

What is an infection? Taber's Cyclopedic Medical Dictionary defines infection as:
" the presence and growth of a microorganism that produces tissue death."
It is the presence of certain microorganisms which predispose us to the possibility of an infection.

As humans, we and our animal friends, domestic or otherwise, are continuously exposed to a variety of extremely small life forms known as microorganisms or microbes. These microbes are everywhere. They are in the air we breathe, on the food we eat, on the clothes we wear, they are on our skin and even inside our mouth and intestines.

What are microbes? Microbes are living structures which manifest traits similar to animals or plants; however, one class, viruses, are neither animal nor plant. Viruses are formed from strains of living material, **RNA** and **DNA** encased in protein. Whatever traits microorganisms exhibit, all require a microscope or electron microscope to be seen.

Some microbes are harmful to both humans and animals. Fortunately, not all are harmful. In fact, certain microbes actually assist humans and animals in maintaining a particular body process. For instance, in the digestive system of humans and animals, there lives a class of microorganisms responsible for breaking down undigested food, and producing specific vitamins. These microbes are considered beneficial microorganisms or "nonpathogenic"; that is, they do not cause infection or disease. Microbes are also found living on the skin, in the urinary and respiratory tract. Still, a few microorganisms do bring about harm by causing disease or infection. An infection can occur when a **harmful microorganism** (pathogen) or germ invades a human or animal. This human or animal becomes the microbe's host. Once inside the host's body, the pathogen can occupy and take over cellular or specific body functions. This occupation often results in cell, tissue or system damage and in some cases death to the host. Whether the pathogen's host develops an infection or disease depends upon two factors: the host's immune system's ability to defend itself through containment or destruction of the microbe and the virulence of the microorganism. Virulence refers to the disease-producing power of the pathogen.

2 How do germs cause infections and make us sick? Effects of the microbe on the host vary greatly depending on the specific pathogen. Pathogens may bring about disease or infection in different ways. Microorganisms, such as bacteria, produce harmful chemicals or poisons called *toxins*. These toxins inflict damage to cells, tissues, or body functions. By way of illustration, have you ever had a sore throat? If so, it may have been caused by the bacteria *Streptococcus A*. These same bacteria can also produce a toxin, capable of rotting away your flesh. In medical circles, it is referred to as " the flesh-eating bacteria". Others trigger the body's immune system to react violently, producing allergic reactions, such as skin rash, runny nose, and shortness of breath. Still other pathogens such as viruses attack and destroy the cells they invade. The human immunodeficiency virus (HIV), the virus that causes AIDS, attacks and destroys the body's T white blood cell. Damage to T cells impairs the immune system's ability to fight off other diseases or infections. Certain germs may suppress the immune system's ability to produce antibodies. Antibodies are substances produced by the immune system which seek out pathogens. Once found antibodies attach to the pathogen's surface destroying or rendering it useless. Some pathogens produce substances, which prevent antibodies from attaching to their surface. Regardless of how germs affect the host, the results

3 Five classes of microorganisms exist. In each class, some microorganisms

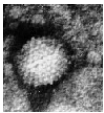
cause disease or infections. These are the pathogenic microorganisms (germs). The main classes are:

Bacteria -simple one-cell plant-like structures that multiply rapidly and are classified according to shape and arrangement. Diseases caused by bacteria include boils, toxic shock, tuberculosis, syphilis and botulism.

Protozoa - these are one-cell animals found living on decayed materials and in contaminated water. Diseases caused by protozoa include malaria, and amebic dysentery.

Fungi - simple plant-like structures that live on dead organic materials. Examples of infections caused by fungi include ringworm, thrush and athlete's foot.

Rickettsia - (ri ket' se é) these are parasitic organisms requiring a host to live. Similar to bacteria but smaller, they reproduce inside their host, which includes fleas, ticks, lice and mites. They are spread to humans through the bites of their host. Diseases include Lyme disease and Rocky Mountain Spotted Fever.



Viruses - the smallest of all microorganisms and visible only with the aid of an electron microscope. Viruses cannot reproduce without the aid of a living host cell. Viruses are spread through blood, vaginal secretions, semen and other body fluids. Diseases caused by viruses include the common cold, HIV and AIDS, chickenpox, warts, Hepatitis, Mumps and Measles.

What do pathogens need to grow and reproduce? To grow and reproduce, pathogens require a source of food, as well as a warm, moist and dark environment. Some pathogens may need oxygen. Unfortunately, for humans, our bodies are the ideal breeding environment for pathogens. On the inside, the human body is warm, (98.6° F) moist, dark and has an abundant source of cells and tissues, food for pathogens.

- a. *of transmission* includes the spread of infections through eating or drinking contaminated foods, water or beverages, touching contaminated materials or objects containing a pathogen such as soil, clothes, bed linens, personal care products and personal care equipment, utensils, pets, equipment or feces, or any other inanimate object. In a healthcare setting indirect contact occurs when there is a personal contact with contaminated equipment, instruments, soiled dressings or laundry or any other contaminated objects. One of the most common indirect means of transmission is a stethoscope contaminated with an infectious microbe.
- b. **Droplet contact** can occur when an infected person coughs, sneezes or talks within three feet of another. Water droplets spread by the infected person come in contact with the nose, mouth or eyes of the uninfected person.

Pathogens can also be spread through the **vehicle** route, such as the spread of hepatitis through contaminated blood.

A third route of transmission is **airborne**. Infections from this route occur when an individual inhales or contacts a pathogen that has been suspended in the air or dust by an infected person who has coughed, sneezed, laughed, or talked. The suspended microbe enters the respiratory tract when the person inhales the contaminated air. The common cold and the flu are often transmitted this way. Additionally, this is how the mycobacterium tuberculosis is spread. Because airborne pathogens spread quickly, they may be responsible for large epidemics among susceptible people. The fourth route of transmission is **vectorborne**. Insects such as fleas, ticks or mosquitoes carry the pathogen and pass them on when they bite an unsuspecting potential host.

Aseptic Control Healthcare workers are expected to follow various policies and procedures aimed at breaking the links in the chain of infection. Specific strategies

are employed to break or block the transmission of infections between links. A few of these strategies are shown in the table that follows.

Reservoirs	• Employee health examinations and screening • Environmental sanitization including floors, walls, exam tables and beds • Disinfection/Sterilization of equipment and instruments • Standard Precautions • Medical Asepsis • Proper Hygiene - bathing and hand washing • Clean gowns, linens and towels • Clean wound dressings
Portal of Exit	• Hand washing • Use of Personal Protective Equipment such as gloves, gowns, facemask, N95 or HEPA mask etc. • Clean dressings over wounds • Medical Asepsis or Clean Technique • Control of excretions and secretions • Covering the mouth and nose when coughing or sneezing • Proper trash and waste disposal • Standard Precautions
Method or Mode of Transmission	• Hand washing • Standard Precautions • Rooms with air flow control • Safe Food handling • Isolation • Transmission-based precautions • Sterilization of equipment and supplies • Medical and Surgical Asepsis • Use of Personal Protective Equipment such as gloves, gowns, facemask, N95 or HEPA mask etc. • Proper disposal of contaminated objects
Portal of Entry	• Aseptic technique • Sterile technique or Surgical Asepsis

	• Medical Asepsis or Clean Technique • Catheter Care • Wound care • Proper Disposal of needles or sharps • Maintaining skin integrity • Standard Precautions
Susceptible Host	• Treatment of Disease

One of the more important methods for breaking the chain of infection is asepsis.

Asepsis is defined as a condition in which pathogens are absent or controlled. Aseptic practices break the chain of infection by preventing the transmission of pathogens. There are three levels of aseptic control.

Antisepsis/Sanitation method of infection control includes using soap and water to wash the hands and body as well as the use of antiseptics such as alcohol, iodine and betadine to clean the skin for medical procedures, as these inhibit the growth of pathogenic microorganisms. This level of asepsis may kill or inhibit some microbes but is generally not effective against viruses and spores.



Disinfection is the process of using chemical agents or boiling water to destroy or kill pathogenic microbes. These agents are not always effective against viruses and spores. Further, disinfectants are often harsh and may irritate or damage the skin so they are mainly used on surfaces, equipment and instruments. Common disinfectants include Clorox bleach solutions, Lysol, and pinesol products. In the health care environment a variety of commercial disinfectants are used.

Sterilization is the only level of asepsis that kills all microbes both pathogenic and nonpathogenic. It is the method used by all health care facilities and includes the use of gas, chemicals, steam under pressure and radiation. Sterilization is mainly used on medical instruments and equipment, surgical dressings, gowns etc.

Infection control is ongoing as pathogens freely abound. Prevention of infectious diseases hinges on the continuous practice of appropriate aseptic



procedures or practice. Strict adherence to aseptic practices is the only way to prevent the spread and transmission of infectious diseases. Indeed, it is the responsibility of each and every person to frequently wash their hands with soap and water, cover their mouth and nose when they sneeze or cough and isolate themselves from others when they are sick. These practices, as well as others, will stop the spread of infections. Infection control and prevention begins with the individual.

Medical VS Surgical Asepsis

Medical Asepsis or Clean Technique is based on maintaining cleanliness to prevent the spread of pathogenic microorganisms and to ensure that the environment is as free of microbes as possible. Medical asepsis involves confining microbes to specific areas and rendering objects as either clean or dirty.

Medical Asepsis – Basic Principles

The basic principles of Medical Asepsis include:

- a. Wash hands frequently, but especially before handling foods, before eating, after using a handkerchief, after going to the toilet, before and after each client contact, and after removing gloves
- b. Keep soiled items and equipment from touching the clothing
- c. Do not place soiled bed linen or any other items onto the floor
- d. Avoid having client's cough, sneeze, or breath directly on others
- e. Move equipment away from you when brushing, dusting, or scrubbing articles
- f. Avoid raising dust
- g. Clean the least soiled areas first then more soiled ones
- h. Dispose of soiled or used items directly into appropriate containers
- i. Pour liquids that are to be discarded directly into the drain so as to avoid splattering in the sink and onto you
- j. Avoid leaning against sinks, supplies or equipment
- k. Avoid touching your eyes, face, nose or mouth
- l. Use practices of personal grooming that help prevent spreading microorganisms
- m. Follow guidelines conscientiously for isolation or barrier techniques as prescribed by your agency

Surgical Asepsis – Basic Principles

Surgical Asepsis also known as Sterile Technique requires strict adherence to ordered and specific procedures which render an area free from all microorganisms including spores. An object or area is described as being sterile or not sterile. Basic principles of Surgical Asepsis include:

- a. Only a sterile object can touch another sterile object

- b. Open sterile packages so that the first edge of the wrapper is directed away from the worker to avoid the possibility of a sterile wrapper touching unsterile clothing
- c. Avoiding spilling any solution on a cloth or paper used as a field for a sterile set-up
- d. Hold sterile objects above the level of the waist
- e. Avoid talking, coughing, sneezing, or reaching over a sterile field or object
- f. Never walk away from or turn your back on a sterile field
- g. All items brought into contact with broken skin or used to penetrate the skin in order to inject substances into the body, or to enter normally sterile body cavities, should be sterile
- h. Use dry, sterile forceps when necessary
- i. Consider the edge (outer 1 inch) of a sterile field to be contaminated
- j. Consider an object contaminated if you have any doubt as to its sterility

Surgical Asepsis is used in the operating room, delivery room, during surgical procedures, catheterization, and during dressing changes.

Infection Control: Standard Precautions and Transmission Based-Precautions

Two tiers of infection control exists to take care of patients in the healthcare setting. The first tier, standard precautions, is designed for all patients regardless of their diagnosis or risk of infection. The precautions are designed to reduce the risk of disease transmission thorough body fluids. It directs health care workers to handle all body fluids as if they are contaminated. Standard Precautions apply to body fluids, secretions and excretions, as well as non intact skin and mucous membranes. Examples of body fluids covered by standard precautions include: blood, semen, vaginal secretions, amniotic fluid, pericardial fluids, tissue specimens, body fluids containing blood, cerebrospinal fluid or peritoneal fluids Included in this list are body fluids which contain visible blood. These include: sputum, breast milk, vomit, nasal secretions, saliva, tears, urine, or feces

Standard Precautions promote: handwashing, the use of gloves, masks, eye protection and gowns when appropriate for patient contact. Gloves, masks, eye protection and gowns are part of the health care providers " Personal Protective Equipment" or (PPE). Each is considered a barrier devise designed to prevent direct contact with blood or body fluid.

The second tier, ***Transmission based precautions***, is directed to patients who are documented or suspected of carrying an infectious disease. This tier requires additional protection in addition to standard precautions. There are three categories: Airborne Precautions, Contact Precautions and Droplet Precautions.

- Airborne Precautions are designed to reduce the transmission of certain diseases which are transmitted through the air. Examples of these diseases include tuberculosis (TB), chickenpox, and measles. Airborne precautions include isolation of the patient in a private room and the use of a gown and protective mask (HEPA) by the health care worker. Handwashing must occur before and after gloving and transport of the patient should be as limited as much as possible with the patient wearing a mask. All equipment and supplies should be thoroughly disinfected
- Contact Precautions are used for patients know to be infected with a microbe that is easily transmitted between the health care worker and patient and between patient to patient through direct or indirect contact. Direct contact

transmission involves skin to skin contact and the physical transfer of microbes to a susceptible host from an infected person, such as might occur when a health care worker turns a patient, gives a bath or conducts any other activity requiring physical contact. Indirect contact occurs when a susceptible host comes in contact with a contaminated object in the environment such as a contaminated stethoscope, stretcher or wheel chair. Examples of such diseases are: scabies, viral conjunctivitis, impetigo, herpes simplex virus, Hepatitis A, and zoster. Gloves and gowns must be worn if coming in contact with the patient. A mask and eyewear should be worn if there is a potential for exposure to body fluids.

- Droplet Precautions are designed to reduce the risk of droplet transmission of infectious agents from patients known or suspected to be infected with microbes transmitted through talking, sneezing, coughing or certain procedures. Examples of these illnesses are influenza, Neisseria meningitis, pneumonia, mumps, pertussis and rubella. Precautions include placing the patient in a private room. Hands must be washed before and after gloves are worn. Gloves and a gown must be worn if coming in contact with blood or other body fluids. A mask must be worn if coming within three feet of the patient. Transport of the patient should be limited. All equipment should be thoroughly cleaned and disinfected after use.

