Unit Four - Safe and Sound

Principles of Infection - Student Lecture Guide

Name_____Date_____

Principles of Infection

■Understanding the basic principles of infection is essential for any health care worker in any field of health care.

■Prevention of disease transmission

Nature of Microorganisms

■Microorganisms (microbes) are small, living organisms that are not visible to the naked eye.

■Pathogens (germs) are microorganisms that cause disease.

■Non-pathogens are microorganisms that do not cause disease; can be beneficial.

Nature of Microorganisms

■At times, a microorganism that is beneficial in one body system can become pathogenic when it is present in another body system.

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»Large intestine: beneficial, part of the natural flora.

»Urinary system: causes an infection.

Non-Pathogens

■Some microorganisms can be beneficial in other kinds of environments:

–Support the production of bread, cheese, yogurt, beer, and several other foods and beverages.

–Contribute to the health of soil for farming.

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Types of Microorganisms

■Bacteria

–Simple, one-celled microorganisms that are classified according to their shape and arrangement.

–Cause diseases such as strep throat, pneumonia, meningitis and tuberculosis.

Types of Microorganisms

■Bacteria, cont. . . .

–Antibiotics are used to kill bacteria – however some strains have become resistant.

–Less than 1% of bacteria are harmful.

–There are more bacteria in our mouths than humans living on the planet.

■ Streptococci (chains)
■ Staphylococci (clusters)
■ Diplococci (pairs)
■ Micrococci (tiny)
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■ Bacilli (rod-shaped)
■ Vibrios
■ Spirilla (spiral)
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Types of Microorganisms

■Fungi

–A plantlike organism that lives on dead organic matter.

–Yeasts and molds can be pathogenic.

–Cause conditions such as ringworm, athlete's foot, yeast infections, and thrush.

–Antibiotics do not kill fungi. Antifungal medications are available, but expensive and may cause liver damage.

Types of Microorganisms

■Protozoa

–One-celled animal like organisms often found in decayed materials and contaminated water.

–Many contain flagella which allow them to move freely.

–Cause diseases such as malaria, trichomonas, and amebic dysentery.

Types of Microorganisms

■Rickettsiae

–Parasites that live inside the cells of other living organisms.

–Commonly found in fleas, lice, ticks, and mites and are transmitted to humans by the bites of these insects.

–Cause diseases such as Rocky Mountain spotted fever and typhus fever.

–Antibiotics are effective against many different rickettsiae.

Types of Microorganisms

■Viruses

–Smallest of all microorganisms – visible only using an electron microscope.

–Cannot reproduce unless they are inside another living cell.

–Spread by contact with blood and other body fluids.

–Difficult to destroy. Not affected by antibiotics.

–Associated with diseases such as the common cold, chicken pox, herpes, hepatitis B, measles, warts, polio, influenza, and AIDS.

Viruses

■Three viruses are of major concern to the health care worker:

–Hepatitis B – leads to destruction and scarring of liver cells. Vaccine is available.

–Hepatitis C – also causes serious liver damage. No vaccine. Often misdiagnosed as the flu.

–AIDS/HIV – suppresses the immune system. No cure and no vaccine.

Factors That Influence Microbial Growth

■Following factors influence microbial growth:

–Temperature

–pH, or the values used in chemistry to express the degrees of acidity or alkalinity of a substance

–Darkness

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–Moisture

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Factors That Influence Microbial Growth

■Aerobic microbes – live only in the presence of oxygen.

■Anaerobic microbes – grow best in the absence of oxygen.

Causing an Infection

■Pathogenic microorganisms cause infection and disease in different ways.

–Produce poisons (toxins) which harm the body. Ex: Tetanus.

–Allergic reaction in the body causing runny nose, watery eyes, sneezing.

–Attack and destroy the living cells they invade. Ex: Malaria (rbc's).

Causing an Infection

■Endogenous – disease originates within the body. Ex: metabolic disorders, congenital abnormalities, tumors.

■Exogenous – disease originates outside the body. Ex: chemical agents, electrical shock, trauma.

■Nosocomial – acquired by an individual in a health care facility (workers to patient).

–Many are antibiotic resistant, life-threatening.

■Opportunistic – occur when the body's defenses are weak. Ex: pneumonia w/AIDs.

Causing an Infection
■In order for disease to occur and spread from one individual to another, certain conditions must be met.
■If any one condition is not met, the transmission of the disease will not happen.
■Pathogens are everywhere and preventing their transmission is a continuous process.

Chain of Infection
■Chain of infection contains six elements. If broken, infection will not occur.

Chain of Infection
■Infectious Agent – pathogen such as a bacteria or virus.
■Reservoir – a place the pathogen can live.
–Examples: human body, animals, the environment, fomites.
–Fomites are objects contaminated with infectious material that contains pathogens.
»Ex: doorknobs, bedpans, linens, instruments.

Chain of Infection
■Portal of Exit – way to escape from the reservoir in which it has been growing.
–Urine
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–Saliva
–Respiratory tract
–Skin
–Blood
–Gastrointestinal tract
–Mucous discharge
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Chain of Infection
■Mode of Transmission – way in which it can be transmitted to another reservoir or host where it can live.
–Can be through direct contact or airborne droplet.
–Contaminated hands are one of the most common sources of direct transmissions.
»Hand washing is one of the most effective means of preventing the spread of pathogens.

Chain of Infection
■Portal of Entry – way to enter the new reservoir or host.
–Respiratory tract, mucous membranes, and gastrointestinal tract are common.
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Chain of Infection
■Susceptible Host – one that is capable of being infected.
–Microorganisms must be present in large enough quantity to be virulent.
–The host must be susceptible.
–Individuals with an immunity to certain pathogens will not be susceptible.

Body Defenses
■If defense mechanisms are intact and the immune system is functioning, a human can frequently fight off the causative agent and not contract the disease.
–Mucous membranes (traps pathogens)
–Cilia (propel pathogens out of respiratory tract)
–Coughing and sneezing
–Hydrochloric acid (stomach)
–Tears in the eyes (contain bacteriocidal chemicals)
–Fever
–Inflammation (wbc's destroy pathogens)
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Signs & Symptoms of Infection
■ Redness
■ Swelling
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■ Warmth
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■ Red streaks leading away from wound