



UNIVERSITY OF SWAZILAND
Faculty of Health Sciences

DIPLOMA IN ENVIRONMENTAL HEALTH
FINAL EXAMINATION PAPER 2011

TITLE OF PAPER : INTRODUCTION TO FOOD MICROBIOLOGY
COURSE CODE : EHS 312
DURATION : 2 HOURS
MARKS : 100

INSTRUCTIONS : ANSWER ONLY FOUR QUESTIONS
: QUESTION ONE IS COMPULSORY
: EACH QUESTION CARRIES 25 MARKS.
: WRITE NEATLY
: BEGIN EACH QUESTION ON A SEPARATE SHEET OF PAPER.

DO NOT OPEN THIS QUESTION PAPER UNTIL PERMISSION IS GRANTED BY THE INVIGILATOR.

Question 1 [Compulsory]
Multiple Choice Questions
(Choose the Best Answer)

1. Which of the following statements is **not true**;
 - A. Botulinum toxin (E) may be destroyed at 80⁰C for 10-30min or boiling for 5-15min.
 - B. *Clostridium botulinum type (E)* will grow and produce toxin at 3.3⁰ C
 - C. *Clostridium botulinum type (C)* only causes botulism in fowls, cattle and other animals.
 - D. *Clostridium botulinum* is an aero-tolerant spore-forming gram positive microorganism
 - E. *Clostridium botulinum type E* is very common in Japan and mainly affect food of marine origin.

2. Which of these statements is **not true**?
 - A. *Escherichia coli* will ferment carbohydrates to produce lactic acid, acetic acid [CO₂ / H₂]
 - B. The toxins produced by *Enterotoxigenic E.coli* (ETEC) are similar or identical to Shigella toxins and therefore will produce shigella-like symptoms
 - C. *E.coli 0157: H7* is acid tolerant and therefore may survive and cause food borne illness in fruit juices and soft drinks
 - D. *Listeria monocytogenes* will colonize the intestinal tract and then invade the tissues including the placenta in pregnant mothers.
 - E. *L.monocytogenes* possess a bile-salt hydrolase enzyme that permits growth in the gall bladder

3. When a milking cow has consumed feedstuff containing AFB1 aflatoxin type, the resultant metabolites in milk will appear as;
 - A. AFB1 aflatoxin
 - B. AFM2 aflatoxins
 - C. AFG1 aflatoxins
 - D. AFB2 aflatoxins
 - E. AFM1 aflatoxins

4. *Thamnidium elegans* mold will attack and cause grayish to brown rot on;
 - A. Frozen and refrigerated meat
 - B. Cereals and cereal products
 - C. Chilled and refrigerated meat
 - D. Fruits and vegetables
 - E. Cheese and dairy products

5. Which statement is **not true** in relation to *Listeria monocytogenes*?
- A. Vegetative cells will invade the colonic epithelial cells, causing ulceration of the colon and resulting in bloody diarrhea
 - B. It can be a host to domestic and wild animals including fish, flies, ticks and crustacean
 - C. It can withstand repeated freezing and thawing
 - D. Poultry workers have been found to harbor high numbers
 - E. May cause bovine mastitis and bovine abortion
6. *Clostridium perfringens* foodborne illness is likely to be transported by which of the following vehicles.
- A. Potato salad
 - B. Meats served several hours or a day or so after cooking
 - C. Raw vegetables
 - D. Cooked vegetables
 - E. All of the above
7. The symptoms of *Clostridium perfringens* foodborne illness are largely;
- A. Nausea and vomiting
 - B. Abdominal pains and diarrhea
 - C. Chills and fever
 - D. Fever and headache
 - E. Dizziness and headache
8. Concerning Salmonella, all of the following are true **EXCEPT** that:
- A. It may produce serious systemic disease in humans
 - B. A carrier state exists in some who recover
 - C. Food animals do not serve as reservoirs
 - D. Animal feed is often contaminated, as cross-contamination occurs during processing
 - E. Animals kept in an enclosure and underfed
9. An outbreak characterized by nausea, vomiting and diarrhea which appears two to six hours after consumption of potato salad would lead you to suspect;
- A. Botulism
 - B. Shigellosis
 - C. Salmonellosis
 - D. Staphylococcal intoxication
 - E. Campylobacteriosis

- 10 General knowledge indicates that most foodborne illness is caused by:
- A. Viruses
 - B. Bacteria
 - C. Protozoan
 - D. Rickettsia
 - E. Molds
- 11 Assume that a culture of pathogenic bacteria was in a favorable food medium. Assume further that the food medium was ingested. Foodborne disease would be less likely if the culture were in the:
- A. Logarithmic phase
 - B. Stationary phase
 - C. Lag phase
 - D. Death phase
 - E. Late log phase
- 12 Under normal, comparable circumstances, which of the following would be expected to have the highest bacterial counts per gram?
- A. Dagwood
 - B. T-bone steak
 - C. Chicken drumstick
 - D. Cheese burger
 - E. A, B and C since it is meat
- 13 The most effective measure which a food service manager can apply in the control of bacterial multiplication in the storage, preparation and service of food is:
- A. pH control
 - B. Inventory control
 - C. Dishwashing control
 - D. Sanitation control
 - E. Time-temperature control
- 14 The chain of transmission for Salmonella may be:
- A. Humans to humans
 - B. Humans to animals
 - C. Animals to animals
 - D. Animals to humans
 - E. Any of the above

- 15 Outbreaks of *Clostridium perfringens* foodborne illness are associated with all of the following circumstances **EXCEPT**:
- A. Poor time-temperature control in the handling of cooked meat
 - B. Recontamination of cooked meat by food preparation equipment.
 - C. Sanitary care of utensils, equipment, and workers hands
 - D. Poor sanitation of food preparation utensils
 - E. Inadequate reheating of foods
- 16 If a microorganism has a minimal growth temperature of 0 deg C, its maximal growth temperature is 20 deg C, and its optimal growth temperature is 15 deg C, it is classified as a;
- A. Facultative psychrophile
 - B. Mesophile
 - C. Psychrophile
 - D. Psychrotroph
 - E. Thermophile
- 17 If a microorganism has a maximal growth temperature of 35 deg C, a minimal growth temperature is 5 deg C and its optimal growth temperature is 30 deg C, it is classified as a/an;
- A. Facultative psychrophile
 - B. Mesophile
 - C. Psychrophile
 - D. Psychrotroph
 - E. Thermophile
- 18 The bacterial growth curve consists of components in the following sequence;
- A. Decline phase, stationary phase, exponential phase, and lag phase
 - B. Lag phase, exponential phase, stationary phase and decline phase
 - C. Lag phase, stationary phase, exponential phase, and decline phase
 - D. Stationary phase, exponential phase, decline phase
 - E. Stationary phase, exponential phase, lag phase and decline phase
- 19 Mycotoxins are produced during the
- A. Lag phase
 - B. Decline phase
 - C. Logarithmic phase
 - D. Stationary phase
 - E. Exponential phase

20. Spoilage of jams that is characterized by gas bubbles is probably caused by;
- A. *Clostridium perfringens*
 - B. Micrococci
 - C. Molds
 - D. Coliforms
 - E. Yeasts
21. Which of these organisms grows at the lowest Aw?
- A. *Clostridium botulinum type A*
 - B. *Clostridium perfringens*
 - C. Salmonella
 - D. *Staphylococcus aureus*
 - E. *Vibrio parahaemolyticus*
22. An organism that is unable to grow in a salt-free medium is known as;
- A. a halophile
 - B. an osmophile
 - C. a salophile
 - D. a sucrophile
 - E. a xerophile
23. Salmonella which reaches humans via food is most frequently reservoir in;
- A. rats
 - B. poultry
 - C. swine
 - D. cattle
 - E. sheep
24. Which of these statements is not true?
- A. Nonproteolytic strains of *Clostridium botulinum* prefer carbohydrates for optimum growth and will spoil food by fermentation
 - B. *Escherichia coli* will ferment carbohydrates to produce lactic acid, acetic acid and CO₂ / H₂
 - C. The toxins produced by *Enterotoxigenic E. coli* (ETEC) are similar or identical to Shigella toxins and therefore will produce shigella-like symptoms
 - D. *E. coli* 0157: H7 is acid tolerant and therefore will survive and cause food borne illness in fruit juices.
 - E. *Clostridium botulinum* spores are heat sensitive under acidic conditions

25. *Cladosporium herbarum* will attack and cause black spots on;
- A. Frozen red meat
 - B. Cereals and cereal products
 - C. Chilled and refrigerated meat
 - D. Fruits and vegetables
 - E. Bread and baked goods

[25 Marks]

Question 2

- a) Describe the differences in the chemical structure and function of cell structures between Gram-positive and Gram-negative bacteria. How does this help determine Gram characteristics of an unknown bacterial isolate? [10]
- b) List five measure sources of foodborne pathogens in foods and indicate the measures that should be implemented to reduce their incidence in foods. [15]

[25Marks]

Question 3

- a) Many vegetables are eaten raw. Discuss what microbiological concerns the consumer should have for these vegetables. [5]
- b) "Low-pH products, such as mayonnaise, can cause foodborne disease." Describe under what conditions this is possible. [5]
- c) Discuss four factors that could be associated with high incidence of foodborne gastroenteritis such as traveller's diarrhea in Swaziland? [10]
- d) Describe how bacterial toxins differs from mycotoxins. [5]

[25 Marks]

Question 4

- a) List and discuss key factors that differentiate foodborne caused by food intoxication and food infection. [5]
- b) Describe the symptoms of foodborne EHEC infection in human. [6]
- c) "Food of animal origin are more frequently associated with foodborne disease outbreaks". Justify or explain this statement. [10]
- d) Describe how foodborne botulism differs from infant botulism. [4]

[25 Marks]

Question 5

- a) Using illustrations explain synergistic growth, antagonistic growth and symbiotic growth of microorganisms in food. What are their advantages and disadvantages? [12]
- b) How does foodborne listeriosis differ from foodborne salmonellosis? [6]
- c) Discuss the factors that contribute to outbreaks of foodborne diseases. [7]

[25 Marks]