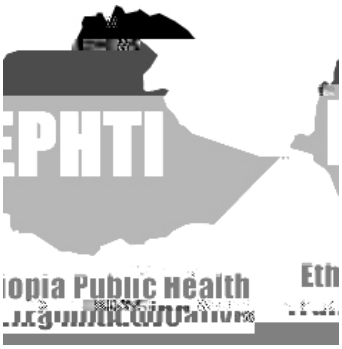
MODULE

Food-borne Diseases

Degree Program
For Health Officers, Nurses, Environmental health Officers and Medical Laboratory Technologists



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In collaboration with the Ethiopia Public Health Training Initiative, The Carter Center,
the Ethiopia Ministry of Health, and the Ethiopia Ministry of Education

2005


USAID

ACKNOWLEDGEMENTS

The authors wish to thank the EPHTI-Carter Center for their financial, technical and moral support, without which this task would have been very difficult to realize. We are especially grateful to Ato Aklilu Mulugeta, the business manager, and Dr. Hailu Yeneneh, technical advisor at the EPHTI-Carter Center, Addis Ababa Office. W/t Tinebeb, W/t Hiwot and W/t Bruktawit who unwearyingly typed and retyped the document also receive our heart-felt appreciations. Our gratitude also goes to Ato Haji Kedir, Ato Jemal Seid, W/t Eriteria Tadesse and Ato Lakemariam Kassa from the Faculty of Health Sciences, Alemaya University who reviewed the whole document and suggested valuable comments which lifted the document to its present level. Moreover, the authors would like to express their appreciation to the following National and International reviewers whose comments helped to bring the module to its present shape: Dr. Teklemariam Ayele, Dr. Aberra Geyid, and others whose names are not mentioned here. Last but not least the authors are also grateful to the Alemaya University in general and particularly to Professor Desta Hamito , the President and Dr. Belay Kassa, the Vice President of Academics and Research for their courageous attention and unreserved support in the production of modules suggested by the initiative.

TABLE OF CONTENTS

UNIT ONE
INTRODUCTION

1.1. Purpose and Use of the Module

A big challenge in the training of well-versed health professionals in the different higher institutions in Ethiopia has emanated from the serious shortage of adequate number of contextual reference materials. To add to this problem, even the available reference materials sometimes fail to address the most important learning issues of the Ethiopian students. However, up to this day, efforts geared towards the preparation of reference materials by instructors in the different institutions in order to reduce this problem have remained meager.

This brings into focus the purpose of the preparation of this module, which is just one among many having been or being undertaken through the initiation made by the Carter Center, EPHTI. This module is prepared to help students develop knowledge, attitudes and skills required in their practice areas through active learning. To this end, it will enable the different categories of health professionals i.e., Health Officer (H.O), Nurse (N), Environmental Health Officer (E.H.O) and Medical Laboratory Technologist (M.L.Technologist) to be able to recognize and manage the important food-borne diseases as well as to prevent them from occurring from the outset.

Besides, it is believed that those already engaged in the service delivery working in different health facilities will benefit as well from reading this module. All individuals taking time to look at this document are reminded of the importance of consulting standard textbooks on the subject whenever possible, since this module is by no means meant to replace them.

1.2. Directions for Using the Module

Before starting to read this module, please follow the directions given below:

1. Go through all the contents of the core module by starting with the pretest.
2. Use a separate sheet of paper to write your answers and label it “pretest answers”.
3. The pretest has two portions: Part I, and Part II.

PART I: Contains common questions to be answered by all categories.

PART II: The questions are prepared for the specific categories; Health Officers, Nurses, Environmental Health Officers, and Medical Laboratory Technologists. Select and do the portion that corresponds to your professional category.

When you are sure that you are through the core module proceed to read the satellite module corresponding to your profession or interest.

Go through the task analysis for the team members in comparison with that of your own.

Read the module for health extension workers under unit 3.5. in order to get an insight what roles they play in public health.

Note: You may refer to the list of abbreviations and glossary shown in Unit Five for terms that are not clear.

B. For Nurses

Write the letter that indicates your best choice.

1. Which one of the following can be taken as an objective data when assessing a patient with food borne diseases?
   A. Patient complaining of crampy abdominal pain
   B. History of ingestion of contaminated foods
   C. Very poor skin turgor
   D. Patient telling you that the diseases has started about 24 hours back

2. During the nursing care for a patient with diarrhea secondary to food borne diseases, caffeine and carbonated beverage is limited because:
   A. These is a potential source of food borne diseases
   B. These extremely decrease the peristaltic action of the gastro intestinal tract.
   C. These stimulate intestinal motility
   D. All are answers

3. One of the following nursing interventions is not carried out for a patient with poisoning related to the ingestion of contaminated food with chemical poisons and poisonous plants.
   A. Attaining control of the air way, ventilation, and oxygenation
   B. Treatment of shock
   C. Administering the specific chemical antagonist or physiologic antagonist
   D. All are answers

4. Induction of vomiting is not recommended after ingestion of caustic substances or petroleum distillates
   A. True
   B. False

5. Identify an incorrect statement about the nutritional management of the patient with food borne diseases that has diarrhea.
   A. Give sips of weak tea, carbonated drinks or tap water for mild nausea.
   B. Advise the patients to increase food products with a cellulose or hemi cellulose base.
   C. Vary the diet to make eating more enjoyable, and allow some choice of foods.
   D. Give clear liquids 12 to 14 hours after nausea and vomiting subsides.

6. Which one of the following nursing interventions is used to reduce anxiety of a patient with diarrhea secondary to food borne diseases?
   A. Providing an opportunity to express fears and worry about being embarrassed by lack of control over bowel elimination.
   B. Assist to identify irritating foods and stressors that precipitate an episode of diarrhea.
   C. Encourage to be sensitive to body clues that warn of impending urgency.
   D. All are answers

7. Identify a measure that is helpful to prevent the spread of food borne infections to others.
   A. Hand washing
   B. Blood and body fluid precautions whenever handling vomitus or stools
   C. Provision of isolation according to the general rule of body substance isolation, or individual institution adaptation of isolation.
   D. All are answers

8. One of the following drugs is not used in the treatment of Taeniasis (T-solium)
   A. Niclosamide
   B. Mebendazole
   C. Thiabendazole
   D. Praziquantel

C. For Environmental Health Officers

Read the following questions carefully and give the appropriate answer.

1. One of the following is **NOT** the basic principle of food sanitation
    A. Prevent contamination of food from microorganisms, toxins or chemicals.
    B. Eliminate /destroy micro-organisms or their toxins
    C. Prevent the growth of microorganism.
    D. None of the above
2. Hazards at the stage of production of raw materials include the following except
    A. Nutrinents
    B. Environmental contaminants
    C. Natural toxins
    D. Microbial toxins
    E. None of the above
3. The factors that are necessary for the transmission of a food borne disease are
    A. Transmission of the causative agent from the environment to the food

E. All of the above

6. One of the following statements is NOT true about blanching operations
    A. It is a mild pre-cooking process
    B. It is a bactericidal process
    C. It is used for vegetables
    D. It used to reduce the bacterial load
    E. None of the above
7. Which of the following techniques is (are) used to keep food safe
    A. Fermentation
    B. Pickling
    C. Irradiation
    D. Chemical treatment
    E. All of the above
8. List the different types of food samples collected for food-borne disease assessment.

D. For Medical Laboratory Technologists

Write the letter of your choice for the

C. Taeniasis

D. Giardiasis

7. Which one of the following is spore forming bacterium?

A. Salmonella

B. Shigella

C. Clostridium perfringens

D. Vibro cholera

2.2 Significance and Brief Description of Food borne Diseases

As far back as the documentation of human history goes, consumption of food unsafe for health and its consequences have been one of man's major health problems. They still remain to be a major public health concern globally. Food- borne diseases are known to be responsible for a large proportion of adult illnesses and deaths; more importantly, as sources of acute diarrheal diseases, they are known to claim the lives of overwhelming numbers of children every day.

In developing countries like Ethiopia, the problem attains great proportions due to many reasons; basic among which are poverty and lack of public health awareness. Although well-documented information is lacking regarding the extent of food-borne diseases in the country, and many cases and outbreaks are unrecognized or unreported, they are unquestionably one of the major reasons or why people of all ages seek medical help. Most food-borne diseases manifest with gastrointestinal symptoms and signs, the latter being uniformly among the top diagnoses in health facilities at all levels. Besides, they commonly lead to epidemics that result in the losses of many lives, accompanied with severe economic repercussions.

In these modern days, in which food is usually not consumed immediately following and/or at the site of production, the risks of food-borne diseases are becoming increasingly important; the concern is obviously much more in areas where food storage and preparation safety measures are far below the optimum.

The role of well-trained health professionals not only in the prevention and control of food- borne diseases, but also in the recognition of individual cases as well as outbreaks and their timely and proper management in order to reduce mortalities and morbidities is very crucial.

2.3. Learning Objectives

General

Upon completion of this module, the learner will be able to recognize, prevent and manage food-borne diseases.

Specific

After completing this module the learner will be able to:

1. Describe the epidemiology of food-borne diseases.
2. Define and classify food borne diseases
3. Identify the causes of most common food-borne diseases in Ethiopia.
4. Describe the clinical features and complications of food born diseases.
5. Explain the general diagnostic and management approaches to some food born diseases.
6. Investigate and control outbreaks of food-borne diseases.
7. Develop preventive and control strategies for common food-borne diseases.

2.4. Case Study

Learning Activity 1

It was during the period of drought and famine that people were getting displaced to other parts of the country. Before the resettlement, they used to wait in groups in the nearly small town for few days or weeks. Among them, Fatuma, a 25 years old lady came to the nearby health center with one day history of nausea, vomiting and watery diarrhea. She was one of the cooks for the group. On examination, she looked weak with feeble pulse, tachycardia and her BP was 90/60 mmHg. Tongue and mucosa were dry.

After appropriate laboratory examination she was given appropriate management and advice. The next day morning 25 similar cases come to the Health Center from the group. They were also given appropriate management, and advice. Staffs from the Health Center supervised their temporary residence and come up with the following report: There were about 50 individuals living in four rooms within one compound. The houses were under construction with multiple openings and dusty floor. There was no toilet in the compound and it was observed that there were indiscriminate human excreta in the compound. The people were sitting in group. Cooking and eating utensils

were not clean and there was no appropriate storage for the food. Pipe water supply was available in the compound; but the people fetched the water using wide mouthed

In the last couple of decades a number of diseases thought to be of unknown causes have been proven to result from food borne infections. For example, hemolytic uremic syndrome which is a very important cause of acute renal failure in children is caused by infection with E.coli 0157: H_7 (EHEC) and related bacteria (9).

Food borne poisonings/ intoxications: diseases arising from the ingestion of toxins released by microorganisms, intoxications from poisonous plants or toxic animal tissues: or due to consumption of food contaminated by chemical poisons. (3, 4)

Table 2.2 shows the etiologies of some food-borne poisonings/intoxications including their category, and the foods commonly involved.

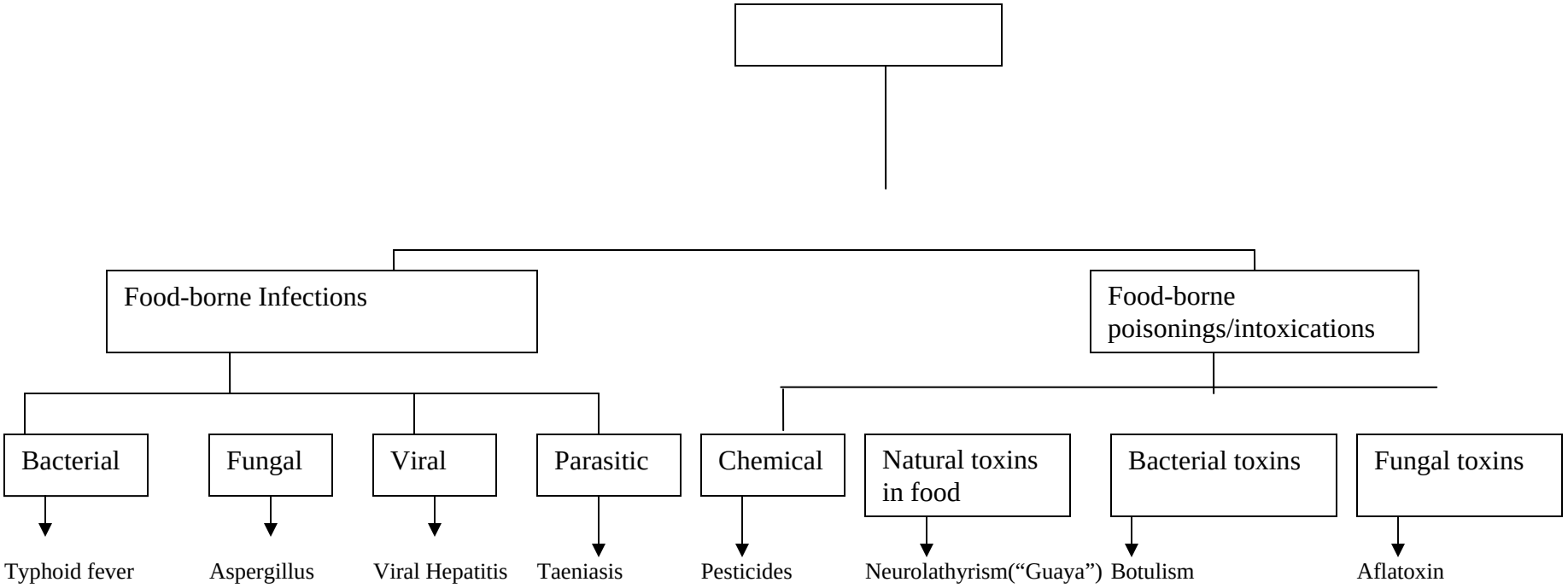
Food-borne Infections
Food-borne poisonings/intoxications
Bacterial
Fungal
Viral
Parasitic
Chemical
Natural toxins in food
Bacterial toxins
Fungal toxins
Typhoid fever
Aspergillus
Viral Hepatitis
Taeniasis
Pesticides
Neurolathyrism(“Guaya”)
Botulism
Aflatoxin

Table 2.1: Etiologies of some food borne infections and foods commonly involved.

Etiologic Category	Diseases	Causative organisms	Foods commonly involved
1.Bacterial	Typhoid fever	Salmonella typhi and parathyphi	Raw vegetables and fruits, salads, pastries, un- pasteurized milk and milk products, meat
	Paratyphoid fever	Salmonella paratyphi	
	Shigellosis	Shigella species	All foods handled by unhygenic workers, potato or egg salad, lettuce, raw vegetables
	Cholera	Vibrio cholerae	Fruits and vegetables washed with contaminated water
	Non typhoid Salmonellosis	Salmonella species, e.g. Salmonella typhimurium	Eggs, poultry, undercooked meals, un-pasteurized dairy products, sea foods, sausages
	Brucellosis	Brucella species, mostly Brucella melitensis	Milk and dairy products from infected animals.
	Anthrax	Bacillus Anthracis	Contaminated raw and undercooked meat
	Bovine TB	M. Bovis	Un-pasteurized milk or dairy products from tuberculous cows, meat
	E.coli infections	E.coli	Beef, dairy products, fresh products, or raw produce (potatoes, lettuce, sprouts, fallen apples), salads.

Etiologic Category	Diseases	Causative organisms	Foods commonly involved

Etiologic Category	Disease	Causative agent	Foods commonly involved

2.8. Pathogenesis and Clinical Features of Common Food-borne Diseases

2.8.1. Food-borne Infections

A. Bacterial Food Borne Infections:

i. Typhoid Fever (Enteric fever) and Paratyphoid Fever

Typhoid fever is a systemic disease caused by

1. Entero toxigenic

Clinical Features

The incubation period 1 week to several months and then patients manifest with many different symptoms and signs most common of which include fever, chills, sweating, myalgia, arthralgia, headaches, anorexia, weight loss, dry cough, etc.

Patients may appear well or may be very ill with any of the following manifestations: pallor, lymphadenopathy, enlarged liver and spleen, evidences of joint inflammation, rash, etc.

vii. Anthrax

Pathogenesis:

The organisms release anthrax toxin, which is responsible for the different manifestations of the disease.

There are three major clinical forms of anthrax:

1. Cutaneous anthrax (95%), which is the most common characterized by localized skin lesion with black central eschar of necrosis and non-pitting edema.
2. Inhalation anthrax (Wool sorter's diseases) characterized by hemorrhagic mediastinitis with high mortality rate.
3. Gastrointestinal anthrax, which is common in Ethiopia, and has high mortality rate.

Since gastrointestinal anthrax is the most important form of anthrax with respect to acquisition through contaminated food, the following discussion focuses on this form of anthrax.

Clinical features of gastrointestinal anthrax:

There are two major forms:

Gastrointestinal anthrax manifesting with fever, nausea, vomiting, abdominal pain, massive and/or bloody diarrhea and occasional ascites.

Oropharyngeal anthrax manifests with fever, sore throat and difficulty of swallowing, painful regional lymphadenopathy and respiratory distress.

iii. Taeniasis

a. Taeniasis Saginata

Pathogenesis:

This is the common form of taeniasis in Ethiopia.

Cysticerci deposited in the striated muscles of cattle infect humans when they are ingested together with raw or undercooked beef and they develop into adults in the small intestine.

Clinical features:

Patients notice passage of proglottids in the feces, perianal discomfort, abdominal discomfort or mild pain, nausea and anorexia.

b. Taeniasis solium

Pathogenesis:

T. solium is able to cause two different forms of infection in humans.

Intestinal disease is infection with adult tape worms, acquired by ingestion of undercooked pork containing cysticerci.

Cysticercosis is infection with larval forms in the tissues, most commonly the brain and skeletal muscles, and follows ingestion of *T. solium* eggs. Fecal-oral autoinfection is possible.

Clinical Features:

Intestinal infection may be asymptomatic or may manifest with epigastric discomfort, nausea, hunger sensation, diarrhea, etc.

Cysticercosis: the clinical features depend on the location and number of cysticerci and the degree of inflammatory response they induce in the tissue.

iv. Ascariasis

Pathogenesis:

Eggs released with feces mature in the soil and become infective in weeks.

When swallowed with contaminated food, they release larvae in the intestines, which enter blood, go to the lungs, enter the alveoli, ascend the bronchial tree and are swallowed into the bowel.

In the small intestine, they develop into adult worms.

Clinical features:

Clinical manifestations result from:

Larval migration in the lungs: cough, shortness of breath, blood-tinged sputum

Effect of adult worms in the intestine: usually asymptomatic, but may produce intestinal obstruction, perforation; or worms may migrate to ectopic sites to produce other manifestations like biliary colic.

C. Viral Food Borne Infections

Different viruses may be transmitted via contaminated food; most produce mild self-limiting illness, but occasional severe illnesses and even deaths may also occur.

i. Viral gastroenteritis

Pathogenesis:

Rota virus causes osmotic diarrhea due to nutrient malabsorption. Caliciviruses such as the Norwalk virus also produce diarrhea in a similar but slightly different mechanism that culminates in nutrient malabsorption.

Clinical Features:

Rota virus infection causes sudden onset of vomiting followed by mild to very severe diarrhea mixed with mucus and fever.

Norwalk illness results in abrupt onset of nausea and abdominal cramps followed by vomiting and /or diarrhea, low-grade fever, headache, myalgia after an incubation period of 18 to 72 hours.

ii. Viral hepatitis.

Pathogenesis:

Almost exclusively the fecal-oral route transmits Hepatitis A and E viruses. None of the hepatitis viruses directly damages liver cells. Immunologic response of the host plays important role in the pathogenesis(9).

Clinical features:

The incubation period varies according to the responsible agent.

Prodoromal symptoms include anorexia, nausea and vomiting, fatigue and malaise, arthralgia and myalgia, headache, photophobia, low-grade fever (38 – 39^{o}C).

These are followed by development of clinical jaundice; possibly accompanied by mild weight loss, tender enlarged liver, right upper quadrant pain.

2.8.2. Food poisonings / intoxications

A. Bacterial Food Poisoning

i. Clostridium perfringens

Pathogenesis

The spores are able to survive cooking, and if the cooked food (meat and poultry) is not cooled enough, they will germinate. The abrupt change in PH from stomach to intestine causes sporulation to occur, which releases the toxin. When massive dose of these organisms are ingested with food, toxins are elaborated in the intestinal tract which cause increased fluid and electrolyte secretion. (4)

Clinical Features:

Incubation period: 6 to 24 hrs usually 8 to 24 hours after consumption of the food.

The most common symptoms are diarrhea, abdominal cramp and little or no fever, nausea is common, but vomiting is usually absent. Illness is usually of short duration, usually 1 day or less. The disease is rarely fatal in healthy people. A cardinal symptom is explosive diarrhea. (4, 1, 9, 10, 6).

ii. Escherichia Coli 0157:H7

Pathogenesis:

Its somatic 0 and flagellar H antigens designate E-coli 0157:H7. Six classes of diarrhea-causing E-coli are recognized. They are enter hemorrhagic (EHEC), enterotoxigenic (ETEC), enteroinvasiv

coli causes watery diarrhea by acting upon the upper small intestine (12). This bacterium attaches itself to the walls of intestine, producing a toxin that attacks the intestinal lining (7).

Clinical Features:

Incubation period: The initial symptoms of hemorrhagic colitis generally occur 1 to 2 days after eating contaminated food, although periods of 3 to 5 days have been reported.

Symptoms start with mild, non-bloody diarrhea that may be followed by a period of abdominal pain and short-lived fever.

During the next 24 to 48 hours, the diarrhea increases in intensity followed by a 4 – 10 days phase of overtly bloody diarrhea, severe abdominal pain, and moderate dehydration.

A life – threatening complication that may occur in hemorrhagic colitis patients is hemolytic-uremic syndrome, which may occur a week after the onset of gastrointestinal symptoms characterized by edema and acute renal failure. This occurs most frequently in children less than 10 years old.

iii. Bacillus Cereus

Pathogenesis:

The pathogenic agent of *Bacillus cereus*

nissepobe frmning(bacthatbirnrelprasdbesas cs)Tj-0.0007 Tc 0.6229 Tw20.407 0 Tdll associnatedendoa

Pathogenesis

The disease is caused by enterotoxins produced by *Staphylococcus aureus*.

The toxins appear to act as neurotoxins that stimulate vomiting through the vagus nerve.

Clinical Features

Typical symptoms include severe abdominal pain, cramps, diarrhea, vomiting, and nausea. The onset of symptoms is rapid (usually 1 to 8 hours) and of short duration (usually less than 24 hours).

v. Botulism

Food-borne botulism is a form of food poisoning caused by *Clostridium botulinum*. It occurs in poorly canned foods, including home-canned foods and honey.

Pathogenesis

It is primarily caused by botulinum toxin, which is a neurotoxin that binds to the synapses of motor neurons preventing neurotransmission. As a consequence, muscles do not contract and flaccid paralysis results.

Clinical Features

Symptoms of botulism occur within 18 to 24 hours of toxin ingestion and include blurred vision, difficulty in swallowing and speaking, muscle weakness, nausea, and vomiting. Without adequate treatment, 1/3 of the patients may die within a few days of either respiratory or cardiac failure.

Infant botulism is the most common form. The infant becomes constipated, listless, generally weak, and eats poorly. Death may result from respiratory failure.

B. Chemical Food Poisoning

i. Heavy Metals

a. Lead poisoning

Possible sources of contamination include residues migrating into foods from soldered cans, leaching from utensils, contaminated water, glazed pottery, painted glassware and paints.

Metabolism

Lead is absorbed through ingestion or inhalation, and excreted in small amounts mainly in the urine and in the feces. Toxicity occurs due to its affinity for cell membranes and mitochondria, as a result of which it interferes with mitochondrial oxidative phosphorylation and sodium, potassium, and calcium transport.

Clinical Features

Lead poisoning is characterized by abdominal pain and irritability followed by lethargy, anorexia, pallor, ataxia, and slurred speech, joint pain, peripheral motor neuropathy and deficits in short-term memory and the ability to concentrate. Convulsions, coma and death due to generalized cerebral edema and renal failure occur in most severe cases.

Sub clinical lead poisoning can cause mental retardation and chronic renal failure. The impact is greatest when the exposure is of long duration.

b. Mercury Poisoning

Possible sources include seafood, and mercury fumes in industries.

Pathogenesis

It is well absorbed by lungs and gastrointestinal tract, and excreted in small amounts in urine and/or feces. Toxicity manifestation occurs due to its local effect and its retention in kidneys.

Clinical features

Inhalation of mercury vapor manifests with cough, dyspnea, and tightness or burning pain in the chest.

Acute high dose ingestion of mercury can cause nausea, vomiting, hematemesis abdominal pain, diarrhea and tenesmus.

Major complications of mercury poisoning include:

Respiratory distress, pulmonary edema, lobar pneumonia and fibrosis.

Neurological toxicity.

Acute renal failure and circulatory collapse

c. Arsenic

Sources for arsenic contamination of food include seafood, pesticides and herbicides.

Did any one else become ill from eating the same food?

Any other evidence suggesting the cause of the illness.

Also, thorough physical examination should be done on any patient suspected to have food-borne disease.

2.9.2. Laboratory Investigations

The laboratory investigations will help to identify the causative agents. These investigations include macroscopic examination, microscopic examination, culture and biochemical tests, serology and toxicological tests. Different biological specimens such as stool, blood, liver aspirate, duodenal aspirate and muscle biopsy can be used for the investigation (16).

Macroscopic Examination

Routinely examine fecal specimens and identify the physical characteristics of the stools (color, consistency, presence of blood, and mucus).

Identify gravid segments of tape-worm from the stool specimen.

Observe adult ascaris worm passing with stool, vomitus, or through the mouth or nose: (16)

Microscopic Examination

The direct examination of stool specimen is essential to detect motile parasite, cyst and helminthes eggs. Because only a few eggs and cysts are usually produced even in moderate and severe infection, concentration technique should be performed.

Gram stain to detect Gram–positive and Gram–negative bacteria (17)

Culture and biochemical tests

General and enrichment culture media can be used to grow bacteria

A selective medium is used to isolate the bacterial pathogen that causes food borne diseases.

Stool cultures are indicated if the patient is, febrile, has bloody diarrhea, , or if the illness is clinically severe or persistent. It is also recommended if many fecal leukocytes are present.

Blood cultures should be obtained when bacteremia or systemic infection is suspected (15).

Following culture, biochemical tests are often required to identify pathogens by their enzymatic and fermentation reactions. (17)

Serology

Serological technique most frequently used in laboratories are those that can be performed simply and economically, uses stable reagents, do not require special equipment and enable specimen to be tested individually or in small number. Such techniques include agglutination test, flocculation technique and enzyme immunoassay (17).

In agglutination test used to detect antibody in a patient serum, a known antigen suspension is used. The antigen particles are agglutinated if the serum contains the corresponding antibody.

Flocculation tests for antibody detection are based on the interaction of soluble antigen with antibody, which results in the formation of a precipitate that can be observed microscopically or macroscopically.

In ELISA, an enzyme is labeled or linked to a specific antibody or antigen. A substrate is added after the antigen-antibody reaction. This substrate is acted on (usually hydrolyzed) by the enzyme attached to the antigen-antibody complex, to give a color change. The intensity of the color gives an indication of the amount of bound antigen or antibody.

Toxicological Tests

Occasionally, the toxicology laboratory is asked to aid in the diagnosis of possible chemical intoxication by taking blood or urine sample from the affected individuals (22).

2.9.3. Environmental Assessment

It is important to conduct environmental assessment and collect environmental samples for suspected and potential causes of food borne illnesses especially of out breaks. The assessment may include survey of the source of the out–break with critical evaluation of:

Source of the suspected food;

How the food is prepared including cleanliness of table and kitchenware;

Personal hygiene and health status of food handlers;

Sanitation of the food preparation and service premises;

Storage of the food before and after its preparation;

Presence of potential or actual contaminants;

Availability of safe and adequate water supply;

Availability of safe and adequate sanitary facilities;

Type and quality of food storage, and service equipments including food contact surfaces.

Collection of samples from suspected foods and dishware as well from vomitus and stools of cases.

Power failure before the outbreak and breakdown of refrigeration

Outbreaks and incidents of food poisoning and food borne infection require careful histories of the food vehicle, with environmental studies of the areas of food production and preparation as far back as possible. Sites of infection and areas of spread may include the farm of origin, dealers, markets, processing areas, wholesale or retail outlets to catering establishments, restaurants and domestic kitchens. Transport conditions for live animals and for food–stuffs

Sanitary disposal of human wastes

Treatment of cases

Washing hands, knives, cutting boards, etc. after handling uncooked foods.

Avoiding contact with materials contaminated with pet excreta or soil.

Decontamination of animal products, e.g., wool, goat hair

Burying intact or cremating of infected animal carcasses.

Isolation

Recognizing, preventing, and controlling of infections in domestic animals, pets.

Washing hands after contact with animals

Training and supervision of food handlers and homemakers

Treatment of carriers.

Proper care for patients with food-borne illnesses.

Avoidance of food from animals with obvious infection, e.g., mastitis in cows

Treatment of infections in food handlers such as skin and throat infections

2. Environment interventions: involve stringent follow-up from production to consumption. Some of the interventions include:

Freezing, salting, etc. of food items during storage

Control of flies, rats, cockroaches

Public education on environmental and personal cleanliness

Surveillance of food establishments

Avoiding contamination of food after cooking.

Maintenance of sanitary food area.

Proper handling and storage of leftover foods

Kitchen cleanliness

Safe canning at home

Careful storage and use of chemicals (storage away from foods)

3. Host:

Active or passive immunization of susceptible hosts

Health education on the above areas.

“The Ten Golden Rules” of WHO for Safe Food Preparation (10)

2.12. Investigation of Outbreaks of Food-borne Diseases

Outbreaks of food-borne diseases can lead to deaths of many people within short periods, and hence their timely detection and proper management should not be undermined. When the Health Team receives information regarding an outbreak of a possible food-borne disease, action should start immediately. This action has to be integrated from the outset since the investigation and management of any outbreak requires the concerted effort of all health professionals concerned. In addition, being prepared beforehand for such outbreaks, by collecting the necessary information on food-borne diseases and previous outbreaks (in the area in particular) is important.

The objectives of investigating an outbreak of a food-borne disease are to:

- Identify the causative agent responsible for the outbreak
- Identify the food items, handlers, etc. responsible for the outbreak
- Identify and trace the location of the source of the outbreak
- Determine the conditions and mechanisms that led to the contamination of the food item identified, e.g. perform sanitary survey
- Limit the impacts and arrest the progression of the outbreak
- Be able to use information obtained from the current outbreak for the prevention of subsequent outbreaks

The health team should do the following in addressing a possible food-borne disease outbreak:

- Obtain as detailed information as possible from all available informers, cases, care-takers, clinicians, etc.; this involves interviewing of infected individuals, management, and food handlers; all the obtained information should be systematically registered using prepared questionnaires.
- In collecting this information, attempt should be made to determine the mean incubation period of the outbreak.
- The exact date and time at which the suspected food was consumed should be sought; and of those who ate and did not eat the food, the number and proportion of those who got sick should be calculated in order to know the attack rate. It will be helpful to have and keep a list of symptoms and signs during assessing these

individuals for the presence or absence of the suspected food-borne illness (nausea, vomiting, diarrhea, abdominal pain, fever, headaches, etc.).

One has to keep in mind that the association between illness and exposure for the suspected food does not have to be “perfect”; in fact, this is rarely so because of different factors, one of which may be that the implicated food may not be contaminated throughout; in addition, host susceptibility varies as does dosage (the quantity consumed), and there may be errors in reporting food histories (faulty recall, uncertainty); there may also be errors in recording.

If the outbreak is large and it is not possible to interview all participants, a random sample should be selected and questioned for symptoms and food exposure history.

Develop a hypothesis based on the initial clinical features and other information obtained regarding the probable food-borne disease in order to devise case management plans to treat the sick individuals.

Tell informers and cases to retain or recover all suspected food items, the original containers and packages.

Collect specimens of suspected food, stool and vomitus from ill persons and send them to a reference laboratory immediately for identification of the agent.

Obtain and use appropriate sampling equipments such as sterile containers and other apparatus.

Visit the institution or place where the outbreak is suspected to have started. During this visit, all members of the team should go and analyze the environment and other situations in a systematic way; they have to keep records of all things observed.

Analyze and interpret all the information collected using the different techniques outlined above and try to trace the exact source of the food implicated

Finally, take remedial actions.

Report the findings to the concerned authorities, and keep a document of it for future use from the experience gained.

Summary of steps in the investigation of food-borne disease outbreak investigation

1. Verify the existence of an outbreak

Compare the current number of cases with the past

Note: Consider seasonal variations

2. Verify the diagnosis

   Review clinical and laboratory findings
3. Describe the outbreak with respect to time, place and person
4. Construct an epidemic curve
5. Calculate food-specific attack rates
6. Formulate and test hypotheses
7. Search for additional cases
8. Analyze the data
9. Make a decision on the hypotheses tested
10. Intervene and follow-up
11. Report the investigation
12. Inform the public on the prevention and control of the disease.

N.B.

While investigating an outbreak the proper treatment and care for patients should not be ignored.

Now you are through with the Core Module, but the satellite module remains. Please go to the Satellite Module that applies to your specific professional category for continued thorough study.

UNIT THREE

SATELLITE MODULES

3.1 Satellite module for health officers

3.2 Satellite module for nurses

3.3 Satellite module for environmental health officers

3.4 Satellite module for medical laboratory technicians

3.5 Satellite module for health extension workers

3.6 Take home message for care-givers/ self care

3.1. SATELLITE MODULE FOR HEALTH OFFICERS

3.1.1 Directions for Using This Module

- Make sure you have thoroughly read the core module before you begin to read this satellite module.
- Read through this satellite module carefully.

3.1.2 Learning Activity

CASE I: Answer questions 1 and 2 based on the following case.

Ato Amsalu, a 28 year old patient, came from Asayta town to your health center complaining of fever and chills of a week's duration accompanied with headache, dry cough, abdominal pain, and reduced frequency of stooling. On examination, you find the following:

The patient is acutely sick looking

Axillary temperature is 38.5^0 C

Pulse rate is 74 beats per minute

Blood pressure is 100/80 mm Hg right arm supine

He has pale conjunctiva and mildly icteric sclera

He has dry tongue and buccal mucosa

On abdominal examination, you find enlarged liver and spleen together with diffuse mild abdominal tenderness.

a) Urgent referral to a higher health facility for better investigation and treatment.
b) Empiric treatment for malaria and typhoid fever with oral medications.
c) Empiric treatment for malaria and close follow-up of the patient.
d)

3.1.3 Learning Objectives

By the end of this satellite module, you are expected to be able to:

Explain the pathogenesis of common food-borne diseases

Clinical Features:

Patients usually have a prodrome of non-specific symptoms such as chills, headache (mild to very severe), anorexia

- Laboratory investigations (9,23,25)

  The gold standard for the diagnosis of typhoid fever is culture from stool, blood, urine or other specimens.

  Tube dilution aggluti

Infective endocarditis (especially in known cardiac patients)

Brucellosis

Hepatitis

Acute pyelonephritis

TREATMENT:

It may be carried out as inpatient if the individual is acutely ill, or as an outpatient for mildly ill individuals.

1. General Measures (9,24,25) include:

Fluid and electrolyte support

Antipyretic-analgesics as required such as paracetamol

Close monitoring of the clinical course of the patient

If there is suspicion of gastrointestinal hemorrhage or perforation, the patient should be immediately referred to a better health facility for appropriate management (blood transfusion, surgery).

CONTROL MEASURES (6,10,26)

- Sanitary disposal of human excrement
- Proper management of patients, e.g.
    - Proper disposal of the excrements of patients (stool and urine)
    - Advice to families on how to prevent transmission
    - Teaching about carrier state
- Control of flies, rats, roaches
- Pasteurization of milk
- Chlorination of water supplies
- Education of public concerning personal cleanliness
- Proper handling of food, water, and human waste
- Vaccination

iii. NON-TYPHOIDAL SALMONELLOSIS

PATHOGENESIS:

The disease is mainly caused by *S. typhimurum* and *S. enteritidis*

Similar to enteric fever, the organisms have to traverse the stomach and gain access to the small intestine.

Then they cause a localized infection that induces the massive infiltration of neutrophils in both the small and large intestinal mucosa with self-limited gastroenteritis (9)

The degranulation and release of toxic substances by neutorphils may lead to damage of the intestinal mucosa, causing inflammatory diarrhea (9,23)

CLINICAL FEATURES:

Patients present with nausea, vomiting, diarrhea (loose, nonbloody, moderate volume), abdominal cramping, fever (38-39^{0}C); the gastroenteritis is self-limiting, resolving in 3-7 days (9,25)

There may be signs of dehydration

DIAGNOSIS:

Clinical features

Nontyphoidal salmonella gastroenteritis is diagnosed when salmonella are cultured from stool; the organisms may also be cultured from blood or other body fluids such as joint fluid and the CSF in cases with metastatic infections(9,23,25).

TREATMENT (9,24,25)

CLINICAL FEATURES:

Patients may present with nonbloody or bloody-mucoid diarrhea, crampy abdominal pain, tenesmus, and fever (which can become high grade, particularly in children) (9, 25)

There may be signs of dehydration.

Complications:

Toxic colonic dilatation (toxic megacolon)

Colonic perforation

Protein-losing enteropathy

Bacteremia, sepsis

Hemolytic-uremic syndrome (HUS) characterized by hemolytic anemia, thrombocytopenia, and evidences of renal failure (oliguria, etc.); in addition one may find leukemoid reactions, hyponatremia, severe hypoglycemia, CNS manifestations, etc. This usually develops towards the end of the first week (9)

Seizures

Reactive arthritis (Immunologically mediated joint inflammation seen in some patients following shigellosis; it may also follow some other bacterial infections, e.g. E. coli infection)

Metastatic infections like pneumonia, meningitis (rare)

DIAGNOSIS:

Clinical features: Shigellosis should be considered whenever a patient presents with bloody diarrhea.

Laboratory diagnosis (9,23,25)

- Gross appearance of the stool may show blood, pus, and mucus.
- On microscopy, there may be red blood cells and leukocytes in the stool.
- The specific diagnosis is based on culture of Shigella from stool.
- Leukemoid reactions (white cell counts of more than 50,000/µl)

DIFFERENTIAL DIAGNOSES:

Invasive intestinal amebiasis

Other bacterial diarrheas, such as those caused by E. coli

Acute exacerbation of inflammatory bowel disease, especially ulcerative colitis

TREATMENT (9, 24,25)

1. General measures:

Fluid replacement

Analgesic-antipyretic

2. Chemotherapy:

See annex V

N.B.

Antidiarrheal agents such as diphenoxylate and loperamide are generally contraindicated.

CONTROL MEASURES:

As for typhoid fever.

IV. CHOLERA

PATHOGENESIS:

Cholera is a disease caused by toxin released by *Vibrio cholerae.*

Ingested organisms colonize the small intestine, using a pilus for adherence. A large inoculum size is required in order to traverse the acidic medium of the stomach.

Then they elaborate cholera toxin, a potent protein enterotoxin.

The toxin, by increasing the level of cyclic AMP inside the cells, leads to inhibition of sodium absorption from and activation of chloride excretion into the intestinal lumen.

The resulting intraluminal accumulation of sodium chloride drags water from the tissues along osmotic gradient.

Isotonic fluid accumulates in the intestinal lumen in this way, and when it exceeds the capacity of the lumen, results in diarrhea (9, 23)

CLINICAL FEATURES:

Then the patient manifests with sudden onset of painless, voluminous, cloudy with flecks of mucus, watery diarrhea (“rice-water” stool). Stool volume can sometimes exceed 250 ml/kg in the first 24 hours. Vomiting accompanies the diarrhea.

Fever is usually absent (9)

Some patients have abdominal cramps, muscle cramps

Symptoms of dehydration-thirst, weakness, postural dizziness, reduced urine output, etc.

DIAGNOSIS

a) Based on clinical features---assessment

- For adults and older children, tetracycline 500 mg PO qid for 3-5 days or 2 gram PO stat; or doxycycline 100 mg PO bid for 3 days or 300 mg PO stat-for children, it may be given as 6 mg/kg/d for 3 days (weigh the risk and benefit); or ciprofloxacin 30 mg/kg PO stat (maximum 1 gram), or 15 mg/kg bid for 3 days (maximum 500 mg PO bid); erythromycin 40 mg/kg/day in 3 divided doses for 3 days
- For younger children, trimethoprim-sulfamethoxazole 8/40 mg/kg/day in 2 divided doses for 3-5 days.
- For pregnant mothers, furazolidone 100 mg PO qid for 7-10 days.

CONTROL MEASURES (6,10,26)

Careful food selection, e.g., avoidance of unpeeled raw fruits and vegetables, as well as raw or undercooked seafood;

Safe disposal of human waste;

Tetracycline or doxycycline for contacts with doses indicated above;

Vaccine has been developed but is not readily available.

CLINICAL FEATURES:

Brucellosis is a systemic disease with many varied manifestations.

Symptoms may start either abruptly or gradually.

Fever with or without diurnal variation, chills, sweating, headaches, myalgia, fatigue, anorexia, joint and low-back pain, weight loss, constipation, sore throat, dry cough

Physical Examination: usually reveals no abnormalities; but some patients may have pallor, jaundice, lymphadenopathy, hepatosplenomegaly, arthritis, spinal tenderness, epididymoorchitis, rash, meningitis, cardiac murmurs, evidence of pneumonia. (9)

DIAGNOSIS

1. Clinical features and history of exposure to animal products
2. Laboratory diagnosis (9, 23)

    Isolation of the organism from blood, discharge, bone or other tissue using culture is necessary for diagnosis

    Serology (tube agglutination test)

TREATMENT

All suspected cases should be referred to higher centers for confirmation of diagnosis and appropriate treatment using multiple antimicrobial drugs.

CONTROL MEASURES (6, 10,26)

Avoid ingestion of all raw milk

Avoid contact with anv fluid from infected animals

For occupational exposure: Caution in handling animals and animal products (use of protective goggles and gloves), vaccination of animals against the disease

- **GASTROINTESTINAL ANTHRAX**

PATHOGENESIS:

Gastrointestinal (GI) anthrax usually results from ingestion of raw or inadequately cooked meat from animals infected with the organism

Organisms that survive gastric defense establish primary infection in the intestine, producing lesions accompanied by hemorrhagic lymphadenitis. Oropharyngeal anthrax can also occur, with the primary lesion found most often in the tonsils (9)

The organisms can invade the bloodstream and multiply rapidly

CONTROL MEASURES:

Similar to Brucellosis

Avoidance of consumption of raw or undercooked meat.

B. VIRAL FOOD-BORNE INFECTIONS

a. VIRAL GASTROENTERITIS

PATHOGENESIS:

Rotavirus infects and kills the mature cells of the small intestinal villi. This leads to nutrient malabsorption resulting in osmotic diarrhea (9, 23)

Enteric caliciviruses like Norwalk virus result in disturbance of the architecture of the small intestine with shortening of villi and infiltration of lamina propria by polymorphs. These changes are accompanied by steatorreha and carbohydrate malabsorption (9, 23)

CLINICAL FEATURES:

Rotavirus infection can cause mild diarrhea to very severe fatal illness due to dehydration. It usually causes abrupt onset of vomiting followed by watery-mucoid diarrhea. One-third of children with rotavirus diarrhea may have fever of more than 39^0C (9)

Norwalk infection causes abrupt onset of nausea and abdominal cramps after an incubation period of 18-72 hours followed by vomiting and/or diarrhea. Half of patients have low-grade fever (9)

DIAGNOSIS

Clinical features

Stool examination reveals white and red blood cells in less than 15% of cases

Specific diagnosis of etiology is not feasible in all Ethiopian health center settings, since isolation of viruses requires extremely specialized laboratories; moreover etiologic diagnosis of viral diarrheas is not important for case management.

The most important measure in the diagnosis is to assess the extent of dehydration.

TREATMENT

The disease is usually self-limited and thus treatment focuses on supportive care in the form of fluid replacement (9)

- Assess the degree of dehydration and manage accordingly.

CONTROL MEASURES

Safe disposal of human waste

Personal hygiene

Proper food preparation and handling

b. VIRAL HEPATITIS

PATHOGENESIS:

Food-borne viral hepatitis is caused by hepatitis A or/and E viruses (HAV or HEV).

None of the hepatitis viruses cause direct cytopathic effect on the liver cells (9)

Immunological response to the presence of the viruses in the liver has important role in the pathogenesis of hepatic damage

In hepatitis E, cholestasis is a common histologic feature. This is also possible in hepatitis A.

Neither HAV nor HEV causes chronic liver disease (9)

CLINICAL FEATURES:

Incubation period varies depending on the agent (15-45 days for hepatitis A; 14-60 days for hepatitis E.

Prodromal symptoms including anorexia, nausea and vomiting, altered smell and taste, fatigue, malaise, arthralgias, myalgias, headache, photophobia, pharyngitis, cough, coryza, and low-grade fever (38-390C) may precede the icteric phase by 1-2 weeks; some patients have dark urine and clay-colored stools 1-5 days before the onset of the jaundice. Others may have steatorrhea.

Icteric phase manifests with clinical jaundice, mild weight loss (2-5 kg), enlarged tender liver, right upper quadrant pain and discomfort

10-20% of patients have splenomegaly and cervical lymphadenopathy.

Complete clinical and biochemical recovery is expected to occur in 1-2 months in all cases of hepatitis A and E.

Significant percentages of patients never become jaundiced (anicteric hepatitis) (9, 25)

DIAGNOSIS

1. Clinical features-history of exposure should be sought; exclude drugs and alcohol as possible causes
2. Laboratory diagnosis (9)

   Marked elevation of liver transaminases

   Mild elevation of alkaline phosphatase

   Bilirubin level may be normal to markedly elevated; if elevated, both the conjugated and un-conjugated fractions will be increased

   Serologic markers to identify viruses

   - Anti-HAV IgM indicates recent infection.
   - Marker for HEV infection has recently been reported.

   For severe hepatitis, measure PT and PTT, albumin, electrolytes, glucose to assess for complications

DIFFERENTIAL DIAGNOSES:

1. Drug-induced hepatitis
2. Alcoholic hepatitis
3. Hepatic malignancy , mostly secondaries
4. Pre- and post-hepatic causes of jaundice
5. Typhoid fever, malaria and other acute febrile illnesses
6. Tuberculosis involving the liver

TREATMENT (9, 25)

Is mainly supportive; no specific pharmacologic therapy is required or available.

Usually treatment as outpatient is adequate

High-calorie diet with some restriction on protein and fat intake is recommended.

Role of multivitamin supplementation is controversial but may be helpful; all other drugs should be avoided as they may aggravate the hepatic damage.

The patient should rest until general condition improves

Educate patient and family regarding proper hygiene

Patients with suspected coagulation defects, disturbances of fluid and electrolyte and/or acid-base balances, impaired renal function or, in general, severe hepatitis should be referred for better management.

CONTROL MEASURES

Proper sanitation and hygiene

Passive (immune globulin) and active immunization have been developed for hepatitis A virus. It is recommended for close contacts of cases and workers in institutions with multiple cases.

C. PARASITIC FOOD-BORNE DISEASES

I. AMEBIASIS

PATHOGENESIS:

Infection occurs following ingestion of cysts from water, food or hands contaminated with feces.

Motile trophozoites are released from the cysts in the small intestinal lumen

The trophozoites remain as commensals in most hosts

In some, however, they cause invasion and ulceration of the large bowel mucosa or enter the bloodstream to cause distant infections in organs like the liver, lungs or the brain.

Various products and their cytopathic effect contribute to the tissue damage, which they cause.

Rarely, intestinal infection leads to the formation of a mass lesion called ameboma (9)

CLINICAL FEATURES:

a. Intestinal Amebiasis:

Most patients with intestinal Amebiasis are just asymptomatic cyst passers. They do not have symptoms but are sources of infection for others.

Symptomatic intestinal Amebiasis:

- The incubation period is 2-6 weeks

- Clinical features include gradual onset of lower abdominal pain, mild diarrhea followed by malaise, weight loss, diffuse lower abdominal or back pain and more severe bloody diarrhea (9, 25)
- Severe infection manifests with passage of many bloody stools per day (10-12 times), severe abdominal pain, high fever
- Patients with ameboma present with an asymptomatic or tender abdominal mass.
- Some patients develop a chronic form of the disease (9)

b. Amebic Liver Abscess:

The liver is the most common site of extra-intestinal Amebiasis

Most patients have fever, right-upper quadrant pain (dull or pleuritic), point tenderness over the liver and right-sided pleural effusion (common), jaundice (rare) (9)

Fewer than 30 % of patients have active diarrhea (9)

Amebic liver disease:

- Patients may have leukocytosis, anemia, normal or minimally elevated liver enzyme levels, and elevated alkaline phosphatase level.
- Stool examination may or may not yield trophozoites and/or cysts
- Serology is a very useful tool but mostly unavailable
- Imaging studies, particularly ultrasonography, are helpful to visualize the hepatic lesions.

TREATMENT (9, 24)

General measures:

- Supportive care and symptomatic therapy including analgesic-antipyretics, replacement of fluid loss, and proper nutrition.

Drug therapy:

- See annex V
- Treatment of asymptomatic cyst carriage is of questionable role in Ethiopia because of the high prevalence of this infection; however, if there is decision to treat, it has to be remembered that metronidazole or tinidazole are not effective.

Other therapeutic interventions:

- Patients with amebic liver abscess may need percutaneous aspiration. Thus, all patients suspected of having an amebic liver abscess should be referred to a hospital.

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They adhere to the intestinal epithelium, but do not cause any invasion.

The exact mechanism by which *G. lamblia* causes diarrhea is not clear. (9)

CLINICAL FEATURES:

Giardiasis may be asymptomatic or a serious disease with severe complications.

Most infected persons are asymptomatic

The incubation period is 1-3 weeks

Symptoms of acute giardiasis may start suddenly or gradually and include diarrhea, abdominal pain, bloating, belching, flatus, nausea and vomiting.

Patients with chronic giardiasis manifest with less severe diarrhea, but increased flatus, loose stools, weight loss, etc. These symptoms may be episodic or continuous and may last for years.**er TcricMCID inD 1ildreDiny bedehyd7 0 T/MCID (Sa), 25)**

III. ASCARIASIS

PATHOGENESIS (LIFE CYCLE):

PATHOGENESIS:

Adult worms of both *T. saginata* and *T. solium* reside in the upper jejunum.

They have thousands of proglottids, each of which produces many eggs.

The eggs and proglottids are released into the environment with stool

The eggs of T. saginata live on vegetation for months to years until cattle ingest them. Those of T. solium are infective for both humans and animals.

After ingestion by intermediate hosts, the eggs embryonate, penetrate the intestinal wall, and are carried to many tissues with a predilection for striated muscles. The embryos in the striated muscle become transformed into cysticerci.

Ingestion of the cysticerci in raw or undercooked beef (T. saginata) or pork (T. solium) leads to human intestinal infection.

Infections that cause human cysticercosis follow the ingestion of T. solium eggs, mostly from food contaminated with feces, or auto infection from eggs produced in the intestine.

CLINICAL FEATURES:

The infection may be asymptomatic

Passage of proglottids in the feces which may be accompanied by the passage of perianal discomfort

Mild abdominal pain, nausea, anorexia, weakness, weight loss

Infection with T. solium may manifest with epigastric discomfort, nausea, hunger sensation, diarrhea, and weight loss.

DIAGNOSIS:

1. Clinical features
2. Laboratory diagnosis-

Identification of eggs or proglottids in the stool; use of scotch-tape may be helpful as in pinworm infection as the eggs are sometimes present in the perianal area. Distinguishing T. saginata from T. solium requires examination of mature proglottids or the scolex.

Patients may have eosinophilia.

TREATMENT:

See annex V

CONTROL MEASURES:

Avoidance of eating raw or undercooked meat

Good personal hygiene to prevent the auto-infection seen in T. solium infection

Sanitary disposal of human excreta

b. CYSTICERCOSIS:

3.1.4.2. FOOD POISONINGS/INTOXICATIONS

A. BACTERIAL FOOD POISONING:

a. PREDOMINANT GASTROINTESTINAL MANIFESTATIONS

A very useful approach to evaluating diarrhea is distinguishing inflammatory from non-inflammatory diarrhea (see ANNEX IV).

PATHOGENESIS:

Cl. perfringens poisoning manifests with abrupt onset of profuse diarrhea after an incubation period of 8-16 hours; vomiting is occasional; without treatment, recovery usually takes 1-4 days

Enterotoxigenic strains of E. coli produce abrupt onset of diarrhea after an incubation period of 24-72 hours; vomiting is rare; in adults the infection is usually self-limited, lasting only for 1-3 days

Enteropathogenic strains produce watery-mucoid diarrhea following an incubation period of 1-2 days; the disease is usually self-limiting, but may sometimes persist for weeks (9)

Enterohemorrhagic strains produce bloody diarrhea which resembles shigellosis.

DIAGNOSIS:

Many cases of non-inflammatory diarrhea are self-limited and can be treated empirically; the determination of a specific etiology is of very little significance in the clinical management; thus one can proceed to treatment using the information obtained from history, assessment of level of dehydration, and stool examination.

In cases of common-source outbreaks, attempt should be made to isolate the responsible organism from the suspected food item(s).

TREATMENT: can be based upon the clinical features (9)

If the patient has watery diarrhea (no blood in stool, no fever, no distressing abdominal pain, no fecal leukocytes), and

- If he/she has only 1-2 loose stools per day with minimal discomfort, consider only oral fluids.
- If he/she has several loose stools per day with distressing symptoms, consider an antibacterial drug such as:
    - Trimethoprim-sulfamethoxazole 160/800 mg PO bid for 3 days; for children, 4/20 mg po bid for 3 days
    - Ciprofloxacin 500 mg PO bid for same duration
    - Norfloxacin 400 mg PO bid for same duration

- If the patient has dysentery or inflammatory diarrhea or fever, investigate and manage accordingly (the patient may have shigellosis, intestinal amebiasis, or typhoid fever, etc.).

b. BOTULISM

PATHOGENESIS:

Botulism is a paralytic disease produced by the potent neurotoxin of Clostridium botulinum.

There are four recognized clinical forms:

- o Food-borne botulism results from ingestion of preformed toxin in contaminated food.
- o Wound botulism results from toxin produced in contaminated wood.
- o Infant botulism and adult infectious botulism follow ingestion of spores and production of toxin in the intestine

The activity of the neurotoxin involves several steps culminating in the proteolysis of the components of the neuroexocytosis apparatus curtailing the release of acetylcholine at the myoneural junction. The end result of this is paralysis (9).

CLINICAL FEATURES (9):

Infant botulism:

This is the most common form of botulism

The severity ranges from a mild transient illness to a fatal paralytic one.

Constipation is usually the early sign

The infant may the show loss of head control, loss of sucking ability and of facial expression and verbalization

Symmetric descending paralysis, with initial cranial nerve involvement, is then noted

Deep tendon reflexes may be diminished or absent

The infant is typically afebrile

Food-borne botulism:

Here also, the illness can vary from a mild illness not needing medical attention to a rapidly fatal severe disease

The incubation period is usually 18-36 hours

Cranial nerve involvement is the usual initial manifestation, manifesting with diplopia, dysarthria, and/or dysphagia, depressed gag reflex

Symmetric descending weakness/paralysis progresses usually rapidly to involve the neck, arms, thorax, and legs; the weakness is occasionally asymmetric

Non-specific symptoms of nausea, vomiting, abdominal pain, dizziness, blurred vision, dry mouth and dry-sore throat may precede or follow the onset of paralysis

Paralytic ileus, severe constipation and urinary retention are common

Patients are typically alert, with no fever; they may sometimes be drowsy or anxious

Most have ptosis; depressed papillary reflexes may be present

Half of patient have fixed or dilated pupils

The deep tendon reflexes may be normal or suppressed

Adult infectious botulism:

The mechanism of acquisition of the toxin is similar to that of infant botulism

Clinical features are similar

DIAGNOSIS (9, 23)

Clinical features-if patient presents with symmetric descending paralysis without sensory findings and without fever, the diagnosis of botulism should be suspected.

The demonstration of the organism or its toxin in intestinal secretions (vomitus, stool) strongly suggests the diagnosis. However, due to limitation of facilities, one has to base presumptive diagnosis on clinical features.

DIFFERENTIAL DIAGNOSES:

Poliomyelitis

Diphtheria

Chemical intox 1r]*ƒ* Chemical1Qr]*ƒ* Poliomyel6

CONTROL MEASURES:

Educate the public:

To cook food well (boiling for 10 minutes or cooking at 80^0C for 30 minutes can destroy the toxin)

To avoid honey in the first year of life, as this has been identified to be one of the food items commonly associated with infant botulism.

Not to eat or taste food from bulging cans

B. CHEMICAL POISONINGS:

a. HEAVY METAL POISONING (LEAD, MERCURY, ARSENIC)

DIAGNOSIS:

History of exposure

Consistent clinical features

Laboratory diagnosis:-determination of serum level (this is available only in few centers to which patients suspected of having these poisonings should be referred)

MANAGEMENT:

Termination of exposure

GI decontamination using induction of emesis, gastric lavage, activated charcoal administration

Use of chelating agents, e.g. , edetate calcium disodium, dimercaprol (9)

Referral for further management

b. INSECTICIDES:

The most important of these are organophosphates.

DIAGNOSIS:

History of exposure

Clinical features

Laboratory investigations for specific diagnosis are not available in most Ethiopian settings

MANAGEMENT:

Termination of exposure and decontamination-remove all contaminated clothing, and wash the skin with soap and water

Use charcoal to decontaminate the GIT

Supportive measures:

- Oxygen administration
- Ventilatory support
- Treatment of symptoms, such as seizures with benzodiazepines

Antidote therapy: atropine 0.5-2 mg IV every 5-15 minutes until bronchial and other secretions have dried (9)

N.B. Use of atropine is not effective in reversing the CNS effects.

C. **POISONOUS PLANTS:**

a. NEUROLATHYRISM (LATHYRISM)/ ''Guaya'':

DIAGNOSIS:

History of exposure in the form of prolonged consumption of "guaya"

Clinical features, mainly consisting of spastic paraplegia, sphincter dysfunctions, and sensory disturbances.

TREATMENT:

The treatment is almost exclusively supportive and patients suspected of having this condition should be referred to health facilities with better supportive facilities (25)

b. MUSHROOM POISONING:

DIANGOSIS:

History of ingestion of mushroom

Clinical features:

- The usual initial clinical features are nausea, vomiting, diarrhea and abdominal cramps
- The subsequent manifestations vary depending on the mushroom group involved as well as the amount ingested
- In addition, some mushrooms are known to produce gastritis and others produce hepatitis.

For detailed discussion of the manifestations that may result from the ingestion of different types of mushroom, please refer to standard textbooks

TREATMENT:

Activated charcoal for gastrointestinal decontamination

Intensive supportive care

Now you are through with the core and satellite modules, but there are still some activities remaining as stated below:

Read the task analysis of the different categories of the health team on Unit Five.

Do the questions of pretest as posttest.

N.B. Use a separate answer sheet.

Compare your answers of the pre and posttests with the answer keys given on ANNEX I and evaluate your progress.

3.2. SATELLITE MODULE FOR NURSES

3.2.1. DIRECTIONS FOR USING THE MODULE

- Before reading this satellite module be sure that you have completed the pre –

- Did anyone else become ill from eating the same food?
- Ask about the health of other family members. (14)
- Sign and symptoms of the disease that the patient reports. (14,28)
- History of ingestion of foods known to have natural toxins or fungal toxins. (14)
- History of ingestion of food sources possibly contaminated by insecticides / pesticides and heavy metals. (11,9)

77

ii. Potential Nursing Diagnosis

A. Risk for fluid volume deficit related to vomiting and increased loss of fluids and electrolytes from gastro-intestinal tract. (14,28)

B. High risk for spreading of the infection to others. (14)

C. Planning the Nursing Intervention

To plan the nursing intervention:

1. Set a priority
    - Consider urgency of the problem
    - Give priority to physical needs of the patient
2. Establish goals for the nursing intervention
    - To remove or inactivate the poison before it is absorbed.
    - Relief pain
    - Regain normal bowel elimination patterns
    - Attain an optimal level of nutrition
    - Reduce anxiety
    - Increase patient understanding about possible causes of the disease & preventive measures
    - Maintain fluid balance
    - Prevent the spreading of the infection to others (14,28)
3. Establish expected outcomes

    The patient:

    - Reveals reduced/ no effects of the Reduce aD 3.I21 Tf0.c.Tc 0.7627

- Has no observable signs and symptoms of fluid balance
- Prevents spread of

Carry out procedures, if indicated, to promote the removal of the ingested substance if the above are not effective:

- Diuresis for agents excreted by the renal route
- Dialysis
- Hemoperfusion (process of passing blood through an extracorporeal circuit and a cartridge containing an adsorbent [such as charcoal or resins], after which the detoxified blood is returned to the patient).
- Multiple doses of charcoal

Monitor central venous pressure as indicated

Monitor for fluid and electrolyte balance.

Reduce elevated temperature (14)

2. Measures to Relief Pain

To ease anal irritation (pains) caused by diarrhea, clean the area carefully and apply a repellent cream, such as petroleum jelly, warm sitz baths and application of witch hazel compresses can also soothe irritation. (28)

3. Establishing a Regular Pattern of Bowel Elimination and Maintaining Nutritional Balance

Administer medications, as ordered, correlate dosages and routes with the patient's meals and activities.

Control nausea

- Administer an anti-emetic medication (give 30 to 60 minutes before meals)
- Give sips of weak tea, carbonated drinks, or tap water for mild nausea.
- Give clear liquids 12 to 24 hours after nausea and vomiting subsides.
- Gradually progresses to a low residue, bland diet i.e. advice the patient to avoid food products with a cellulose or hemi cellulose base (nuts, seeds). Vary the diet to make eating more enjoyable, and allow some choice of foods.

6f/<</MT

Limit caffeine and carbonated beverage intake because these stimulate intestinal motility.

Very hot and very cold foods should be avoided.

Milk and milk products, fat, whole grain products, fresh fruits, and vegetables may be restricted for several days.

Monitor fluid status carefully. Take vital signs at least every 4 hours, weigh the patient daily. and record intake and output.

Watch for signs of dehydration, such as dry skin and mucous membranes, fever, and sunken eyes.

If dehydration occurs, administer oral and I.V. fluids. If necessary, a potassium supplement may be added to the I.V. solution. If the patient is receiving a potassium supplement, be especially alert for the development of hyperkalemia (14,28,29).

4. Reducing Anxiety

An opportunity is provided for the patient to express fears and worry about being embarrassed by lack of control over bowel elimination. This fear of embarrassment is often a major concern.

The patient is assisted to identify irritating foods and stressors that precipitate an episode of diarrhea. Eliminating or reducing these factors helps control defecation. The patient is encouraged to be sensitive to body clues that warn of impending urgency (abdominal cramping, hyperactive bowel sounds). Special absorbent underwear, which will protect clothes if there is accidental fecal discharge, may be helpful.

An understanding, tolerant, and relaxed demeanor on the part of the nurse is essential. The patient's efforts to use coping mechanisms are supported and encouraged.

A

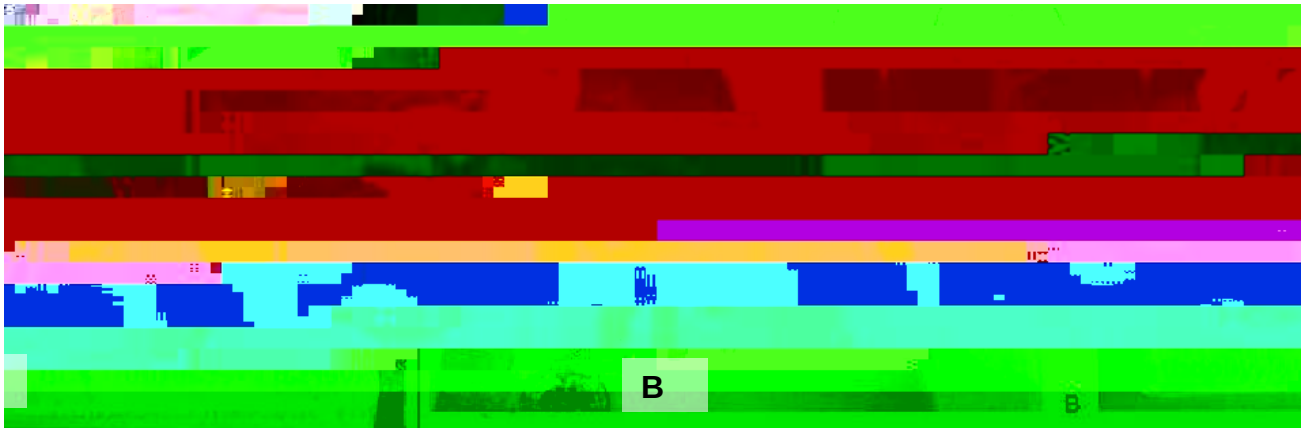


Figure 3.2.1 Effective hand washing. (**A**) Washing hands and forearms with firm rubbing and circular motions. (**B**) Rinsing thoroughly. (Adopted from Brunner and Suddarth's Text Book of Medical-Surgical Nursing).

Gloves must be used when handling any body fluid from the patient. Gloves must be changed between patient care activities and hands must be washed after gloves are removed .

To prevent patient-to-patient infection spread provide isolation according

Electrolyte replacements can be made. Evidence of dysrhythmias or a change in the level of consciousness is reported immediately. (14)

F. Evaluation

Evaluate nursing intervention based on the outcome criteria setted in section 3.2.3 under planning the nursing intervention (under C).

G. Treatment of Specific Food-Borne Diseases

Food-borne diseases for which their specific chemotherapy is not indicated in this section please refer annex-v

i. Food-borne infections

Apart from the chemotherapy management of food-borne infections include fluid and electrolyte replacement. Supportive care and rest are particularly the corner stone of management for viral infections.

ii. Food poisonings/intoxications

Bacterial food poisoning:

a. Staphylococcal food poisoning

- Fluid replacement and close observation
- Antibiotics are rarely used

b. Botulism

- Penicillin should be given to eradicate *Clostridium botulinum* from the site, even though the benefit of this therapy is unproven

Chemical poisoning:

a. Heavy metals

- Terminate exposure
- Use chelating agents

b. Insecticide poisoning (organophosphates and carbamate ingestion)

- Use activated charcoal
- Supportive measures:
  - Oxygenation

- Ventilatory assistance
- Treat seizure

- Atropinization: 0.5-2 mg IV every 5-15 minutes until bronchial and other secretions have dried

c. Poisonous plants

1.Mushroom poisoning:

- Gastric emesis with ipecac
- Decontamination with activated charcoal with sorbitol for catharsis
- Atropine
- Withdraw ingestion of poisonous plants
- Supportive therapy

2.Neurolathyrism (lathyrism):

- Withdraw ingestion of the plant
- Supportive therapy (9,11,12)

3.Fungal toxins

Aflatoxins:

-Treament in Hepatocellullar carcinoma includes drugs 5- flouroucil and mitomycin, and surgery.

Ergot toxin:

- Refer standard text books

3.3. SATELLITE MODULE FOR ENVIRONMENTAL HEALTH OFFICERS

3.3.1 Directions for Using the Module

- Make sure you have thoroughly read the core module before you begin to read this satellite module.
- Read through this satellite module carefully.

3.3.2 Learning Objectives

By the end of learning this satellite module the reader will be able to:

1. Explain the basic principles of food sanitation
2. Describe the transfer of contamination in food borne diseases
3. Discuss the different sources for food borne diseases.
4. Identify factors leading to food borne disease outbreaks.
5. Design prevention and control measures of food borne diseases.

3.3.3 Learning Activity

Case study

There is a busy cafeteria at a boarding school in the town of Bullhawo. The boarding school accommodates over 1200 students; and all are served in this cafeteria. The cafeteria is located in front of the students' dormitories in about a 50 meter distance. In most cases the direction of the wind blow is from the dormitories to the cafeteria. The dormitories harbor toilets with a water flush design but as water is scarce it is common to observe piles of human excreta with a buzzing population of flies feeding on the excreta. The campus compound, though has some trees, is dusty. The problem of water is alleviated by fetching water with trailer tankers from bore holes at a distance of about 20 KM. The water then is filled, for storage, to open barrels or narrow mouthed jerrycans with plastic hoses pulled over the floors in the kitchen of the cafeteria. The cafeteria lacks adequate dishes but this is compromised by rotating the utensils to serve more students. During this rotation the dishes are simply rinsed in a bowel of water before they are given to the next user in the queue. However, after a session of service the utensils(DS6 0 TaTj0.0326 Twv9ue. Ho rotation sessionthe basic botenshe fl 5ten0 servisy th ser

The dishes are placed to drip and dry in perforated plastic racks placed on the floor for ease of sliding over the floor. The floor of the kitchen is rough and usually wet. However, it is frequently cleaned to drain but not usually mopped, as this is a tedious task.

The number of workers in the kitchen and cafeteria is enough to manage the required service. However, most of them are with low skills and they have been on the job for long period. Despite this fact the management of the boarding school is not prepared to train them on proper food handling assuming that they have the experience and the training requires additional cost.

The wastes including garbage from the kitchen and the cafeteria are given to pigs that scavenge around these facilities. The sewage drains to underground sewers but there is frequent blockage that leads at times to overflow. The overflows facilitate growth of green grasses surrounding the cafeteria. Moreover, this wastewater is used to water vegetables planted in the backyard. It is common to smell odors arising from the garbage and the wastewater. This is not given much attention by the school management as they consider it to be normal to kitchens and cafeterias.

The campus clinic record shows that most students come with complaints of diarrhea. The clinic head reports that mass diarrhea complaints are commonly observed but are usually not serious. As the clinic is so busy, the staffs have no time to visit the cafeteria. In addition, the head of the clinic believes that giving proper care to the sick is easier and better than wasting time assessing the cafeteria.

Questions related to the above case study

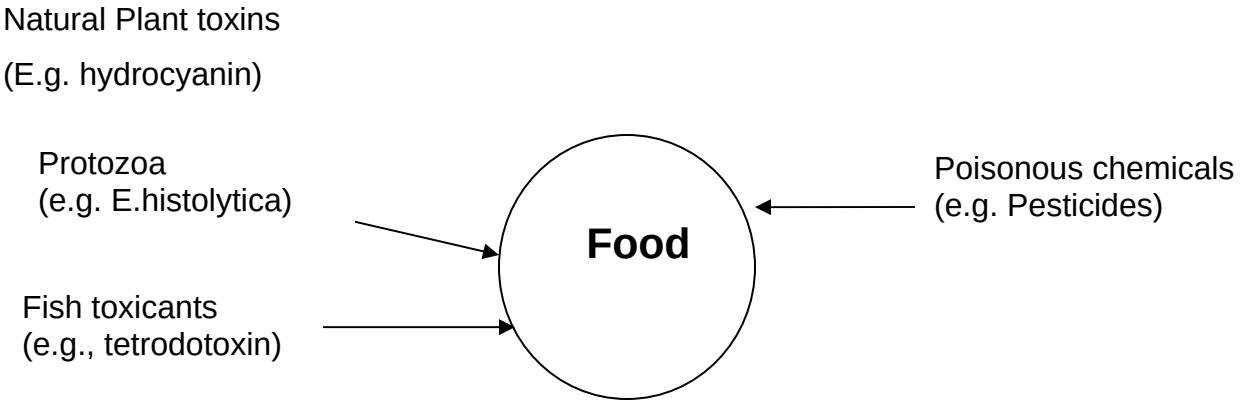
1. Based on the case study, make an assessment of the overall sanitation of the cafeteria?
2. What do you think are the potential sources of food contamination in this cafeteria?
3. How do you evaluate the dish handling and washing practice?
4. Do you think training of food handlers can address any problem related to food hygiene in the cafeteria? If so, discuss on some of them.

An effective program of food sanitation includes the following benefits. To mention some:

a. Reduced Public health risks
b. Improved product shelf life

chemical contaminates too with several pathways. Figure 3. 3.1 below illustrates some of the various biological or chemical contaminants of foods (2).

See figure 3.3.2 an example of pathways to food for selected chemical contaminants of food (19).



5. **Food preparation and consumption areas:** Restaurants cafeterias, mess halls, kitchens, bars, dining rooms, service tables, and utensils etc. can be conducive to growing and spreading of pathogens as well as chemical and physical agents of disease.

The flow of raw food materials to actual consumption is schematically presented in figure 3.4.3 including the accompanying hazards and risks at each stage. In principle the same flow scheme applies to both the food industry and to locally produced foods for private consumption (19)

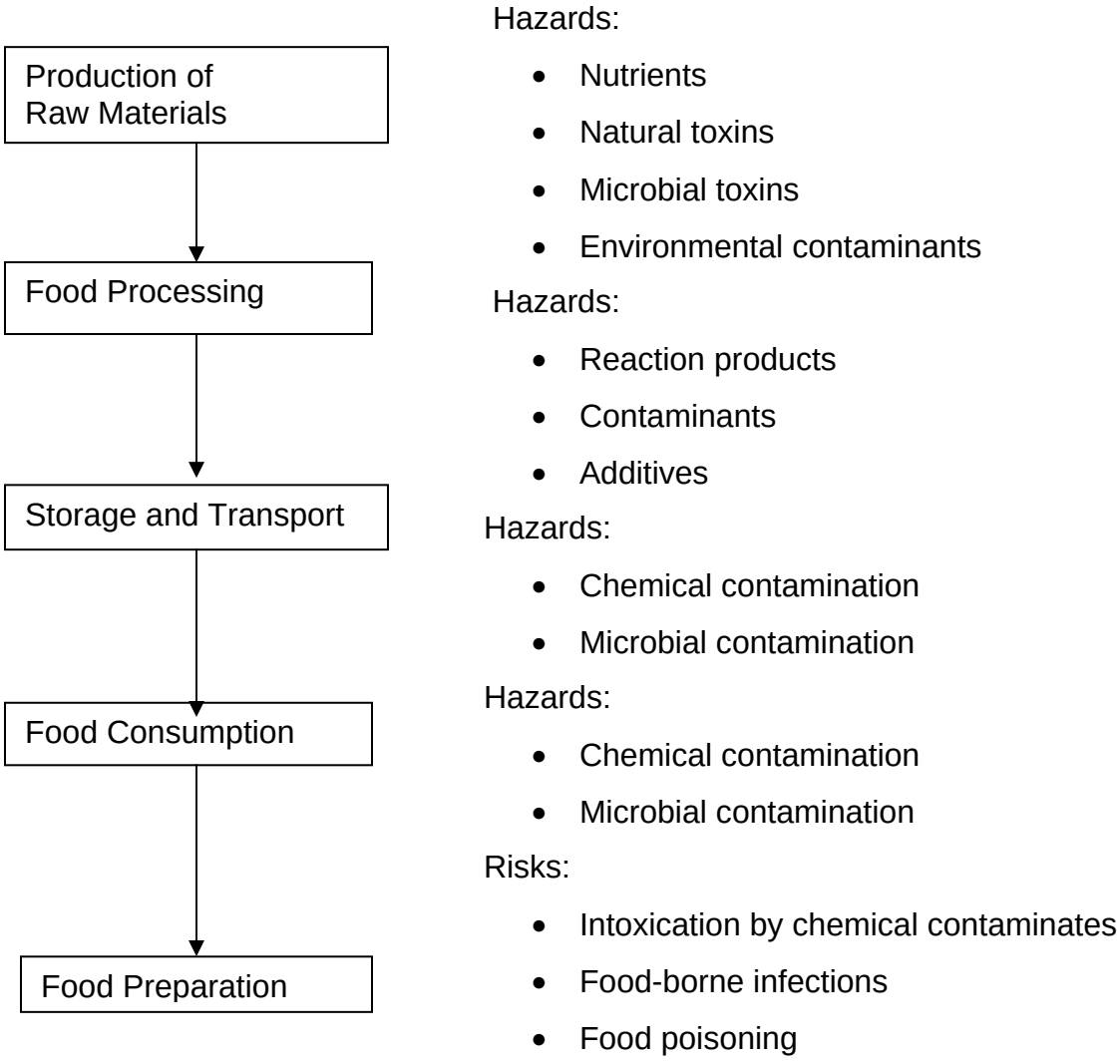


Fig. 3.3.3: Flow scheme of food production to food consumption

Sources of contamination of food:

Food products are rich in nutrients required by microorganisms and may become contaminated. Major contamination sources are **(7, 19,4):**

Water: water serves as a cleaning medium during sanitation operation and is an ingredient added in the formulation of various foods. If a safe water supply is not used it then becomes a source of contamination of the food (chemical or biological agents).

Sewage: Raw, untreated sewage can contain pathogens that have been eliminated from the human body, as well as other materials including toxic chemicals from the environment. Examples are microorganisms causing typhoid and paratyphoid fevers, dysentery, and infectious hepatitis. If raw sewage drains or flows into potable water lines, wells, rivers, lakes, and ocean bays the water and living organisms such as seafood are contaminated.

Air: Contamination can result from airborne microorganisms and chemicals in food processing, packaging, storage, and preparation areas. This contamination can result from unclean air surrounding the food or from contamination through improper sanitary practices.

Food Equipment: contamination of equipments used for processing, preparing or serving food occurs during production (manufacture) and when the material is not properly cleaned**.**

Employees: Of all the viable means of exposing microorganisms to food, employees are the largest contamination source. The hands, hair, nose, and mouth harbor microorganisms that can be transferred to food during processing, packaging, preparation, and service by touching, breathing, coughing, or sneezing. This is because the human body is warm; microorganisms proliferate rapidly, especially in the absence of good hygienic practices.

Adjuncts and additives: Ingredients (especially spices, flavoring and coloring agents, preservatives) are potential vehicles of harmful or potentially harmful microorganisms and toxins. The amounts and types of these agents vary with place and method of harvesting, type of food ingredient, processing technique,

- Deliberate and malicious contamination of food by a person for some irrational
- Water polluted by chemicals from farm and or spraying food trees (4, 6).

3.3.6 Transfer of Contamination

Before a food-borne disease can occur, food-borne disease transmission requires that several conditions be met. There are two related models that illustrate the relationship among factors that cause food-borne diseases. These are (7):

a. Chain of infection:

This is a series of related events or factors that must exist or materialized and be linked together before an infection will occur. These links can be identified as Agent, Source, Mode of Transmission, and Host. The essential links in the infectious process must be contained in such a chain. The factors that are necessary for the transmission of a food borne diseases are (7):

1. Transmission of the causative agent from the environment in which the food is produced, processed, or prepared to the food itself.
2. A source and reservoir of transmission for each agent.
3. Transmission of the agent from the source to a food.
4. Growth support if the agent is biological.

   These are conditions such as required nutrients, moisture, PH, Oxidation – reduction potential, lack of competitive microorganisms, and lack of inhibitors for contaminates to survive and grow. Moreover, the contaminated food must remain in a suitable temperature range for a sufficient time to permit growth to a level capable of causing infection or intoxication (7).

3.3.8 Prevention and Control of Food-borne Diseases

The quality and safety of food is a topic of interest to the general public. Food quality from a more scientific point of view includes a number of safety aspects such as the presence of environmental contaminants, pesticide residues, use of food additives, microbial contamination, and nutritional quality. In practical terms, safe food can be defined as food that, after being consumed, causes no adverse health effects (19).

To ensure high quality of the food supply a number of parties must play specific roles. The main actors include the government, consumers, and the food industry. The government is responsible for the establishment of standards or codes of practice as well as the enforcement of laws and regulations. Furthermore, it should encourage the food industry to undertake voluntary measures to improve food safety. Consumers in turn should be well aware of the quality of t

aimed at reduction of industrial and vehicle emissions and disposal of hazardous waste materials that can enter the food chain.

2. Food Processing:

Greater demands are being made on the food-processing industry as a result of increasing urbanization. As consumers continue to move further a way from the sources of production, they will require an effective and safe food distribution system. This separation of the customer from the production sector means a loss of the traditional methods used by the consumer to ensure, the

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Box 3.4. 1

Determine hazards and assess their severity and risks.

Identify critical control points.

Institute control measures and establish criteria to ensure control.

Monitor critical control points.

Take action whenever monitoring results indicate criteria are not met.

Verify that the system is functioning as planned.

Establish a documentation system for procedures and records. Develop and maintain procedures and practices for record keeping.

Definitions:

i. **Hazard:** Means the unacceptable contamination, growth or survival of microorganisms of concern to safety or persistence in foods of products of microbial metabolism (E.g. Toxins, enzymes, histamine) or the presence of chemicals of a harmful level of concentration or of a potential risk to health (4).

ii. **Critical control Point**: Is a location, practice, procedure, or process at or by which control can be exercised overall or more factors that, if controlled, could minimize or prevent the hazard (4).

3. Food Preservation and Storage

The aim of food preservation is to eradicate or prevent the growth of pathogens during manufacturing, processing and preparation of food so that it will remain, safe to eat for longer periods of time. Bacterial growth is enabled by a number of conditions, the most important being the presence of a good substrate (in this case a food item); an infection with viable organisms; a temperature that allows growth of bacteria; proper pH; and sufficient water for growth. To guard against microbial growth, at least one of these conditions should be hindrance (19).

4. Food Preparation in the Home:

The household is perhaps the most relevant place for developing strategies to combat food borne illness, as it is the location where the consumers, can exert the most control over what they eat. Clearly, one of the most significant components of keeping food pathogen–free in the household is maintaining a clean and hygienic environment in the kitchen or other food preparation areas. Proper sanitation facilities, cleanliness of household members who prepare the food, and control of pests are all essential for the presentation of acceptable food.

Consumption cooked food, while still hot will not cause food borne infection. The chemical risks in food preparation at home are the same as those present during food processing. The general public should be made aware of these risks.

Keeping chemicals away from kitchens and areas of food preparation is important. If needed, use chemicals cautiously.

Many bacterial pathogens are able to multiply in food because of the temperature at which the food is stored. Figure 3.4.5 shows the temperatures at which bacteria can be killed or controlled (4.19).

The prevention and control strategies for food borne diseases emanate from the three basic principles (described in section3.4.4): the prevention of contamination, destroying the pathogenic agent or retarding the growth and multiplicat

Pasteurization: A process of heat treatment of food that kills pathogenic microorganisms without destroying taste, digestibility and nutritive value of food. It also destroys some food spoilage microorganisms.

Drying (Desiccation): Bacteria cannot multiply in the absence of water (moisture). This can be achieved by application of heat or chemical treatment.

b). The use of low temperature

Unlike high temperature, low temperature (cold) is not an effective means of destroying microorganisms and toxins in foods except retarding their multiplication and metabolic activities there by reducing toxin production.

Chilling (cold storage or refrigeration): is reducing food temperatures to below ambient temperatures. This is a suitable temperature to preserve perishable food items that may get spoiled at freezing temperature.

Freezing: This is a dehydration method because the water in the food is transformed to ice, thus rendering it unavailable for microbial metabolic function. Freezing temperature depends upon the kind of food and the intended storage time.

2) Fermentation and pickling:

In fermentation the food is transformed into an acid state based on the pH control principle. Some fermented foods have high amount of alcohol, which is antimicrobial. Pickling on the other hand refers to the immersion of certain foods in concentrated natural acid solution such as vinegar.

3) Chemical treatment:

This involves osmotic balance disturbance or direct actions of the chemicals on the microorganisms. Chemicals that increase osmotic pressure with reduced water activity below the level that permits growth of most bacteria can be used as bacteriostatic. Liquids pass into or out of bacterial cells by the process of osmosis. Examples for osmotic actions are salting and sugaring. Some other chemicals may destroy or inhibit growth of microorganisms in food. Examples include application of nitrites and smoking.

4) **Radiation:** this is a process of exposure of the food to high- speed electrons to destroy microbial cells. Beta, gamma or x-rays irradiate microorganisms in foods. A cell inactivated by irradiation cannot divide and produce visible growth (7).

5) **Other important methods /supportive procedures that facilitate the safety of food:**

Health education

Good personal and environmental hygiene

Availability of safe, ample and convenient water supply

Training of food handlers and managers

Stringent inspection and control actions

Legislative support (ordinances and codes), licensing

Good-house keeping practices including separate storage and care of toxic chemicals.

Understanding about additives and restrictions of unauthorized use.

Food equipment selection to avoid chemical poisoning arising from the material constituency and or coatings of some food utensils.

Avoidance and care of insecticide use in food processing and preparation areas.

3.3.9 Collection of food samples

The need for sample collection:

The following factors may determine the essentiality of sample collection in food borne disease outbreaks:

For diagnosis of outbreak

For epidemiological reasons

For legal issues

For preventive aims

For designing appropriate actions

Types of samples for assessment of food-borne diseases:

Official samples: suitable for initiating prosecutions in court

Informal samples: generally collected for the purpose of obtaining information, e.g., general survey

Standard samples: for the purpose of establishing standards for foods

Post-seizure samples: collected under court order from goods under seizure

Documentary sampling: is done when samples are too heavy, too expensive, or too bulky

Sampling Plan:

Before instituting a food sampling plan, the following steps should be followed:

- Discuss the plan with laboratory personnel
- Determine the analytical capability of the laboratory
- Determine how sample is to be taken
- Decide how often and under what conditions sampling is to be done

Criteria for sample collection:

- Type of food
- Size of the lot to be sampled
- Representative ness of the sample
- Acceptance and rejection criteria: of pathogens, adulteration, tolerance limits, composition standards, net contents
- Degree of hazard to human health

Types of tests:

- Physical
- Bacteriological
- Chemical/toxicological

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3.4. SATELLITE MODULE FOR MEDICAL LABORATORY TECHNOLOGISTS

3.4.1 Directions for Using the Module

- Before you start reading the Satellite Module, be you have completed the Core Module and performed the pre-test questions.
- Read through this satellite module carefully.

3.42 Learning Objectives

At the end of this satellite module, the reader is expected to be able to:

Explain the safety procedures that should be taken in the processing of the specimens during diagnosis of food borne disease.

Describe how to collect and handle different specimens in the investigation of food borne disease.

List the laboratory investigations employed for diagnosis of food borne diseases.

Describe the appearance of stool specimens during investigation processes in the diagnosis of food borne disease.

Illustrate the morphological features of etiological agents of food borne disease.

3.4.3 Learning Activities

Refer to the case study under learning activity section 2.4 in the core module and discuss the following questions.

1. What type of specimen should be collected?
2. How should this specimen be collected?
3. What could be the etiology of the disease?
4. What type of investigations can be done?

3.4.4 Laboratory Diagnosis

A. Collection and handling specimen

Proper collection of specimen is essential since the final laboratory results are dependent on the initial proper quality of the sample. The cause of food borne disease may be identified in the laboratory by examining specimens such as stool, blood, vomit, rectal swab, liver and duodenal aspirate; macroscopically, microscopically, culture and immunolgicly (16). If food poisoning is suspected because of a cluster of cases are

related to the eating of common foodstuff a sample of the suspected food should be collected (17).

i. Safety

Some organisms are more hazardous to handle and are more likely to infect laboratory workers than others, e.g. Hepatitis virus.

may not be clean and can result in the faecal contamination of hands and surfaces. Dysenteric and watery specimens must reach the laboratory as soon as possible after being passed (with in 15 minutes), otherwise motile parasites; such as E. histolytica and G.lamblia tropohzoites may not be detected. Other specimens should reach the laboratory with in 1 hour of being collected. Specimen must be labeled correctly and accompanied by a correctly completed request form (16).Fecal specimens like other specimens received in the laboratory, must be handled with care to avoid acquiring infection, from infectious parasites, bacteria, or virus. Feces may contain infective forms of:

Parasites such as E. vermicularis, T.solium, G. lumblia, E. histolytiea or C. parvum.

Bacteria such as V. cholerae, shigella or salmonella species.

Viruses including hepatitis virus, HIV and rotavirus.

Whenever it is difficult to get feces, rectal swab should be obtained but rectal swab is unsatisfactory unless it is heavily charged and visibly stained with feces, which collected from the rectum, not anus. (17)

iii. Collection of Blood Specimens

The following precautions need to be followed during collection of blood sample.

Syringes and needles used for collecting blood samples must also be chemically clean and dry

Follow a safe technique and wear protective gloves.

Specimen container must be leak proof, sterile and chemically clean, should be well washed with detergent, and rinsed in several changes of clean water.

Blood should be collected before antimicrobial treatment has been started and at the time the patient’s temperature is beginning to rise

To increase the chance of isolating a pathogens it is usually recommended that at least two specimens (collected at different times) should be cultured

Blood for culture must be collected as aseptically as possible.

If anti-coagulated blood is required, add the correct proportion of blood to the anticoagulant in to the tube or bottle and mix it by gently inverting the container several times.

assay and ELISA are commercially available, and the result of tests are positive in more that 90% of patients with colitis, amebomas, or liver abscess (9).

b. Giardiasis:

Occasionally giardiasis can be diagnosed by detecting G. lamblia trophozoites in duodenal contents, but this should only be considered when giardiasis is clinically suspected and no parasites are detected after examining several faecal specimens (20).

Diagnosis of G.lamblia using an antigen test:

Several tests are commercially available for detecting Giardia lamblia specific antigen in faecal specimens using a monoclonal antibodies reagent. The antigen is stable and can be detected in fresh or preserved faeces. The presence of antigen indicates active infection. It is produced as G. lamblia multiplies in the intestine. Most Giardia antigen tests use an enzyme immuno assay (EIA) method in micro plate or membrane format. No equipment is required to perform or read the assay. Each test device contains a positive control. A circular blue – green spot in the test area indicates the presence of Giardia antigen in the specimen. The assay has 92.6% relative sensitivity and 98.1% relative specificity (16).

c. Taeniasis

The laboratory diagnosis of T. saginatia infection is by:

Macroscopic Examination

Identifying gravid segments recovered from clothing or passed in faeces macroscopically. The segment appears white and opaque and measures about 20mm long by 6mm wide when freshly passed.

Microscopic Examination

Identifying the ova in the stool

A concentration technique and the examination of several specimens may be necessary to detect Taenia eggs in fces. The eggs can be concentrated by formal ether technique. It is round to oval measuring 33 – 40 µm. Embryo is surrounded by a thick brown wall, hook lets are present in the embryo. Eggs may also be present in the perianal area; thus, if proglottids or eggs are not found in the stool, the perianal region should be examined with use of a cellophane tap swab (9).

d. Ascariasis

The laboratory diagnosis of Ascaris lumbericoides is by:

Macroscopic Examination

Identifying A. lumbricoides worms expelled through the anus or mouth. Freshly excelled ascaris worms are pinkish in color. They measure 12 – 35cm in length and taper at both ends.

Microscopic Examination

Microscopically identifying A. lumbricoid egg in faeces:

Usually fertilized eggs are found in faces but occasionally infertile eggs are produced. Fertile egg has yellow – brown oval or round shell is often covered by an uneven albuminous coat; contains a central granular mass, which is the unregimented fertilized ovum. Infertile egg is dark in color and has a thinner wall more granular albuminus covering, more elongated than a fertilized egg, and contains a central required mass of large granules.

ii. Bacterial food borne infection

a. Enteric Fever (Typhoid and paratyphoid fever)

Salmonella typhi and sa

to 50% by the third week. Organism usually from fecal specimen can be isolated from 40 – 50% of patients from the second week of infection. A diagnosis can also be based on cultures of urine and Bone marrow (21).

For fecal specimen Eosin Methylin Blue and MacConkey are some different media and Salmonella shigella agar, Xylose Lycine Deoxy chocolate agar and deoxy chocolate citrate agar are selective media. For fecal specimen befor innoculatng on the plate agar,it is better to use selective broth such as selenit F to enhance the growth of salmonella which is usually found in small number.

Blood sample primerly cultured in Thioglycolate broth and to the plat agar

Biochemical reaction and slid agglutination tests with specific sera are used for the identification of suspected colonies from solid media. The differentiation of suspected salmonella colonies using motility indol urea (MIU) medium and kliger iron agar (KIA) are described on annex II.

B. Serology

For serological examinations, paired acute and convalescent samples of serum should be collected at an interval of about 10 days in suspected enteric fever (17). Several serological tests including the classic Widal test for febrile agglutinins are available; however, it gives high rate of false positivity. The Widal test is a serological test for the presence of salmonella antibodies in patient's serum when facilities for culturing or antigen testing are not available. Widal test if performed reliably and interpreted with care (with

venous blood collected in to a clean dry tube and allowed to clot. The serum should be free from red cell and must not be heated.

The Widal test is reported by giving the titer from both O and H antibody (antibody titer is the highest dilution of serum in which agglutination occur). If no agglutination occur report as:

S. typhi O titer less than 1:20

S. typhi H titer less than 1:20.

In typhoid endemic areas in developing countries active typhoid is suggested if the titers of H or O or both, agglutinins are significantly raised (i.e. titer greater than 1 in 180 or 1 in 200)

Raised O or H titers other than active typhoid associated with vaccination with typhoid vaccine, infection with other salmonella species, chronic liver disease and immunological disorder such as rheumatoid arthritis rheumatic fever, multiple myloma and ulcerative colitis (21).

b.Shigellosis

General Characteristics of the causative agents

Shigellae are:

Gram negative

Non-sporing non-capsulated rods

Unlike salmonellae and many other enterobacteria, shigellae are non-motile.

Diagnostic laboratory tests

Specimen: fecal specimen for culture and blood for antibody detection

A. Microscopy

Fecal specimens from patients with shigellosis may be watery and contain little blood and mucus in the early stages of infection, but, consists almost entirely of pus and blood mixed with mucus in the later stages of infection. When examined microscopically, red cells and large number of pus cells are usually found. Specimens from patients with amoebic dysentery contain red cell, and usually very few pus cells (21).

B. Culture

A fresh feces specimen is required to isolate shigella.

The specimens are inoculated on different media e.g. macConkey. A selective media Deoxycholate citrate agar (DCA), Salmonella Shigella agar (SS), Xylose lysine deoxy cholate (XLD) agar is required to isolate shigallae from feces. But XLDis more preferable than the others.

Biochemical reactions are used for differentiation of suspect shigella colonies. The differentiation of suspected shigellae colonies using Motility Indole Urea (MIU) and kligler Iron Agar (KIA) and other biochemical reaction is described on annex II.

C. Serology

Serological test can be performed since antibodies to somatic antigens develop early in the acute phase of disease. (9) Normal persons often have agglutinins against several shigella spesies, therefore serology is not used to diagnose shiggella infection.

c. Cholera

General Characteristics of the causative agent

The main species of medically important is Vibro cholerae 01.It is strongly oxidase positive and non lactos fermenter

V. Cholerae is an aerobe and facultative anaerobe

Gram negative motile usually curved rod with a single flagellum at one end

Highly motile with a distinctive rapid to and fro movement

Diagnostic Laboratory Test

Specimen: A fecal specimen is required to test directly for V. cholera antigen and to isolate V. cholera in culture.

A.Microscopy

If the specimen is obtained on the first day of the illness the vibros are likely to be present in enormous numbers , and it is then possible ,in urgent cases to make provisional diagnosis by direct microscopic examination of a film of the the feces ,preferably by dark ground illumination. The vibros should be seen darting about and to be immobilized when specific antiserums added to the film.(17)

Diagnostic laboratory test

Specimen: Feces

A. Culture

Stool culture on blood and MacConkey agar. E.coli produces 1- 4 mm in diameter colonies on blood agar after over night incubation at 35 -37^{o}C. The colonies may appear pink on macConkey agar,due to production acid by fermenting acid.. An important bio chemical feature of E.coli is the production of indole from peptone water containing tryptophan, which differentiate the E.coli from other most entrobacteria.. The basic biochemical reaction of E.coli compaird with other entro bacteri is shown on annex II.

e. Brucellosis

General Characteristics

Brucella are Gram negative coccobacilli (Short rods) and obligate parasite of human and animal

Non-capsulated and non motile

An intracellular bacteria, strict aerobic

Requires a carbon dioxide enriched atmosphere in which to grow.

Diagnostic laboratory test

Specimen: Blood , bone marrow and lymph gland fluid for culture

A.Culture

Blood or bone marrow specimens needed for culture in the acute stage of infection.. Triptone soya diphasic medium is recommended for Isolation of Brucella species from blood sample. A varity of colonial forms are produced by brucella strains including smooth, and rought colonies. The may be colorless or gray white.

The inoculated diphasic media should be incubated at lest for 3 to 8week before reporting no brucella is isolated.

When the organism is s

These include urase and hydrogen sulphide production. All Brucella strains are catalase positive.

B. Serology

Infection with Brucella organisms produces an antibody response. Measuring the titer of brucella antibodies in serum is an important method of diagnosing Brucellosis. Rapid slid screening agglutination test and tube or micro plate agglutination test can be used to test serum for Brucella antibodies (21).

N.B: Brucella species are highly infectious. Specimen must be marked **HIGH RISK**.

j. Bacillus cereus

Morphology

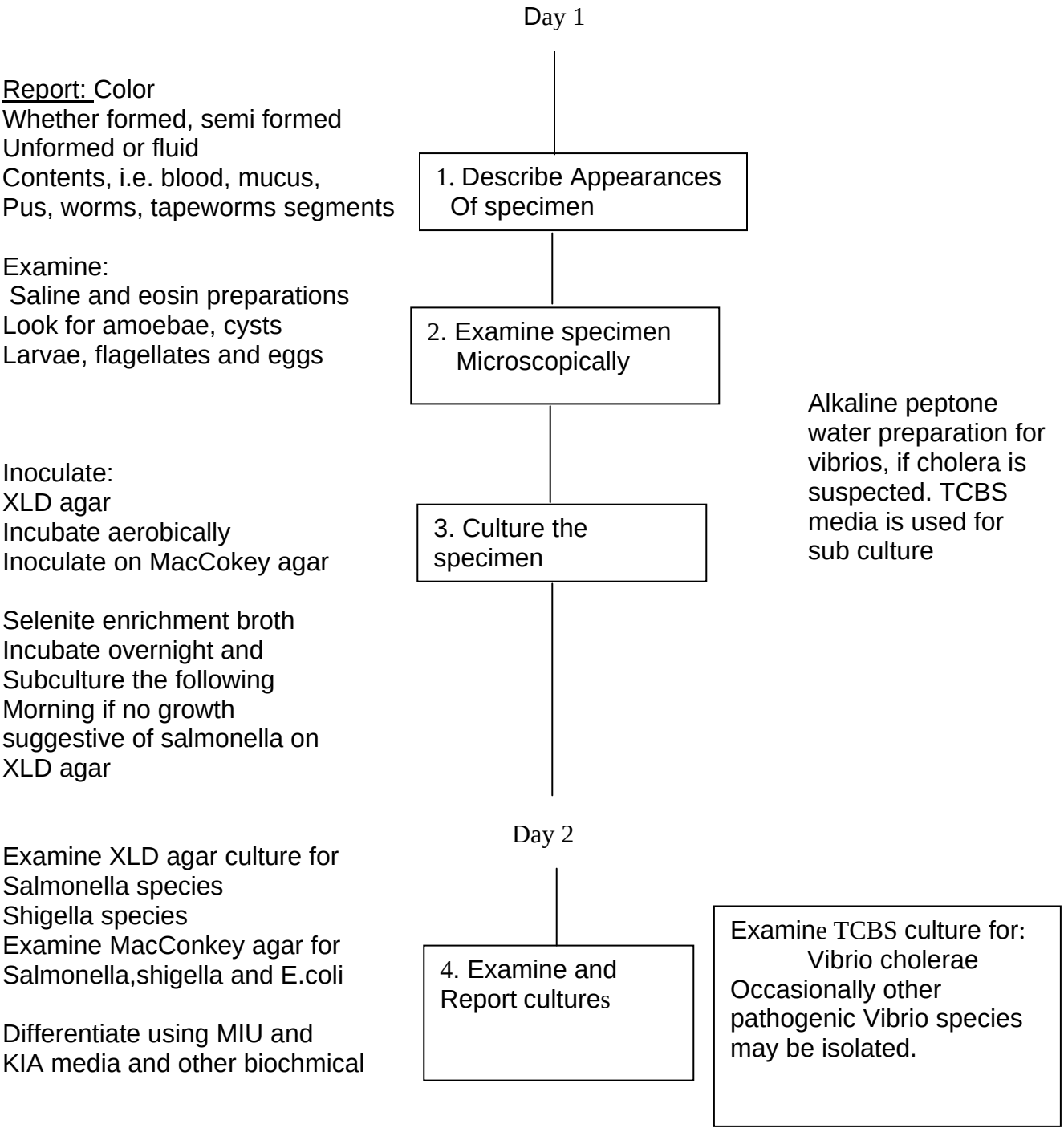

Figure 3.4.1 Summary of the laboratory examination of fecal specimens

iii. Viral food borne infection

A. Viral Hepatitis

Hepatitis A virus is a non-enveloped, heat, acid and ether-resistant RNA virus in the picorna virus family. A diagnosis of hepatitis can be made on the basis of characteristic presentation and the presence of liver function test (18). In case of hepatitis the serum aspartate aminotransferase (AST) and alanin amino transferase (ALT) show a variable increase during the prodormal phase of acute viral hepatitis and precede the rise in bilirubin level. . Antibodies to hepatitis A virus can be detected during acute illness when serum aminotransferere activity is elevated. This early antibody response is predominately of the IgM class and persists for several months. During convalescence, however anti-HAV of IgG class become predominate antibody (9).

B. Viral Gastroenteritis

Because rotavirus is shed in large amounts in the stool, detection is relatively easy. Various specific and highly sensitive commercial immunoassays are available to detect rotavirus antigen in fecal specimens.

DNA probe diagnosis appears to be sensitive and specific, as do polymerase chain reaction (PCR) – based assays, but this detection method have been used for research purpose (9).

Food poisoning/ intoxication

i .Bacterial food poisoning/ Intoxication

a. Staphylococcal food – poisoning

S. aureus food poisoning is caused by the ingestion of preformed toxin in contaminated food. Staphylococcus species are:

Non motile

Non capsulated

Gram-positive cocci of uniform size; they occur characteristically in-groups but also single and in pair.

Grow well aerobically and in carbon dioxide enriched atmosphere

In an outbreak plat out few loopfull of a saline suspension of faeces on plates of blood agar, macConky agar and a selective medium, eg. 6% Nacl nutrient agar and manitol salt agar. Incubate aerobically for 18 – 24 hrs at 37^{o} C and examine for colonies of S.

aureus. On blood agar produces yellow to creamy 1-2 mm diameter colonies, on macCnky agar smaller (0.1-0.5 mm) colonies are produced after over night inqubatin at 35-37^{O}C.In an out break send sub-culture for phage typing and tests for enterotoxin production.

S.aureus may often be isolated from the faeces of healthy person, so that it's isolation from the feces of a patent with diarrhea is not proof of a casual role.

Identification of page type among the isolate from suspected food staff is fair evidence that the outbreak is due to staphylococal food poisoning

Some staphylococcal food poisoning out breaks; however, are caused by foodstuff that has been heated at a temperature sufficient to kill the staphylococci though insufficient to inactivate the more thermostable entrotoxin. In such cases the diagnosis requires the demonstration of staphylococcal entrotoxin in the feces or food. Kits for the detection of staphylococcal entrotoxins A, B, C, and D by reversed passive latex agglutination are available commercially (17).

b.vailable cowbul0027(m/MCID 5 BDC /TT2 1 6f-0.0004 Tc 0.2926 Tw -6.09 -144.725 Tureus my o

of these metals. The principle of the test is clean copper wire is submerged in boiling urine to which has been added a small amount of HCl. Mercury, if present will be deposited on the copper wire (23).

c. Arsenic

Because arsenic quickly cleared from the blood, urine is the specimen of choice for diagnosing arsenic poisoning. Arsenic will persist in the urine for about a week after an acute poisoning and for as long as a month following chronic exposure. Occasionally, hair and nails are analyzed to detect the long-term effect of arsenic poisoning. The recommended method of analysis is flamelen atomic absorption (23).

2. Pesticide Poisoning

Organophosphates represent the largest single group of pesticides used and causes approximately one–third of pesticide poisonings. The laboratory may help identify individuals who have become toxic with organophosphates. The method of screening is to measure serum pseudocholinesterase activity, which will be depressed in the presence of organpophosphates. Individual pesticide testing is well developed but not warranted in a clinical toxicology laboratory because of infrequency of pesticide poisoning seen in the average emergency room and the expense of such testing.

Several analytical techniques have been applied to measuring pseudocholinesterase, including manometry, electrometric titration, and colorimetry. The photometry uses acetylcholine as a substrate. Acetylcholine is converted to thiocholine and acetate. Thiocholine then reacts with dithiobisnitrobenzoic acid to form the yellow-colored 2-nitro-5-mercaptobenzoate (23).

Now you are through the core and satellite modules, but there are still some activities remaining as stated below:

1. **Read the task analysis of the different categories of the health team on Unit 4.**
2. **Do the questions of pretest as posttest.**
   N.B. Use a separate answer sheet.
3. **Compare your answers of the pre and posttests with the answer keys given on ANNEX I and evaluate your progress.**

3.5. SATELLITE MODULE FOR HEALTH EXTENSION WORKERS

3.5.1 Purpose and Use of the Module:

Health Extension Package Workers, as they will be playing vital roles in the betterment of the health of the community, are expected to have basic information about the most important health problems of the country, common among which are food-borne diseases. This module aims at providing them with some of this information so as to enable them to recognize food-borne illnesses and outbreaks, refer cases for proper therapy (in the mean time providing basic treatment), and to prevent them from occurring.

3.5.2 Directions for Using the Module:

Do the pre-test given below using a separate answer sheet for your answers.

Read the material thoroughly including the section on task analysis for health extension package workers presented in section 3.4.15.

3.5.3 Pre-test:

Write the letter of your best choice for each of the following questions on a separate answer sheet.

1. One of the following is not a food-borne disease:
   A. Typhoid fever
   B. Typhus
   C.

3. Identify the false statement:
   A. All food-borne diseases can be prevented only by cooking all foods adequately.
   B. The presence of latrine helps to reduce the transmission of food-borne illnesses.
   C.

7. Proper disposal of human excrement helps to reduce the transmission of food-borne diseases by flies to prepared food and also by preventing contamination of soil and vegetations with infective organisms.
   A. True
   B. False

3.5.4 Learning Objectives:

Define food-borne diseases

List some common food-borne diseases in Ethiopia

Describe the most important manifestations of some food-borne diseases

Refer patients with food-borne diseases and, in the mean time, provide basic treatment

Educate the public and advise individuals on how to prevent food-borne diseases

3.5.5 Definition:

Food-borne diseases are those diseases acquired following the ingestion of infective organisms, toxins, or chemicals together with food items or following the ingestion of poisonous plant or animal tissues or products.

3.5.6 Epidemiology

The different types of food-borne diseases are among the major causes of sickness, being responsible for large numbers of outpatient visits, hospital admissions and deaths. There are many factors that contribute to this condition, some of which are poor personal hygiene and environmental sanitation, grossly inadequate safe water supply, poor food preparation and storage of food items, and others.

3.5.7 Causes:

1. **Bacteria:** e.g., typhoid fever, shigellosis, E. coli infection, cholera
2. **Parasites** (the infective stages are microscopic cysts, eggs or larvae)**:** e.g., amebiasis, giardiasis, ascariasis, tapeworm infection
3. **Viruses:** e.g., hepatitis, viral diarrhea
4. **Fungal toxins** such as aflatoxin

5. **Chemicals:** e.g., insecticides (malathion, etc.), heavy metals (lead, mercury, etc.)
6. **Poisonous plants:** e.g., mushrooms, “guaya”

3.5.8 Transmission (Modes of Acquisition):

The most important modes of transmission of food-borne diseases are:

1. Ingestion of raw or undercooked meat and meat products
2. Ingestion of raw milk
3. Ingestion of food contaminated with human feces (directly or indirectly)
4. Ingestion of raw vegetables contaminated with soil, human feces, etc.
5. Accidental ingestion of chemicals such as malathion together with food
6. Ingestion of poisonous plants intentionally as food items (“guaya”, mushrooms) or unknowingly (mushrooms, etc.)
7. Ingestion of food prepared using contaminated water, e.g., for washing vegetables
8. Ingestion of food kept in an unsuitable condition for long time after preparation

Some common contaminants of foods

Figure 3.5.1 below illustrates some of the various biological or chemical contaminants of foods (2,19).

Sewage: Raw, untreated sewage can contain pathogens that have been eliminated from the human body, as well as other materials including toxic chemicals from the environment. If raw sewage is used to irrigate vegetable farms, it can be a source of food contamination.

Equipment: contamination of equipments used for processing, preparing or serving food occurs during production (manufacture) and when the material is not properly cleaned.

Food handlers: The hands, hair, nose, and mouth harbor microorganisms that can be transferred to food during processing, packaging, preparation, and service by touching, breathing, coughing, or sneezing. Of all the viable means of exposing microorganisms to food, employees are the largest contamination source.

Insects and rodents: Flies, cockroaches and rodents are associated with living quarters, eating establishments, and food processing facilities, as well as with toilets, garbage, and other filth. These animals transfer contaminants to food through their waste products; mouth, fur, intestinal tract, feet, and other body parts; and during regurgitation onto clean food during consumption.

Soil: Soil may contain microorganisms as well as poisonous chemicals. These agents may get access to food either due to direct contamination or through dusts.

Other animals' bodies: From the intestinal tracts of animals, microorganisms find their way directly to the soil and water. From there, they may find their way into plants, dust, utensils and/or food. Meat of animals can get contaminated during slaughtering, cutting, processing, storage, and distribution. Other contamination can occur by contact of the carcass with the hide, feet, manure, dirt, and visceral contents. Like wise drugs used to prevent disease and promote growth in animals may also become potential risk for human health due to persisting of these drugs in the meat or milk products.

Others:

- Mistaken use of a toxic chemical in the preparation seasoning or sweetening of food or by children believing it is a drink.

- Deliberate and malicious contamination of food by a person for some irrational reason.
- Water polluted by chemicals from farm and or spraying food trees (4,6).

3.5.10 Factors most commonly contributing to food-borne disease outbreaks

There are a number of factors that may lead to the occurrence of food-borne illness outbreaks. The major ones are:

Preparation of food more than half a day in advance of needs

Storage at ambient temperature

Inadequate cooling

Inadequate reheating

Use of contaminated processed food (cooked meats and poultry, and the like)

Undercooking

Cross contamination from raw to cooked food from utensils, and unhygienic kitchen environment

Infected food handlers or poor personal hygiene of food handlers

Unsanitary dishware, utensils and equipment

Improper food handling procedures such as unnecessary use of the hands during preparation and serving of food

Improper food storage that may lead to cross contamination by agents of diseases (micro-organisms, poisonous chemicals), or exposure to moisture that may facilitate microbial growth

Insects and rodents (4,13).

3.5.11 Some common food-borne diseases: their etiology and foods involved

1. Food infections

Etiologic Category	Diseases	Causative organisms	Foods commonly involved
1.Bacterial	Typhoid fever	Salmonella typhi and parathyphi	Raw vegetables and fruits, salads, pastries, un- pasteurized milk and milk products.
	Shigellosis	Shigella species	All foods handled by unsanitary workers, potato or egg salad, lettuce, raw vegetables
	Cholera	Vibrio cholerae	Fruits and vegetables washed with contaminated water
	Bovine TB	M. Bovis	Un-pasteurized milk or dairy products from tuberculous cows.
	E.coli infections	E.coli	Beef, dairy products, fresh products, raw produce (potatoes, lettuce, sprouts, fallen apples), salads.
Etiologic Category	**Diseases**	**Causative organisms**	**Foods commonly involved**
2. Viral	Viral GE	Rota virus, Norwalk virus, calici virus, astro virus	Any food of daily use with poor hygiene
	Viral hepatitis	Hepatitis A & E	Raw shellfish from polluted water, sandwich, salad, and desserts.
	Poliomyelitis	Polio virus	Any food of daily use with poor hygiene
3. Parasitic	Taeniasis	Taenia species	Raw beef, raw pork
	Amoebiasis	*Entameba histolytica*	Any food soiled with feces
	Ascariasis	*Ascaris lumbricoides*	Foods contaminated with soil, specially foods that are eaten raw such as salads, vegetables
	Giardiasis	*Giardia lamblia*	Foods contaminated with feces

2.

Etiologic Category	Disease	Causative agent	Foods commonly involved
		Additives (unauthorized)	Various food items where unauthorized additives may be added as coloring agents, sweeteners, preservatives, flavoring agents etc.

3.5.12 Common signs and symptoms of food borne diseases

- Individuals with food-borne diseases can have many different kinds of manifestations.
- Some of these manifestations are listed below:
  1. Diarrhea (watery/mucoid/bloody), tenesmus (painful straining at defecation with sensation of inadequate emptying), abdominal pain, nausea, vomiting, bloating , belching, flatulence, abdominal distention
  2. Loss of appetite, loss of general sense of well-bei

Proper washing and cooking of vegetables

Other important methods that facilitate the safety of food include the following:

- Health education
- Good personal and environmental hygiene
- Availability of safe, ample and convenient water supply
- Training of food handlers and managers on hygienic food preparation and handling
- Stringent inspection and control actions
- Legislative support (ordinances and codes), licensing
- Good-house keeping practices including separate storage and care of toxic chemicals.
- Understanding about additives and restrictions of unauthorized use.
- Food equipment selection to avoid chemical poisoning arising from the material constituency and or coatings of some food utensils.
- Avoidance and care of insecticide use in food processing and preparation areas.

2. Education of the public at large on the above issues as well as avoidance of consumption of potentially harmful plants
3. Advising patients and families to seek immediate medical help in the event of any food-borne illness
4. Searching for cases and referring to nearby health institution for proper management; this is particularly so when there is anyone with some form of food-borne illness in the community since there may be several others with the same problem who may have manifestations or may have not started to show them yet.

This brings you to the conclusion of the satellite module prepared for Health Extension Workers. What remains now is to:

Read the task analysis for Health Extension Package Workers in section 3.5.15

Do the pre-test on section 3.5.3 as a post-test

Compare your responses against the keys given on section 3.5.16.

3.5.15: Task Analysis for Health Extension Workers

Table3. 5.1. Knowledge Objectives and Learning Activities

No	Learning Objectives	Learning Activities
1	To define food-borne diseases	Define food-borne diseases
2	To classify food-borne diseases	Classify food-borne diseases
3	To describe the epidemiology of common food-borne diseases	Describe the magnitude of common food-borne diseases
4	To identify the etiologic agents of common food-borne diseases	Identify the etiologic agents of common food-borne diseases
5	To describe the c	

Table 3.5.2. Attitude Objectives and Learning Activities

No	Learning Objectives	Learning Activities
1	Consider that food-borne diseases are a major public health problem	Recognize food borne diseases are one of the major public health problems in Ethiopia
2	Believe that improper handling of food can result in food borne diseases.	Believe increasing public awareness improves food handling practices
3	Appreciate preventive measures are more important than treatment in food borne disease.	Emphasize on preventive measures
4	Believe that food borne diseases can occur in the form of outbreak.	Emphasize on health education to prevent outbreak occurrence
5	Believe that the causes are not attributed to only microbial agents	Consider possibilities of non-microbial causes of food borne diseases
6	Consider that the role of food handlers is crucial in food borne diseases.	Emphasize on training of food handlers
7	Believe that some food borne diseases are fatal thus need immediate intervention	Emphasize on timely intervention
8	Believe that food borne diseases are preventable	Emphasize on prevention
10	Appreciate the role of different category of the health team in the prevention, control and management of food born diseases	Believe on team approach

UNIT FOUR

TAKE HOME MESSAGES FOR CARE GIVERS/ SELF-CARE

Food-borne diseases are caused by ingestion of food contaminated with poisonous substances or germs. Germs are tiny organisms that cannot be seen with the naked eye.

If several people consume contaminated food from the same source, they may be affected by a similar type of sickness.

The manifestations of food-borne sicknesses are many in type, e.g. diarrhea, vomiting, fever, abdominal pain, bloody stool, muscle weakness, etc.

If an individual is possibly affected by a food-borne illness, he/she should seek medical help from health facilities as soon as possible.

If not treated in time, food-borne illnesses can lead to serious and sometimes life-threatening problems.

There are different measures that can be taken at home to prevent food-borne diseases:

- o

- Wash food utensils preferably in three compartments: the first with worm water and detergent for washing, the second with warm clean water for rinsing, and the third with very hot water for sanitizing (disinfecting). Finally dry the utensils in air without the need for swabbing with a cloth to dry them. Swabbing may cross contaminate the utensils.
- Getting rid of flies, cockroaches, and rats
- Keeping cooked foods always properly covered if not immediately e

UNIT FIVE

TASK ANALYSIS FOR THE DEGREE TEAM MEMBERS

TABLE 5.1. KNOWLEDGE OBJECTIVES AND ACTIVITIES

No	Learning Objectives	Learning Activities			
		HO	NURSE	EHO/	MLT
1	To define food-borne diseases	Define food-borne diseases	Define food-borne diseases	Define food-borne diseases	Define food-borne diseases
2	To classify food-borne diseases	Classify food-borne diseases	Classify food-borne diseases	Classify food-borne diseases	Classify food-borne diseases
3	To describe the epidemiology of common food-borne diseases	Describe the magnitude of common food-borne diseases	Describe the magnitude of common food-borne diseases	Describe the magnitude of common food-borne diseases	Describe the magnitude of common food-borne diseases
4	To identify the etiologic agents of common food-borne diseases	Identify the etiologic agents of common food-borne diseases	Identify the etiologic agents of common food-borne diseases	Identify the etiologic agents of common food-borne diseases	Identify the etiologic agents of common food-borne diseases
5	To explain the pathogenesis of common food-borne diseases	Explain the pathogenesis of common food-borne diseases	Explain the pathogenesis of common food-borne diseases	Indicate the most important pathogenic factors for common food-borne diseases	Indicate the most important pathogenic factors for common food-borne diseases
6	To describe the clinical features of common food-borne diseases	Explain the clinical features and disease course of common food-borne diseases	Explain the clinical features and disease course of common food-borne diseases	List the major symptoms and signs of common food-borne diseases	List the major symptoms and signs of common food-borne diseases
7	To state the diagnostic methods for common food-borne diseases	Describe the diagnostic methods (clinical, laboratory, etc.) for common food-borne diseases	Describe the diagnostic methods (subjective and objective assessments) for common food-borne diseases	Mention the laboratory diagnostic methods of common food-borne diseases	Explain detailed laboratory diagnostic procedures for common food-borne diseases

TABLE 5.1. KNOWLEDGE OBJECTIVED AND ACTIVITIES (CONTINUED)

No	Learning Objectives	Learning Activities			
		HO	NURSE	EHO	MLT
8	To describe the management approach for common food-borne diseases	Describe the general and specific management measures for common food-borne diseases	Describe the nursing management approaches for common food-borne diseases	Describe the general management approaches for food-borne diseases	Describe the general management approaches for food-borne diseases
9	To explain the preventive and control measures for common food-borne diseases	Discuss the general and specific preventive and control measures for food-borne diseases	Discuss the general and specific preventive and control measures for food-borne diseases	Discuss the general and specific preventive and control measures for food-borne diseases Describe environmental measures used in prevention and control of food-borne diseases	Discuss the general preventive and control measures for food-borne diseases
10	Outline the steps in the investigation of food-borne disease outbreaks	Outline the steps in the investigation of food-borne disease outbreaks	Outline the steps in the investigation of food-borne disease outbreaks	Outline the steps in the investigation of food-borne disease outbreaks Identify the most common factors responsible for food-borne disease outbreaks List sample collection procedures for food-borne disease outbreaks	Outline the steps in the investigation of food-borne disease outbreaks Identify the laboratory procedures used for investigation of common food-borne disease outbreaks

TABLE 5.2. ATTITUDE OBJECTIVES AND ACTIVITIES

No	Learning Objectives	Learning Activities			
		HO	NURSE	EHO	MLT
1	Consider that food-borne diseases are a major public health problem	Recognize food borne diseases are one of the major public health problems in Ethiopia	Recognize food borne diseases are one of the major public health problems in Ethiopia	Recognize food borne diseases are one of the major public health problems in Ethiopia	Recognize food borne diseases are one of the major public health problems in Ethiopia
2	Believe that improper handling of food can result in food borne diseases.	Believe increasing public awareness improves food handling practices	Believe increasing public awareness improves food handling practices	Believe increasing public awareness improves food handling practices	Believe increasing public awareness improves food handling practices

TABLE 5.3. PRACTICE OBJECTIVES AND ACTIVITIES

No	Learning Objectives	Learning Activities			
		HO	NURSE	EHO	MLT
1	To identify a case of food borne disease	-Take appropriate history and carryout physical examination -request and interpret necessary laboratory tests	make a subjective and objective assessment, interpret the data and reach on specific diagnosis	-assess the environmental risk factors	

UNIT SIX

ABBREVIATIONS AND GLOSSARY

A. ABBREVIATIONS

BID	Bis In Die (twice a day)
CNS	Central Nervous System
ELISA	Enzyme-Linked ImmunoSorbent Assay
EPHTI	Ethiopia Pulbic Health Training Initiative
HACCP	Hazard Analysis and Critical Control Point
IM	Intramuscular
IV	Intravenous
KIA	Kliger Iron Agar
MIU	Motility Indole Urea
ORS	Oral Rehydration Salts
PO	Per Os (through the mouth)
PT	Prothrombin Time
PTT	Partial Thromboplastin Time
QID	Quater In Die (four times a day)
SC	Subcutaneous
TID	Ter in Die (three times a day)

B. GLOSSARY

Antidote: a drug or other substance that antagonizes or abolishes the effect of a poison or toxin.

Blanching: treating vegetables, etc. with heat, e.g. steam or boiling water, briefy before freezing; it inactivates enzymes altogether and reduces discoloration and nutrient loss

Canning: a process of preserving food by heating and sealing it in airtight container. The can is filled with food, and air is pumped out of the space remaining at the top of the can to form a vacuum. the container is sealed, heated in a cooker, and then cooled to prevent overcooking of the food inside. It is used to preserve a wide variety of foods, including soups, sauces, fruits, vegetables, juices, meats, fish, and some dairy products.

Cathartic: a substance that aids bowel movement by exciting intestinal waves (peristalsis), increasing the bulk of feces, making the feces soft, or adding slick fluid to the wall of the intestines.

Caustic substances: any substance that destroys living tissue, or causes burning or scarring, as silver nitrate, nitric acid, or sulfuric acid

Cholestasis: stasis or interruptio of the flow of bile through any part of the biliary system, within and from the liver to intestine

Cyanosis: bluish discoloration of the skin and mucous membranes from lack of oxygen

Defervescence: dropping or disappearance of a fever

Endotoxin: a toxin produced within a micro-organism and liberated when the micro-organism disintegrates.

Enterotoxin: an exotoxin that acts on the intestine

Epidemic: the occurrence of a disease or diseases with a greater than normal (usual) rate of occurrence in a population

Exotoxin: a toxin excreted by a microbe into the surrounding medium.

Hazard: a situation or thing that increases the chance of a loss from some danger that may cause injury or illness

Hazardous waste: solid, liquid, or gas wastes that can cause death, illness, or injury to people or destruction of the environment if improperly treated, stored, transported, or discarded. Substances are considered to be hazardous wastes if they are ignitable, orrosive, reactive, or toxic.

Hygiene: practices necessary for establishing and maintaining good health.

Intussesception: the sinking of one part of the bowel into the next, like a telescope effect.

Leukemioid reactions: an abnormal condition resembling leukemia in which the white blood cell count rises in response to an allergy, inflammatory disease, infection , poison, hemorrhage, burn or other causes of sever physical stress.

Mycotoxins: compounds or metabolites produced by a wide range of fungi that have toxic or other adverse effects on humans and animals

Outbreak: an epidemic referring to a more localized situation.

Pasteurization: the process of applying heat at certain degree for a specified period, usually immediately followed :

UNIT SEVEN

ANNEXES

ANNEX I: Answer Keys to Pre-Test and Post-Tests

I. Answer Keys to Pre-test and Post-test for All Degree Categories

1. The term “food borne disease” is defined as a disease usually either infections or toxic in nature, caused by agents that enter the body through the ingestion of food (1).

2 a. **Food borne infections:** are diseases whose etiologic agents are viable pathogenic organisms ingested with foods and that can

4. The extent of diagnostic evolution of food borne diseases can be based on history, clinical features, environmental assessment and laboratory investigations. If applicable, radiological examinations may be implemented.
5. Prevention and control of food–borne diseases, regardless of the specific cause, are based on the same principles:
   a. Avoidance of food contamination
   b. Destruction or prevention of contaminants
   c. Prevention of further spread or

II. Answer Keys to Pre-test and Post-test for Specific Categories of the Health Team

A. Health Officers

1. D
2. E
3. D
4. B
5. D
6. E

B. Nurses

1. C
2. C
3. D
4. A
5. B
6 .D
7. D
8 .C

C. Environmental Health Officers

1. D
2. C
3. E
4. B
5. E
6. B
7. E
8. -Official samples
   -Informal samples
   -Standard samples
   -Post-seizure samples
   -Documentary sampling.

D. Medical Laboratory Technologists

1. A
2. E
3. B
4. D
5. B
6. D
7. C

ANNEX II: Laboratory Identification of Causes of Food-Borne Diseases

Direct Examination of stool specimen

Direct microscopic examination of stool specimen with physiological saline and Dabell's iodine solutions

Procedure

1. Place a drop of physiological saline in the center of the left half of the slide and place a drop of Dobell's iodine solution in the center of the right half of the slide.
2. With an applicator stick, pick up a small portion of the feces (about 2mg which is as much as the size of a match

ANNEX III: Bacterial Food Infections and Poisonings

Incubation Period, Organisms	**Signs and Symptoms**
1 to 6 hours	
Staphylococcus aureus	Nausea, vomiting, diarrhea
Bacillus cereus	
8 to 16 hours	
Clostridium perfringens	Abdominal cramps, diarrhea, vomiting rare
Bacillus cereus	
More than 16 hours	
Enterotoxigenic *E.coli*	Watery diarrhea
V. cholerae	Watery diarrhea
Shigella spp.	Dysentery
Enterohemorrhagic *E. coli*	Dysentery
Salmonella spp.	Inflammatory diarrhea

The above table shows bacterial food Infections and poisonings with predominant gastrointestinal manifestations (Modified from Harrison's Principles of Internal Medicine, 15th Edition, 2001).

ANNEX IV: Gastrointestinal Pathogens Causing Acute Diarrhea

Mechanism	Location	Illness	Stool Findings	Examples Of Pathogens Involved
Non-Inflammatory (Enterotoxin)	Proximal small bowel	Watery diarrhea	No fecal leukocytes	*V. cholerae, Enterotoxigenic E. coli, Clostridium perfringenes, Bacillus cererus, Staph. aureus*, viral
Inflammatory (Invasion Or Cytotoxin)	Colon or distal small bowel	Dysentery or inflammatory diarrhea	Fecal polymorphnuclear leukocytes	*Shigella spp., Salmonella spp., Enterohemorrhagic E.coli, E. histolytica*
Penetrating	Distal small bowel	Enteric fever	Fecal mononuclear leukocytes	*Salmonella typhi*

The above table shows gastrointestinal pathogens causing acute diarrhea (modified from Harrison's Principles of Internal Medicine, 15th Edition, 2001)

No	Food-borne Disease	Antimicrobial Therapy

No	Food-borne Disease	Antimicrobial Therapy	
		Adults	**Children**
8	**Taeniasis**	Niclosamide 2 gram po stat May be repeated in 1 week if required.	<2 years: 500 mg po stat 2-8 years: 1 gram po stat 8 years: 1.5 gram po stat

B. Types of Hazards

Types of Hazards	Microbiological	Examples
Biological	Bacteria	*Clostridium botulinum* *Salmonella choleraesuis* *Salmonella paratyphic A-C* *Shigella dysenteriae* *Vibrio cholerae* *Salmonella spp.* *Enteropathogenic E. coli* *Listeria monocytoenes* *Bacillus cereus and other spp.* *Campylobacter jejuni* *Clostridium perfringens* *Staphylococcus aureus* *Vibrio parahemolyticus* *Aeromonas hydrophila*
	Viruses	*Norwalk and Norwalk-like viruses* *Rotavirus* *Hepatitis A virus*
	Parasites	*Anisikiasis simplex* *Ameba* *Giardia* *Taenia spp.* *Trichinella spiralis*
Chemical	Raw materials	Heavy metals Pesticide/Insecticide residues Antibiotic residues Histamine Toxins
	In the process	Refrigerants Lubricants/Hydrocarbons from the process Pest control agents Sanitizing agents Water additive Paints
	From packaging materials	Plasticizers Printing code inks Adhesives Lubricants
Physical	Natural materials	Bone Skin Connective tissue Contaminating ingredients
	Foreign bodies	Insect infestation Glass Metal Plastic Wood paper

C. Control Measures of Hazards

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