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Prevention of Infectious Diseases

Infections occur when harmful microorganisms – such as bacteria, viruses, fungi or parasites – enter the body and multiply. They remain a major global public health concern, accounting for more than 8 million deaths worldwide each year. Lower respiratory tract infections alone are among the leading causes of death globally.

Evidence-based measures designed to reduce the spread of infections are known as **Infection Prevention and Control (IPC).** These practices help protect individuals in healthcare settings, workplaces, and communities by reducing the risk of transmission and improving overall public health.

What is an infection?

Microorganisms, including bacteria and viruses, are microscopic living organisms. They are found everywhere, including in and on the human body. While there are thousands of different species of microorganisms, only a small proportion can invade the body, multiply, and cause disease. An infection occurs when these harmful microorganisms enter the body and begin to grow and spread.

Many microorganisms live naturally on the skin, in the mouth, in the upper respiratory tract, in the intestines (known as the microbiota), and in the genital tract without causing harm. In fact, many of these microorganisms play an important role in maintaining health. Whether a microorganism remains a harmless companion or causes disease depends on both its characteristics and the strength of the body's natural defenses.

Infections can affect a single part of the body (a local infection) or spread throughout the entire body (a systemic infection). Examples of infections include abscesses and urinary tract infections. In some cases, systemic infections can become severe and lead to life-threatening conditions such as sepsis or septic shock.

Common symptoms of infection may include fever, an increased heart rate, rapid breathing, fatigue, and a general feeling of being unwell. In more severe cases, symptoms such as confusion may occur. Most symptoms resolve once the infection has been treated effectively.

Types of infectious organisms

The main types of infectious organisms (pathogens) that can cause disease are **viruses, bacteria, fungi, parasites** (including protozoa and helminths), and **prions**. These pathogens can enter the body, multiply, and interfere with normal bodily functions. They may be transmitted through direct contact, airborne particles, contaminated food or water, or by insects and other animals.

The main types are:

- **Viruses:** Tiny infectious agents that can only reproduce by invading living cells and using the cell's machinery to make copies of themselves
    - *Examples:* Influenza virus, SARS-CoV-2 (COVID-19), HIV, Hepatitis B virus

- **Bacteria:** Microscopic single-celled organisms that can multiply rapidly. While many bacteria are harmless or even beneficial, some can cause disease and produce toxins that make people ill.
    - *Examples: Escherichia coli* (urinary tract infections), *Streptococcus pyogenes* (strep throat), Neisseria meningitidis (meningitis), *Mycobacterium tuberculosis* (tuberculosis).

- **Fungi:** Organisms that include yeasts and molds. Some fungi can cause infections of the skin, nails, mucous membranes, or internal organs.
    - *Examples:* Candidadis (commonly caused by *Candida albicans)*, and athlete's foot (tinea pedis).

- **Parasites:** Organisms that live on or inside another organism (the host) and depend on it for survival.
    - **Protozoa:** Microscopic single-celled organisms
        - Example: *Plasmodium*, which causes malaria.
    - **Helminths:** Parasitic worms that are visible to the naked eye in their adult stage
        - Example: tapeworms, roundworms, and hookworms

- **Prions:** Abnormal proteins that can cause neurodegenerative diseases. Unlike other infectious agents, prions are not living organisms
    - Example: Bovine spongiform encephalopathy ("mad cow disease").

While many infections are mild and resolve without complications, some can be serious and potentially life-threatening. This is why infection prevention and control are so important.

How do infections spread?

Microorganisms can enter the body through the mouth, nose, or eyes, through cuts or wounds, through sexual contact, through animal bites or insect stings, and through contaminated medical devices. Infections can spread either directly or indirectly. People may become infected by consuming contaminated food or water, inhaling airborne particles or droplets released when an infected person coughs or sneezes, or touching contaminated surfaces and then touching their eyes, nose, or mouth. Direct contact with an infected person can also lead to the transmission of infectious microorganisms.

Some microorganisms are transmitted through bodily fluids such as blood, semen, and feces. These pathogens can enter the body through sexual contact with an infected person or through non-sexual exposure to contaminated bodily fluids, for example when providing personal care or during medical procedures.

Human and animal bites, as well as cuts and other wounds that break the skin, can allow microorganisms to enter the body. Certain insects and ticks can also transmit infectious diseases when they bite.

Microorganisms can also attach to medical devices such as catheters, joint prostheses, and artificial heart valves that are placed inside the body. Infection can occur if microorganisms contaminate a device during implantation or if they reach an implanted device through the bloodstream from another site of infection. Because implanted materials di not have the body's natural defense mechanisms, microorganisms can multiply more easily and cause disease.

After entering the body, microorganisms must multiply before they can cause an infection. Once they begin to multiply, one of three things may happen:

- The microorganisms continue to multiply and overcome the body's natural defenses, leading to illness.
- A balance is established between the microorganisms and the body's defenses, resulting in a chronic infection.
- The body, with or without medical treatment, successfully eliminates the invading microorganisms.

Infection often begins when microorganisms attach themselves to the body's cells. This attachment allows them to establish themselves and, in some cases, spread into surrounding tissues. Whether an infection remains localized or spreads to other parts of the body, and how severe it becomes, depends on factors such as the type of microorganism, its ability to multiply, and how effectively the body's immune system can respond.

Many disease-causing microorganisms have characteristics that help them survive in the body, spread infection, and evade the body's natural defense mechanisms: These characteristics, known as **virulence factors**, include substances such as toxins, which can damage cells and tissues, and enzymes, which can help microorganisms invade the body and spread more easily.

Some microorganisms have developed ways to evade the body's natural defenses. For example, they may interfere with the immune response, protect themselves with external layers, or otherwise avoid being detected and eliminated. Some microorganisms can also develop resistance to antibiotics, making infections more difficult to treat.

Some microorganisms can develop new ways to survive and spread over time. For example, they may become resistant to antibiotics, making infections more difficult to treat.

People with a weakened immune system are more susceptible to infections. The immune system may be weakened due to inherited conditions, acquired diseases such as HIV infection or cancer, or medications that suppress the immune response. These medications, known as **immunosuppressants,** are used for a variety of medical purposes, including preventing organ transplant rejection and treating certain inflammatory or autoimmune conditions.

Key prevention measures:

Preventing infectious diseases starts with simple habits in our daily lives. By adopting good hygiene and taking appropriate precautions, we can significantly reduce the risk of infection. The most important preventive measures include:

- **Handwashing:** This is the most important measure to reduce transmission, using soap and water before eating, after using the toilet, after coughing, or when caring for someone who is ill. Hand sanitizers can be used when soap and water are not available.
- **Respiratory hygiene:** Cover your mouth and nose with your bent elbow or disposable tissues when coughing or sneezing.
- **Food safety:** Cook food thoroughly, wash fruits and vegetables, and keep food preparation areas clean to prevent foodborne infections.
- **Personal and household hygiene:** Maintain good personal hygiene, wear clean clothing, regularly clean frequently touched surfaces and sanitary facilities and ventilate indoor spaces.
- **Use of protective equipment:** Wear a mask if you have respiratory symptoms and use gloves when appropriate.
- **Avoid sharing personal items:** Do not share toothbrushes, cutlery, or towels.
- **Practice safe sex:** Use condoms to reduce the risk of sexually transmitted infections.
- **Physical distancing:** Keep a safe distance from others if you have respiratory symptoms or are unwell.
- **Prophylaxis:** In some situations, preventive medications may be prescribed before certain medical procedures or after exposure to specific infectious diseases.
- **Use antibiotics correctly:** Take antibiotics only as prescribed and avoid self-medication to help prevent antibiotic resistance.
- **Vaccination:** Vaccination is one of the most effective ways to prevent infectious diseases, protect vulnerable individuals, and reduce the spread of infection within the community (herd immunity).
- **Seek medical attention:** If symptoms of infection develop, seek medical advice promptly to ensure appropriate treatment and help prevent the spread of disease.
- **Follow public health guidance:** Always follow the recommendations of health authorities, particularly during outbreaks, epidemics, or pandemics.

Infections can often be prevented through simple, consistent daily habits that help protect both ourselves and those around us.