

INFECTION CONTROL I: MEDICAL ASEPSIS

OBJECTIVES/RATIONALE

Due to constant exposure to pathogens within the work environment, health care professionals must have an understanding of microorganisms and the chain of infection. The student will characterize the various microorganisms and determine effective ways to interrupt the chain of infection.

TEKS: 121.23 (c) 3A, 5C, 6A, 4C

TAKS ELA 1, 3, 4, 5, 6
Science 2

KEY POINTS

- I. Microorganisms
 - A. Comes from Micro = small and organism = body
 - B. Cannot be seen with the naked eye, only under the microscope
 - C. Are found everywhere, both inside and outside the body
 - 1. Within the body
 - a. found in the mouth
 - b. in various body systems
 - c. on our skin
 - 2. Live in communities called colonies
 - 3. Some microorganisms capable of causing disease – referred to as pathogens
 - 4. Some microorganisms essential for maintaining health or have no harmful effect on the body – referred to as nonpathogens
 - 5. Colonies of nonpathogens in the body constitute what is known as normal body flora
 - 6. Flora not the same in all body areas, e.g. normal flora in the intestines is different from the normal flora of the skin.
 - 7. Nonpathogens misplaced to another part of the body can become pathogens; e.g. intestinal flora entering the urinary bladder can cause a urinary tract infection.
 - 8. Infections that are acquired in the hospital are called nosocomial infections.
- I. Characterization of microbes
 - A. Shape and how they congregate (are arranged) together
 - 1. Round, rod-shaped, spiral, irregularly shaped.
 - 2. Found in single units, dyads, clusters, chains
 - 3. Can be single entity/cell capable of sustaining its own life, or made up of cell parts, i.e. DNA and requiring a host for existence.
 - B. Requirements for life
 - 1. Need for oxygen
 - a. aerobic
 - b. anaerobic
 - 2. Temperature requirements

- a. many pathogens grow best at body temperature
 - b. some microorganisms are killed by excess temperatures
 - c. some microorganisms are dormant at excess temperatures
 - 3. Light requirements
 - 4. Moisture requirements
 - 5. Food supply
- II. Action of microorganisms in causing disease
- A. A pathogen meets its requirements for life within the human body.
 - B. Depending on the organisms, it meets its own needs and also causes disease by
 - 1. Entering human cells and using them to reproduce.
 - a. Ultimately this attack destroys the human cell, but allows the proliferation of the microorganism
 - b. Example of this is the AIDS virus entering the lymphocytes
 - C. Producing substances that are poisonous to the body
 - 1. Poisons called toxins
 - 2. Example of this process is the disease botulism.
 - D. Entering the body as a foreign entity, reproducing and causing disease or response (inflammatory) within the body
 - 1. The body provides the requirements for proliferation.
 - 2. Does not necessarily require the human cell for existence.
- IV. When disease occurs the Infection cycle has been successfully completed.
- A. If a microorganism is pathogenic (capable of causing disease) all elements of the chain of infection must be present in order for disease or infection to occur.
 - B. Elements of infection chain
 - 1. Causative agent – microorganism producing disease
 - 2. Reservoir – the environment where a microorganism can survive
 - a. human carrier
 - b. animals
 - c. environment
 - d. fomites – inanimate objects that can transmit microorganisms
 - e. In health care setting, reservoir includes
 - 1. patient
 - 2. health care worker
 - 3. environment
 - 4. Portal of exit from reservoir – e.g. mouth, nose, secretions
 - 3. Method of transmission
 - a. direct contact – person to person, object (fomite) to person
 - b. Airborne – through the air
 - c. Droplet – transmitted through tiny drops of moisture
 - d. Vector - insect
 - 4. Portal of entry – e.g. mouth, nostrils, break in skin
 - 5. Host
 - C. Illustration of chain

The tuberculosis bacillus (causative agent) is located in the respiratory tract (reservoir) of the patient (host). The respiratory tract is also the Portal of Exit.

When the person coughs, airborne droplets (Transmission) carry the bacillus to the respiratory tract (Portal of Entrance) of the new potentially susceptible host.

- D. Three main factors determine whether the pathogen successfully causes infection
 - 1. susceptibility of the host
 - 2. amount of the pathogen.
 - 3. The presence of all elements of the infection chain
 - 4. A microorganism that takes advantage of the weakened state of the host is termed an opportunistic organism.
 - E. A disease that can be spread through the infection chain from one person to another is referred to as a communicable disease.
- III. Body Defenses to infection
- A. First line of defense
 - 1. Body parts and mechanisms that act to keep microorganisms out of body tissues and bloodstream. Interrupts the infection chain at the port of entry link
 - 2. Include
 - a. skin
 - b. mucus membranes
 - c. cilia
 - d. tears
 - e. coughing or sneezing
 - f. pH of body areas
 - B. Second line of defense
 - 1. Microorganisms gain entrance to the body
 - a. Body forms White Blood Cells that kill the invader by phagocytosis.
 - b. Interrupts the infection chain at the susceptible host link
 - C. Third line of defense – Immune response
 - 1. Organism multiplies rapidly and cannot be destroyed fast enough by phagocytosis
 - 2. A specialized white blood cell – lymphocyte forms antibodies
 - a. antibodies are tiny substances that attach to specific pathogens and inactivates or destroys them.
 - b. Another form of lymphocyte acts as a memory cell, remembering the pathogen over time, resisting further future infection.
 - c. This process of long-term protection is called immunity.
 - d. Antibodies are specific to disease.
 - e. Immunity does not prevent pathogens from entering the body, it prevents Pathogens from doing harm.
 - 3. Interrupts the infection chain at the susceptible host link.
 - D. Vaccination
 - 1. A small dose of killed or weakened microorganisms or similar substance that stimulates the third line of defense (immune response).
 - 2. Antibodies are produced.
 - 3. In time every encounter with the microorganisms will cause memory cells in the body to quickly produce antibodies. This is active immunity.

4. Antibodies can also be injected for some diseases, which gives immediate protection. This is passive immunity.
 5. Immunity can be life-long or short term, depending on the disease.
- IV. Medical asepsis as another means of fighting pathogens by breaking the disease chain.
- A. Referred to as clean technique
 - B. Practices that reduce possibility of disease by reducing the number of pathogens or interrupting their transmission
 1. Practices that reduce pathogens include
 - a. Interrupts chain at level of causative agent and reservoir
 - b. Handwashing – the single most effective and important way to prevent spread of microorganisms
 1. occurs through friction – loosening the microorganisms so they can be removed
 2. Use of antiseptic soap – killing numbers of microorganisms
 - c. Use of disinfectants and antiseptics on people and objects
 1. disinfectant – substance that reduces the number of microorganisms, but does not eliminate them.
 2. Antiseptic – substance that can be applied to skin to reduce the number of microorganisms.
 2. Practices that interrupt transmission
 - a. Interrupts chain at level of portal of exit, transmission, and portal of entry
 - b. Use of personal protective equipment
 1. latex gloves
 2. gowns
 3. mask, goggles
 4. equipment i.e. one-way valves
 - c. Use of isolation procedures
 3. Antibiotics can also interrupt the infection cycle. These are medications that kill many types of bacteria.
- V. Classification of microbes (to be done by students)
- A. Bacteria
 1. Considered plants
 2. Named according to shape
 - a. Coccus (cocci, plural) – circular
 - b. bacillus (bacilli, plural) – rod-shaped
 - c. spirillum (spirilla, plural) – spiral shaped
 3. Also named according to arrangement
 - a. diplo – two
 - b. strepto – chains
 - c. staphylo – clusters
 4. Example: streptococcus hemolyticus – circular chains that cause sore throats

Example: staphylococcus aureus – circular clusters which cause wound infections, boils, and toxic shock.

5. In lab tests some bacteria stain pink in test called gram stain – referred to as gram negative.
Some stain blue in gram stain – referred to as gram positive.
 6. Some diseases caused by bacteria are some pneumonias, sore throats, Tuberculosis
 7. Treated with antibiotics
- B. Protozoa
1. Considered to be animals
 2. Usually parasites – something that lives off another
 3. Common diseases caused by protozoa are amoebic dysentery, malaria
- C. Fungus
1. Two groups of fungi associated with infections in humans
 - a. yeast – diseases are thrush, monilial vaginitis
 - b. mold – ring worm, athlete’s foot
 2. Both groups are opportunistic parasites – take opportunity to invade when human is run-down and unable to fight infection.
 3. Treated with anti-fungal agents
- D. Rickettsiae
1. Microorganisms that like a virus require the human cell to live and proliferate.
 2. Diseases caused by rickettsiae are Rocky Mountain spotted Fever and Lymes disease
- E. Viruses
1. smallest of microorganisms
 2. depends of host cell for reproduction. Is not alive per se until enters cell.
 3. It is essentially DNA that uses the cell to complete itself.
 4. No treatment for viruses
 5. Diseases caused by viruses include chickenpox, measles, German measles, influenza, shingles, AIDS, etc.
- F. Helminths
1. worms i.e. pinworms, flatworms, roundworms
 2. Treated with specific anti-helminth agents

ACTIVITIES

- I. Define the Infection Control Terminology and make flash cards of each term. See Infection Control Terminology.
- II. Develop multimedia PowerPoint presentation of microorganisms. See Guidelines for Microorganism Presentation.

Teacher Note: Divide the class into 6 groups and assign each group one of the classifications of microorganisms covered in the lesson plan. Give each a Guideline for Microorganism Presentation. Also each student is to receive a Microorganism Chart for use as a note-taking tool during the presentation by each group.

III. Practice proper handwashing, having a peer complete Check 1.

MATERIALS NEEDED

PC with PowerPoint

Internet access

Have following for demonstration and practice:

Latex gloves

Protective gown

Mask

One-way valves

Goggles

Infection Control Terminology sheet

Handwashing Skill Checklist

Infection Control Medical Asepsis Objective Test

Sorrentino, Sheila A. *Mosby's Textbook for Nursing Assistants, 5th edition*. St. Louis, Mosby Year Book, 1999.

www.accessexcellence.org

Good source of science ideas. Specific area on health that can be accessed, including a fun quiz on diseases.

www.findarticles.com

Good source for finding articles of any nature. Simply type in the topic you wish to search

Video – “SUPERBUGS: When Antibiotics Don’t work” – Films for the Humanities –

www.films.com

ASSESSMENT

Successful completion of Handwashing Check 1

Successful completion of Medical Asepsis Objective Test

Multimedia Rubric

ACCOMMODATIONS

For reinforcement, the student will make a poster or mobile of the infection chain, identifying specific classifications of causative agents, specific portals of exit, modes of transmission, and portals of entry.

For enrichment, the student will research a disease process of interest and write a paper using the infection chain as an outline. Evaluation: Writing Rubric.

REFLECTIONS

GUIDEDLINES FOR MICROORGANISMS PRESENTATION

Use the Internet as a resource. After finding the information required, develop a PowerPoint Presentation including this information.

Duration of presentation: 7 – 10 minutes maximum time limit.

1. Name the category of microorganism that has been assigned to you.
2. Give identifying characteristics of the category of microorganism.
3. Indicate how the microorganism reproduces.
4. State specific microorganisms in your category.
5. State whether the specific microorganisms are pathogens or nonpathogens.
 - a. If pathogens, state the disease(s) that are caused by the pathogen.
 - b. Discuss how the microorganism causes the illness, i.e. toxin, entering human cells, etc.
 - c. Indicate the requirements for life, i.e. oxygen, moisture, temperature, etc.
 - c. Give current information regarding treatment of diseases and (if applicable) mutating strains of microorganisms.
6. For one of the specific pathogenic microorganisms, develop an infection chain, starting with the causative agent, and progressing through to the susceptible host.
7. Determine ways that the chain can be interrupted and the infectious process stopped for this microorganism.
8. Include a Bibliography.

Assessment will be made using the Multimedia Presentation Rubric and also the Member of a Team Rubric.

SKILL #1: HANDWASHING/PROCEDURE GUIDELINE

Adapted from the Texas Department of Human Resources Nurse Aide Curriculum.

Students failing to complete Check 1 with a peer will automatically receive a 0 for the Check 2 Assessment. The initials of the peer performing the check must appear above the Check 1 column.

PROCEDURE	POSSIBLE POINTS	CHECK 1	CHECK 2
1. Remove jewelry.	2	_____	_____
2. Turn on faucet with paper towel, adjust temperature.	2	_____	_____
3. Wet hands and wrists thoroughly with fingertips pointing down.	3	_____	_____
4. Apply skin cleanser or soap to hands to get lather.	2	_____	_____
5. Rub all surfaces of hands together for a MINIMUM OF 20 SECONDS.	2	_____	_____
6. WASH ALL SURFACES OF HANDS AND AT LEAST UP TO THE WRISTS.	2	_____	_____
7. Rinse hands thoroughly with fingertips pointing downward.	2	_____	_____
8. Dry hands thoroughly from tips of fingers to wrists.	2	_____	_____
9. Turn faucet off with paper towel.	2	_____	_____
10. Discard wet towel appropriately.	2	_____	_____
11. Apply lotion if appropriate.	2	_____	_____
12. Student did not lean against sink, touch inside of sink or faucet handles during procedure.	3	_____	_____

TOTAL POSSIBLE POINTS: 26

TOTAL POINTS EARNED: _____

INFECTION CONTROL TERMINOLOGY

Protozoa
Fungi
Bacteria
Rickettsiae
Virus
Aerobe
Anaerobe
Bacteriology
Microbiology
Microorganism
Mold
Parasite
Sanitation
Germicide
Bacteriocide
Antiseptic
Bacteriostasis
Aseptic
Septic
Contamination
Decontamination
Disinfectant
Sterilization
Virulence
Nosocomial Infection
Myco-
Morpho-
-osis
Virology
Opportunistic Infection
Vector
Fomite
Sterile Field
Pathogen
Nonpathogen
Transmission
Immunity
Antibody
Antibiotic
Reservoir
Phagocytosis
PH
Medical Asepsis
Surgical Asepsis

Mycology
Morphology
Mycosis

UNIT TEST: INFECTION CONTROL/MEDICAL ASEPSIS

NAME: _____

Multiple Choice: For each of the following, select the best answer and write the letter on your answer sheet.

1. Microorganisms that can only live and grow in the presence of oxygen.
 - a. anaerobe
 - b. pathogen
 - c. aerobe
 - d. mold

2. An infection that is acquired in the hospital is called a(n) _____ infection.
 - a. parasite
 - b. pathogen
 - c. nosocomial
 - d. anaerobic

3. A minute living body not visible to the naked eye.
 - a. microorganism
 - b. spore
 - c. anaerobe
 - d. aerobe

4. Microorganisms that only lives and grows without oxygen.
 - a. spore
 - b. anaerobe
 - c. aerobe
 - d. pathogen

5. The study of bacteria is called
 - a. virology
 - b. bacteriology
 - c. morphology
 - d. mycology

6. The study of microorganisms is called
 - a. virology
 - b. bacteriology
 - c. microbiology
 - d. mycology

7. A disease-causing microorganism is a(n)
 - a. nonpathogen
 - b. pathogen
 - c. anaerobe
 - d. aerobe

8. A microorganism that causes infection when given the opportunity by the altered weakened state of the host.
 - a. parasite
 - b. opportunistic microorganism
 - c. pathogen
 - d. flagellum

9. The study of fungus
 - a. mycology
 - b. mycosis
 - c. morphology
 - d. microorganism

10. Any condition caused by a fungus.
 - a. mycology
 - b. mycosis
 - c. morphology
 - d. microorganism

11. The study of viruses
 - a. mycology
 - b. virology
 - c. bacteriology
 - d. microbiology

12. A rod or cylinder shaped bacteria that appears in chains is called a
 - a. diplococci
 - b. streptobacilli
 - c. spirillum
 - d. diplobacilli

13. Sphere or round forms of bacteria that arrange themselves in grapelike clusters.
 - a. streptococci
 - b. staphylococci
 - c. diplococci
 - d. spirillum

14. Sphere or round bacteria that appear in pairs.
- streptococci
 - staphylococci
 - diplococci
 - spirillum
15. Longer, flexible, motile spiral bacteria are called
- streptococci
 - spirillum
 - streptobacilli
 - diplobacilli
16. An inanimate contaminated object that can transmit disease is called a(n)
- fomite
 - vector
 - anaerobe
 - aerobe
17. Contact with pathogens is known as
- sanitation
 - bacteriostasis
 - contamination
 - asepsis
18. The process of destroying all microorganisms, including spores, is known as
- asepsis
 - sterilization
 - sepsis
 - bacteriostasis
19. The condition where the growth of bacteria has been stopped, but under the right circumstances could begin growing again is called
- bacteriocidal
 - bacteriostasis
 - disinfection
 - asepsis
20. A substance that can destroy fungi is called a(n)
- bactericide
 - fungicide
 - germicide
 - antiseptic

21. Tears and sneezing are examples of
- the first line of defense
 - the second line of defense
 - a reservoir
 - the third line of defense
22. An example of a reservoir is
- a human
 - a fomite
 - a host
 - all of the above
23. A person sneezing when they have a cold is transmission by
- droplet
 - air
 - contact
24. –25. Wearing gloves in the hospital environment interrupts the chain of infection at the _____ and _____ levels.
- host
 - reservoir
 - transmission
 - portal of exit and entrance
26. If an individual receives an injection of antibodies, this is known as
- first line of defense
 - third line of defense
 - active immunity
 - passive immunity
27. If an individual receives a small dose of killed or weakened microorganisms in order to produce antibodies, this is known as
- first line of defense
 - third line of defense
 - active immunity
 - passive immunity

True/False: For each of the following, write either true or false in the space on your answer sheet.

28. All bacteria must have some oxygen to live.
29. Moisture delays the growth of bacteria.
30. Viruses are the smallest organism known and can only be seen with the aid of an electron microscope.

31. Viruses that affect humans can multiply outside of the human body.
32. The second line of defense is the skin.
33. The second line of defense involves White Blood Cells that kill by the process of phagocytosis.
34. The third line of defense is the formation of antibodies.
35. The single best way to prevent transmission of pathogens is by washing hands.

Matching: For each of the definitions on the left, write the letter of the microorganism best described on your answer sheet.

- | | |
|--|----------------|
| 36. Low form of plant life lacking chlorophyll that exist on dead or living matter. | a. fungi |
| 37. Organisms that are smaller than bacteria, but larger than viruses. Like viruses, they only grow within the cells of a living host. | b. bacteria |
| 38. Single-celled animals capable of movement by various means. | c. protozoa |
| 39. Single-celled organisms that are considered to be microscopic colorless plants. | d. rickettsiae |
| 40. Organisms that cannot grow or reproduce until they have taken over a living cell. | e. viruses |

41. - 45. Select the five major classes of microorganisms by placing the letter of each one selected in the appropriate blanks on your answer sheet.

- | | |
|----------------|-------------|
| a. Cocci | f. Bacilli |
| b. Spirillae | g. Protozoa |
| c. Viruses | h. Molds |
| d. Rickettsiae | i. Bacteria |
| e. Fungi | |

KEY: MEDICAL ASEPSIS

1. c
2. c
3. a
4. b
5. b
6. c
7. b
8. b
9. a
10. b
11. b
12. b
13. b
14. c
15. b
16. a
17. c
18. b
19. b
20. b
21. a
22. d
23. a
24. c
25. d
26. d
27. c
28. F
29. F
30. T
31. F
32. F
33. T
34. T
35. T
36. a
37. d
38. c
39. b
40. e
41. c
42. d
43. e
44. g
45. i