the industry. Again some of the instruction

on how to mix and use the chemical is always written on the label, so if the chosen is not labeled, the user will find it difficult during usage.

Cover all the food in tight container properly when spreading the insecticide.

Food can be easily contaminated. Insecticide is a product that can affect the quality and also causes food poisoning. Therefore, in order to avoid contamination of food, it is advisable to cover all the food in tight container during spreading of the insecticides.

Avoid naked light when spreading insecticides so that fire outbreak will not occurs

Insecticide is highly inflammable. Therefore, it is wise to avoid any naked light when in use. Refusal to do so can lead to explosion of the insecticides with can result fire outbreak which will lead great loss to the establishment. Therefore, it is better to avoid naked light during spreading.

To ensure good result, make sure that all windows and doors are properly closed.

Doors, windows and other opening in the kitchen should be closed during spreading of insecticide. The reason is that, failure to it will allow the chemical to escape which will make it ineffective. Therefore, for good result, closing of windows, doors and other opening is better.

Answer to SAE 2

i. Prevention /control of rats

- Maintaining environment hygiene
- By maintaining good house keeping
- Ensuring that access routes for rodents are blocked
- Use of traps in controlling mice and rats
- By use of rodenticides
- Use of cats to control rats and mice
- Examination of food stock before entering in the store

- Buildings must kept clean

ii. Prevention/ Control of Flies are:

- Disposing of refuse in the kitchen without allowing it to stay always prevent flies in the premises.
- Refuse in the food premises should be covered.
- Keep shutters and drains clean
- Cover all food properly
- By eliminating their breeding places
- Put suitable wire-netting on doors and windows to prevent the entry of flies.
- Apply insecticide where necessary, but ensure that all food are covered

iii. Prevention /Control of Cockroaches

1 When kitchen is designed very well and maintained good environment that can prevent infestation.

2 Maintenance of food hygiene and ensuring that where foods are kept are clean always prevent Cockroach infestation.

3 Cover all cracks and holes where cockroaches can hide.

4 Good hygiene is very important in preventing cockroach infestation.

5 Cover all foods properly

6 Keep the kitchen properly ventilated.

3.6 GLOSSARY

Disinfection: is the killing of microbes to the level it will be safe, which can be possible by using some chemical in order to remove microbe except bacterial spores.

Cleaning is when one uses detergent that is suitable in removing food soil completely.

Chemical disinfection is the process of using chemical to destroy pathogens except bacterial spores. When using chemical adequate care should be taken in ensuring that chemical used is suitable, required and will reliable in elimination or killing the microbes.

Cleaning methods: are those cleaning processes that involve dusting, sweeping, mopping, polishing among others in which one uses when cleaning an area.

Manually method of cleaning: is the process by which one cleans an area with cleaning equipment that does not required electricity or mechanical tools. Examples are dusting, sweeping, mopping among others.

Mechanical methods of cleaning: are the processes by which one cleans an area with cleaning equipment that required electricity or mechanical tools which include polishing, vacuum cleaning, etc.