

# Infections: types, causes and prevention



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Health care professionals share the responsibility of preventing the spread of infection between themselves and clients and between clients.

Clients at health facilities are more at risk than the rest of the people

Sources of infecting microorganisms can be people or environmental objects, such as medical or nursing equipment that has become contaminated

### **What is an infection?**

An infection is the growth of a parasitic organism within our body. In other words a person with an infection has another organism growing within him, drawing its nourishment from the person.

Infective diseases that are readily communicable from person to person are called infectious or contagious

Normal Flora- microorganisms found on or in the body that do not cause any infection

### **What is a microorganism?**

Microorganisms are forms of animal or plant life too small to be seen without the aid of a microscope.

One of three events occur when a microorganism invade the human body:

Microorganism are destroyed by the body's immune defence mechanisms

Microorganisms stay within the body and cause diseases

Microorganisms cause infection or an infectious disease

## **Causes of Infection**

An infection can be caused by:

- Viruses
- Bacteria
- Fungi
- Parasites

### **Virus**

A microorganism smaller than bacteria

Cannot grow or reproduce apart from a living cell.

Invades living cells and uses their chemical machinery to keep itself alive and to replicate itself.

It may reproduce with fidelity or with errors (mutations)-this ability to mutate is responsible for the ability of some viruses to change slightly in each infected person, making treatment more difficult.

#### **How can viruses be cured?**

Many viruses cannot be cured with drugs; you just have to wait until your immune system gets strong enough to fight the virus. Viruses like the flu can not be cured by antibiotics

#### **Can you be immune to them?**

Yes, if your body can protect itself against a virus, you are immune to it. You also can create immunity after you suffered from a virus infection.

You can also have a vaccine (like the polio vaccine) and this can protect you against catching the polio virus. Each vaccine only protects you against that particular virus

### **Bacteria**

A simple living thing that is made up of single cells and that have the capacity to reproduce rapidly , this microorganism can exist either as independent (free-living) organisms or as parasites (dependent upon other organism for life).

Bacteria can be 100 times bigger than viruses. They work differently from viruses, but like viruses, they can make you ill.

Some bacteria can infect open wounds, others can get inside your body by being eaten or breathed in as in the case of infections such as bronchitis or strep throat

Some species of bacteria have the ability to develop highly resistant round or oval structure, called spores, when they are exposed to adverse conditions such as lack of nutrients and /or water

Spores are resistant to disinfectants and to high or low temperatures, so they are difficult to destroy. They are resistant to sunlight and even freezing conditions so many remain viable in adverse environments for many years until the right conditions arise and they multiply again

### **How can they be cured?**

Bacteria can be killed by antibiotics; some bacteria have become immuned to antibiotics, which in turn make these bacteria difficult to kill.

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**Can you be immune to them?**

Yes, if your body can protect itself against bacteria, you are immune. You can have a vaccine (like the tetanus vaccine) and this can protect you against catching that bacteria. Each vaccine only protects you against those particular bacteria.

**Fungi**

Tiny organisms that belong to the world of plants but contain no chlorophyll.

Fungi are present in the soil, air and water and they multiply by producing various kinds of spores

There are three types of fungal infections: superficial, which affect the skin, mucous membranes, hair and nails; intermediate, which affects subcutaneous tissues; and systemic, which infect deep tissues and organs

Fungi like wet conditions and are most likely associate with skin infections and do not get inside your body .

An example of common fungus is the yeast

Fungi are also used for the development of antibiotics.

Another example of fungi's infection is athlete's foot

How can they be cured? Anti fungal drugs, powders or creams get rid of fungal infections

Can you be immune to them? There are no vaccines for fungal infections but there are ways you can prevent them. For example, by making sure you dry

between your toes to prevent athlete's foot, as fungi like damp, warm conditions

### **Parasites**

An organism that lives in or takes its food from another organism. A parasite can not live independently. An examples of a common parasites is the lice

Parasites are usually classified as: endoparasites (usually living inside the body of the host), and ectoparasites usually live on the surface of the host.

Occasionally the definition of “ parasitic disease” is restricted to diseases due to endoparasites.

Humans can get parasites from contaminated food or water, bug bites or sexual contact.

Parasites normally enter the body through the skin or mouth.

Close contact with pets can lead to parasite infestation as dogs and cats are host to many parasites.

Other risks that can lead people to get parasites are walking barefoot, inadequate disposal of faeces lack of hygiene, close contact with someone who carries specific parasites, eating undercooked or exotic foods.

Common parasites of the human body

(1) The hookworm latches on the walls of the colon with its sharp teeth where it feeds on blood.

(2) The tapeworm is the longest parasite. A mature adult can lay a million eggs a day.

(3) Tapeworm eggs embedded in the colon. (4)

The roundworm can grow to be 20 inches (50 cm) long and lay 200, 000 eggs per day.

(5) Pinworms migrate outside the colon during the night to lay their eggs around the anus. This causes the nightly itching of many unsuspecting victims.

How can they be cured? There are different treatments depending upon the type of parasite. For example, lice can be treated with special shampoos or by combing the hair with a special comb

Can you be immune to them? No, there are no vaccines for parasites. There are ways you can reduce your chances of catching parasites. You can avoid contact with people who have head lice, or avoid sharing equipment such as hairbrushes

## **Passing and preventing infections**

The process of the spread of infection can be conceived as a chain of events. Each event is a link in the chain and must occur sequentially for an infection to develop.

For the chain of events to continue, the following elements must be present:

Reservoir, pathogenic organisms , portal of exit from the reservoir, mode of transmission, portal of entry to the new host, and susceptible new host

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Importantly, infection prevention and control is directed towards breaking the links in the chain of infection

### **Chain of infection**

Chain of infection/ Reservoir

Reservoir

The reservoirs of pathogenic microorganism are human, animal or inanimate sources. A reservoir is a place where a pathogen can survive but may or may not multiply.

Human reservoir: variety of microorganism (normal flora) reside on the surface of the skin or within body cavities, fluids and discharges, when this normal flora is transferred from their normal place of residence to a different site in the same host an auto-infection may occur

Cross infection may occur when organisms from one person are transferred to another person.

A person incubating a disease is another source of infection.

During the incubation period the organisms multiply and can be transmitted and infect others before the host or anyone else knows the disease is present.

Health care professionals therefore should treat every client as if they were a potential source of infection



Animal reservoir: animals, birds and insects (vectors) can also be reservoirs for infectious microorganisms example: malaria.

Inanimate reservoir : soil, seawater, food, water and milk are additional reservoirs for microorganism.

Chain of infection / Portal of exit

Portal of exit from the reservoir:

if microorganisms are to enter another host and cause disease, they must first find a portal of exit, then a new site in which to reside .

Chain of infection / Portal of exit

Portal of exit from the reservoir:

When the human body is the reservoir , microorganisms can exit through a variety of sites such as:

Skin and mucous membranes

Gastrointestinal tract: saliva, expectorated sputum, faeces, vomitus, bile

Urinary tract

Respiratory tract: sneezing, coughing, talking or even breathing .

Reproductive tract : semen, vaginal discharge

Blood: blood is normally sterile but, when a client has blood borne infectious disease such as hepatitis B or C or AIDS, it becomes a reservoir for the

causative pathogens . Any break in the skin that allows blood to escape, and menstrual blood from the vagina, are portals of exit for blood-borne pathogens.

### **Chain of infection/ Modes of transmission**

Microorganisms move from a reservoir to a new host in a variety of ways.

Disease may be transmitted via :

- Airborne (inhalation)
- Contact (touching)
- Indirect Contact
- Vector

\* Some microorganisms may be spread by more than one route

### **Airborne transmission**

it may occur via either airborne droplet or dust particle.

Tiny pathogens can be carried on airborne particles such as dust, water, and respiratory droplets and, if inhaled by a susceptible host, cause infection .

Examples of illnesses spread by this via are measles, rubella, influenza, pneumonia, meningitis, tuberculosis and polio.

Some of these diseases can be also spread by other means

Droplets of moisture that contain organism do not have to be inhaled to spread infection.

They contaminate all surfaces on which they fall, so transmission can occur via indirect contact

How to prevent passing on this type of infection:

Avoiding close contact with an infected person is the best way to avoid airborne infections

Covering the mouth and nose when coughing or sneezing can decrease the spread of infection

Avoid close contact with people in crowded or enclosed spaces such as shopping malls

Wearing a mask may help reduce spread of infection for short exposures.

### **Contact transmission**

This is the most significant route of transmission in health care setting .

Microorganisms can be transferred directly from one individual to another by physical contact between an infected person and a new host, or throughout the use of contaminated equipment.

The hands can be the means of transfer if, after contact with an infectious client, they are not washing adequately before attending another client .

Effective hand washing is the single most important way to prevent the spread of infections.

Direct contact

How to prevent passing on this type of infection:

Good hand washing

Avoid direct contact with an infected person

Use barriers such as gloves for contact with infected skin and body fluids

Condoms prevent the spread of sexually transmitted diseases

### **Indirect contact**

Contact with objects that are infected such as doorknobs, handrails, tables, counter tops, taps, cups, cutlery, computer keyboards, telephones, pens and children's toys.

Infections that can be passed in this way include: Chicken pox, colds, conjunctivitis.

How to prevent passing on this type of infection:

Frequent hand washing, especially before touching the face , eyes, mouth, or nose with your hands

Using gloves when handling things that may be infected

Frequent disinfecting and not sharing personal items (cups, cutlery, combs, or towels)

Transmission by ingestion

Microorganism can enter the gastrointestinal tract in a variety of ways, including via infected food or water or contaminated eating or drinking utensils

Example of a disease transferred in this way is the cholera.

## **Vector**

Vector borne transmission (via mosquitoes , flies, rats and other animals) as a health concern is not as significant in Australia and New Zealand .

The most common example of a disease spread in this way is the malaria.

Chain of infection/ Portals of entry

Microorganisms can enter the body through the same routes they use for exiting:

Inhalation into the respiratory tract

Ingestion

Inoculation through the skin or mucous membrane

Chain of infection/ Susceptible host

## **Susceptibility**

the degree of resistance an individual has to pathogens. Whether a person acquires an infection depends on their susceptibility to the infectious agent.

A susceptible host is the last link in the chain of infection

Susceptibility can be reduced by lifestyle practices that boost resistance, such as healthy nutrition, adequate exercise, rest and sleep and effective hygiene practices among other.

Body Flora

Microbes live on our bodies

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## Normal flora

Flora are different in different areas

Balance can be disturbed. E coli is normally found in the intestines, however, there are types of E. Coli that can cause diarrhea and can even lead to kidney failure.

E. Coli infection is common during summer and complications are likely to occur on elderly and children population.

Reduce problems by

- Attention to health
- Lifestyle
- Natural Body Defenses
- Tears
- Mucous membranes
- Intact skin
- Stomach acid, saliva enzymes
- Hair in nose, eyelashes
- White blood cells
- Antibodies
- Inflammation
- Temperature
- Immunity
- Ability to fight off disease

Pathogenic microbe enters body

Body responds by producing antibodies

Immunosuppressant:

Weak immune system

Points to Consider for older Adults:

There is a decrease in the function of immune system and and slowed response to treatment in older adults.

There is a marked physical change that may increased easy access of infection into the body such as atrophic skin, decreased gastric acid, decreased cough reflex, etc...

Slower cellular response due to decreased protein reserves and serum albumin resulting to slow healing of wounds.

Changes in mental status and decreased functional ability resulting to limited ability to use preventive health practices to improve resistance to infection.

Immunizations

Protection from pathogens

Vaccines are weak antigens

Make body produce antibodies

Prevent childhood diseases

## **Vaccinations**

How vaccines work:

A. Vaccines contain antigens (weakened or dead viruses, bacteria, and fungi that cause disease and infection). When introduced into the body, the antigens stimulate the immune system response by instructing B cells to produce antibodies, with assistance from T-cells.

B. The antibodies are produced to fight the weakened or dead viruses in the vaccine.

C. The antibodies practice on the weakened viruses, preparing the immune system to destroy real and stronger viruses in the future.

D. When new antigens enter the body, white blood cells called macrophages engulf them, process the information contained in the antigens, and send it to the T-cells so that an immune system response can be mobilized.

Bacterial Infections

Culture and sensitivity

Antibiotic use and misuse

Antibiotic resistance

Methicillin-resistant *Staphylococcus aureus* (MRSA)

Vancomycin-resistant enterococcus (VRE)



MRSA: is an infection caused by *Staphylococcus aureus* that has become resistant to antibiotics that are used to treat a common infection.

Most people that are infected with MRSA are those who stay long in the hospital, people who lives in a resthome, people who are having dialysis.

VRE: Vancomycin Resistant Enterococcus. This entero coccus acquire a special DNA called plasmid. These VRE can invade the bloodstream or spread locally. Once in the bloodstream, it may cause meningitis, pneumonia orendocarditis

#### Other Bacterial Infections

Strep A:

- Flesh-eating
- high mortality
- Pseudomonas:
- Found in water

E. coli:

- Normal in intestines; if found in food it is likely from poor food prep
- Other Bacterial Infections
- Salmonella:
- Food poisoning

*Mycobacterium tuberculosis*:

- Tuberculosis
- *Clostridium difficile*:

- Normal in bowel, severe diarrhea in elderly on antibiotics
- Infection control and prevention

The basic principles employed in preventing the spread of infection are the same in all situations, regardless of whether clients are cared for the community, in aged cared facilities, in day clinics or in hospitals.

Standard precautions, are the basic recommended work practices to be implemented in the treatment and care of all clients regardless of diagnosis or presumed infectious status

Infection control and prevention / Standard precautions

Standard precautions are the first approach to infection control. Additional precautions form the second tier and are used in situations in which clients are known or are suspected as being infected with pathogens that may not be contained by the use of standard precautions

Standard precautions mean placing a barrier between yourself and someone else's: Body fluids, secretions and excretions ( except sweat), non intact skin and mucous membranes

Body fluids include:

- Blood
- Urine
- Semen
- Breast milk
- Nasal secretions
- Faeces

- Vomitus
- Vaginal secretions
- Human tissue
- Wound exudates/pus
- Sweat
- Cerebrospinal, pleural, pericardial, synovial, peritoneal, and amniotic fluids

Standard precautions relate to:

- Effective hand hygiene
- Use of personal protective equipment such as gloves, gowns, masks or eye protection when appropriate
- Safe systems for the handling of blood and all other body fluids
- The safe handling of no-intact skin and mucous membranes

Hand hygiene

Hand hygiene is the most important way to prevent the spread of infection and includes washing of hands or the use of alcohol hand rubs

Micro-organisms: can be picked up from body fluids or objects in the home. They stick to the skin on your hands and then are passed on to other people. Skin is your body's first line of defence against infection. If your skin is broken or damaged, your risk of infection increases.

When to wash your hands with soap and water:

When visibly dirty

When soiled with blood and other body fluids

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After using the toilet

If alcohol-based hand rub is not available

When alcohol-based hand rub is indicated

In all other clinical situations, use alcohol-based hand rub and if hands are not visibly soiled

Soap and alcohol-based hand rub should not be used together

When you start to work

When you finish work

Before and after you have contact with each consumer

After contact with any body fluids such as blood or urine

‘ After contact with mucous membranes, broken skin or skin rashes or infections

After touching contaminated items such as soiled sheets

After removing gloves

After using the toilet or changing incontinence pads

Before preparing food, eating or feeding

After touching animals

Whenever your hands look dirty

Between consumers visits

Food handling- between different food types

Before and after giving medications

After applying creams

Handling chemicals

The uses of gloves do not replace the need for washing your hands

Hand hygiene

In addition to washing, care of the hands involves:

Covering any broken or infected areas of the skin with a waterproof dressing

Wearing disposable gloves to protect larger skin lesions

Keeping fingernails clean and short and not wearing artificial nails

Keeping the skin free from cracks. If frequent immersion in water results in skin dryness, a good quality hand cream should be used

Hand hygiene procedure

Hand washing steps

Remove watches or jewellery and roll your sleeves up to your elbow

Wet your hands and wrists with warm water ( very hot water can dry your skin)

Place a small amount of soap on your hands

Rub your hands together to form lather. Make sure you clean under your fingernails, around and between your fingers and your fingertips and thumbs

Wash for 10-15 seconds

Rinse your hands well using plenty of warm running water ( removing all the soap reduces irritation from washing your hands often)

Pat your hands dry with a towel, or paper towels. Do not rub as its can damage your skin. Dry your hands thoroughly

If you can, use the towel to turn off the tap, so you do not contaminate your clean hands

Hand hygiene procedure

Tips for using alcohol based hand rubs:

Check hands for visible soil or blood/ body fluids. It is alright to use a hand rub if there is no visible soiling.

Apply a small amount of alcohol gel( about the size of a ten cent piece ) to the palm of one hand and rub hands together

Cover all surfaces of hands and fingers including areas around and under fingernails

Continue rubbing hands together until alcohol dries ( about 15-25 seconds)

Make sure hands are complete dry prior to putting on gloves or supporting a consumer

You need to wash your hands with soap and water when it feels sticky on the hands

Personal protective equipment

In accordance with standard precautions, personal protective equipment (PPE) is used with all clients when there is potential to come in contact with body substances or airborne microorganisms

PPE equipment refers to gloves, aprons/gowns, masks and protective eyewear or face shields

Disposable gloves

Purpose: to prevent the transfer of body fluids, dirt and microorganisms from person to person by the correct use of latex/plastic disposable unpowered gloves

When to use disposable gloves:

Gloves are worn for anticipated contact with blood, secretions, mucous membranes, non intact skin and moist body substances for all patients

Gloves must be changed between client procedure and after each client

Contaminated gloves should always be removed immediately after the task is completed and in such a way that the contaminated outside surfaces are enveloped within the inside surfaces

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Gloves should not be reused

Gloves that are not intact or discoloured should not be use

Gloves must be used when touching contaminated items such as bed linen and continence products

Gloves should be removed before touching items such as doorknobs, light switches, telephones, medication trolley .

You should also use gloves when you are cleaning, especially commodes, shower chairs and urinals

You should use a new pair of gloves if the gloves become soiled

Important to wear gloves when you are handling continence products and sanitary napkins, which should be placed in a double plastic waterproof bag, sealed and then put in the rubbish bin

PPE/ Gowns and Aprons

These are required when procedures are likely to generate splashing of body fluids

Or when contact between the resident's body / clothing/linen items and the health professional may not be able to be avoided

Gowns and aprons need to be disposable and used once only

Gowns and aprons need to be changed between clients

Gowns and aprons will not be stored in clients' room

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Aprons/Gowns must be worn when attending the following procedure:

Cleaning soiled/wet linen, clothes

Emptying bed pans, bowels, urinals, and vomit

Emptying / cleaning suctioning equipment, blood, I. V. equipment

PPE/Face protection devices

Depending on the mode of transmission, health care workers may wear a mask, goggles or face shield

Face mask are worn to prevent the spread of microorganisms from the respiratory tract of a client to a healthcare worker or from a healthcare worker to a client

Disposable masks are worn and discarded immediately after use and hands should be washed and dried after mask is removed

When a mask is used it must:

Be handled only by the tapes or loops at either end

Cover the nose and mouth completely

Not be allowed to hang around the neck

Be changed as soon as it becomes damp, as moisture allows microorganisms to pass through the mask

Protection devices

Protective eyewear/ face shields: ( face protection device) to be use if there is a risk of splash of blood or other body fluid

Hats: To protect your hair when you might get splashed or sprayed with blood or body fluids, or to prevent hair contaminating food or a consumer with a open wound. Hats may also be used when the person you are supporting has lice.

Infection control disposal

It is important to dispose of certain things, such as body fluids , wound dressings, suction or drainage, I. V therapy equipment, wet or soiled incontinence pads, or contaminated items in the proper manner

How to dispose body fluids :

Always use gloves when handling body fluids

Urine and faeces should be flushed down the toilet

Blood can also be flushed down the toilet

How to dispose body fluids :

Any items contaminated with body fluids , such as, bed linen, should be rinsed in the laundry sink with cold water before being washed with hot water in the washing machine. The item should be washed separately from other washing or according with the organisation P&P.

Catheters, colostomy bags and other medical waste should be put in a plastic bag, sealed and then put it in the rubbish bin, or dealt with according to organisations P&P.

Dressing and other items which may be infected should be put in a plastic bag, sealed and then put it in the rubbish bin, or dealt with according to organisations P&P.

Infection control disposal

Sharp instruments represent the major cause of accidents involving potential exposure to blood-borne disease. Sharps must not be passed by hand between workers

How to dispose sharps waste

Sharps waste includes needles, cannulas, scalpel , etc

Items should be disposed of into a puncture resistant container without recapping.

How to dispose sharps waste

A portable sharps container shall be taken to bedside/location of the intervention

Needles should not be: recapped, broken or bent by hand, or removed from disposable syringe after use

How to handle soiled clothing and gowns: These items should be treated in the same way as contaminated linen

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Wash hands before putting on gloves

Treat all soiled clothing and gowns as if is contaminated.

Wear gloves when handling these items

Carry the items away from the body to the laundry.

If an item becomes soiled when you are out in the community, or when you do not have access to a laundry, you should put it in a waterproof, plastic bag. If possible, put this bag inside another bag so that it has a double layer protection

How to handle contaminated linen

Treat all bed linen as if it is contaminated. Wash your hands and put on gloves.

If the linen is wet or soiled, put on an apron as well.

When taking the linen off the bed, fold it on itself. This means that the contaminated surfaces are on the inside bundle

Rinse the dirty linen according to the organisations P&P, then put in the washing machine

Carry soiled linen in a container or bucket to avoid dripping

Other soiled items should be treated in the same way.

Remove and dispose off the gloves and wash your hands

## Infection control: First aid

Sometimes emergencies happen when supporting a consumer and the support person may be exposed to body fluids or contaminated surfaces.

Spills of blood or body fluids:

Put on gloves and other PPE

Isolate and contains the spill

Remove solid matter using a dust pan and paper towel

Small spots of blood or small spills of body fluid can be easily wiped up with disposable towels (procedure may vary according to organization's P&P)

Important, absorb the fluid DO NOT RUB

Clean the area with soap and water or an alcohol rub (procedure may vary according to organization's P&P)

Discard contaminated material into a white plastic bag

Remove gloves and dispose them before washing hands

If support person is injured by a needle or other sharp item or get blood or other potentially infectious materials on the eyes, nose, mouth, or broken skin (body fluid splashes) the following steps are required:

Immediately rinse the exposed area with lots and lots of water

Clean any wound with soap and water or a skin disinfectant

Report this immediately

Complete and accident or incident report

Seek appropriate evaluation and follow up according with organization's P&P.

Splashes :

Immediately rinse the area with running water

Report immediately to your supervisor

Refer to organisation's P&P.

Spills

Wash your hands and put on gloves.

Wipe as much of the spillage as possible using toilet paper or towel.

Dispose of the paper or towel either down the toilet or put them into a plastic bag. Double bagging is recommended.

Clean the area with soap and water or disinfectant, in accordance with your organization's policies and procedure.

Remove your gloves and put them in the plastic bag before disposing off them in the rubbish bin.

### **Infection Control: Reporting**

The risk in acquiring Infection:

The risk if you (support worker) have infection. Going to work with an infection is a risk by passing on the infection to other staff and the people you support.

The risk if the client you are supporting has an infection. An infection will lead to changes in condition of the person and it is a risk to his/ her health.

The risk to the organization. Special policies and procedures such as in a hospital or eldercare facility will be in place to control the spre