Causes and spread of infection

Level 3 Diploma in Health and Social Care

Unit 1C02

Assignment task – IC02 - Causes and spread of infection

Unit summary; purpose and aim

This unit is about knowledge and understanding of the causes of infection and common illnesses that may result as a consequence; to understand the difference between infection and colonisation, pathogenic and non-pathogenic organisms, the areas of infection and the types caused by different organisms; to understand the methods of transmission, the conditions needed for organisms to grow, the ways infection enter the body and key factors that may lead to infection occurring.

1 Understand the causes of infection

1.1 Identify the differences between bacteria, viruses, fungi and parasites

1.2 Identify common illnesses and infections caused by bacteria, viruses, fungi and parasites

1.3 Describe what is meant by "infection" and "colonisation"

1.4 Explain what is meant by "systemic infection" and "localised infection"

1.5 Identify poor practices that may lead to the spread of infection

2 Understand the transmission of infection

2.1 Explain the conditions needed for the growth of micro-organisms

2.2 Explain the ways an infective agent might enter the body

2.3 Identify common sources of infection

2.4 Explain how infective agents can be transmitted to a person

2.5 Identify the key factors that will make it more likely that infection will occur

What is the spread of infection?

Before you can prevent an infection, it is important to understand how they are spread.

Infections are caused by bacteria, viruses and other microscopic organisms. These germs are found in the environment (water, soil, air) as well as in and on humans, in our body secretions (stool) and in the tiny droplets that are generated by breathing, coughing, sneezing.

The routes of infection may include: blood circulation, digestive, respiratory, and body fluids.

Infections are spread through different means:

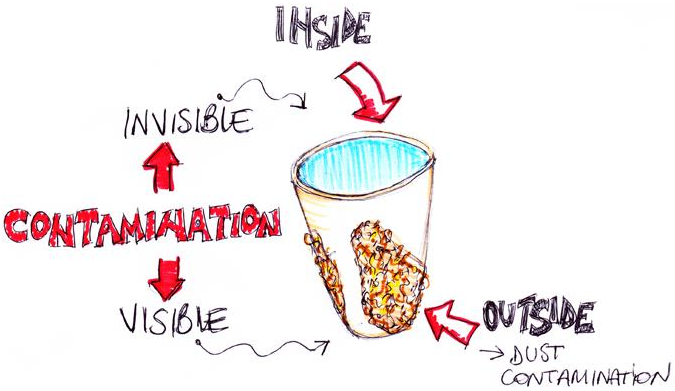
Stool: Absorbent adult diaper pad, pee napkin, absorbent hygiene products. Germs that cause diarrhoea or other infections of the intestinal tract are found in faeces. If personal hygiene is insufficient, stool may contaminate hands, food, water, surrounding objects and surfaces. The easy spread of intestinal infections is also due to the fact that some of the germs can survive on surfaces and objects for long periods of time. Proper hand washing is the most effective way to prevent the spread of intestinal infections.

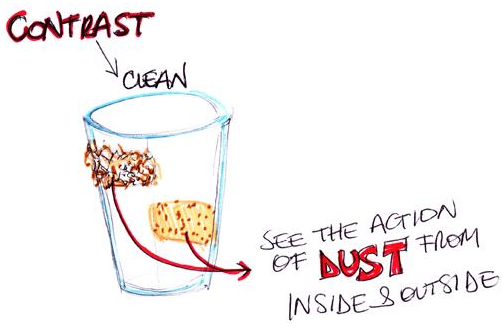
Droplet spread: Germs that cause colds, strep throats, are found in the saliva and secretions of the nose. Colds and other minor infections including the eyes, nose and throat, are the most frequent illnesses in young children. When people cough, sneeze, have runny noses, or do anything that spreads droplets of secretions from the respiratory tract, the germs can spread. The germs can then be inhaled, or they may land in a person's eye, nose or mouth. Indirect spread may also occur because some viruses can survive in the environment (counter tops) for days at a time. Because the respiratory viruses can be found in the nose and throat of children for several days before they show signs of an illness, it is important to follow good infection control practices at all times.

Contact with blood: The skin offers an excellent barrier when in contact with blood. Several infections may be spread by direct contact with blood if there is a break in the skin (blood to blood) or direct contact with mucous membranes (eye, mouth). Only a small amount of blood or body fluids can cause infections so whenever any amount of blood or bloody body fluids is noticed, equipment such as gloves, and proper cleaning and disinfection of exposed objects must occur. Personal protective equipment: refers to any protective equipment or clothing that an employer must provide where risks have been identified. This may include: gloves, aprons, masks, hair nets, safety goggles, and hospital shoe covers.

Direct physical contact: Infections, particularly skin infections such as impetigo and ringworm, are spread by direct physical contact. This is when children play together and one child touches the infected skin area of another child.

Contaminated Objects: Contaminated objects like toys, towels, even food and water, can also infect people. It is important that all objects are properly cleaned and sanitized and all food/water is from approved sources.





Assignment task – IC02 Answers

1 Understand the causes of infection

1.1 Identify the differences between bacteria, viruses, fungi and parasites

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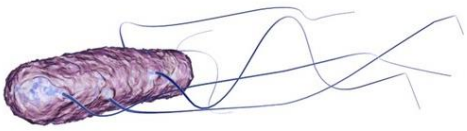
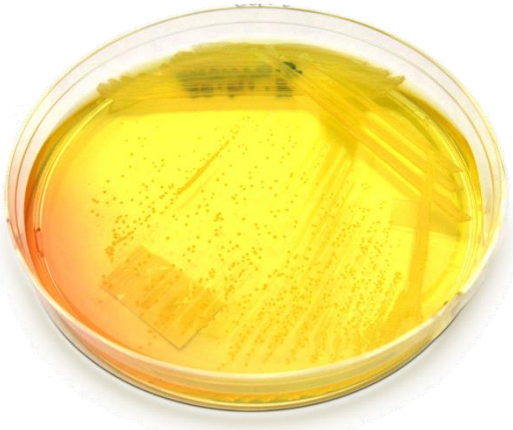
Bacteria are tiny living beings (single-cell microorganisms) – they are neither plants nor animals – they belong to a group all by themselves, usually a few micrometers in length that normally exist together in millions. A gram of soil typically contains about 40 million bacterial cells. A milliliter of fresh water usually holds about one million bacterial cells. Bacteria come in three main shapes: Spherical (like a ball); Rod shaped; Spiral.

Bacteria do not have a nucleus and often does not even contain organelles. They reproduce only asexually. Bacteria can be beneficial e.g. we have bacteria in our intestinal tracts which aid in digestion. Bacteria can be used in wastewater treatment to break down sewage, and bacteria can be used in the food industry for example, in the production of yogurt. Bacteria in the food industry can also be of concern with respect to spoilage. It can affect the odour, taste, and texture of a food product. Bacteria can also be pathogenic, meaning they are capable of causing disease.



Salmonella

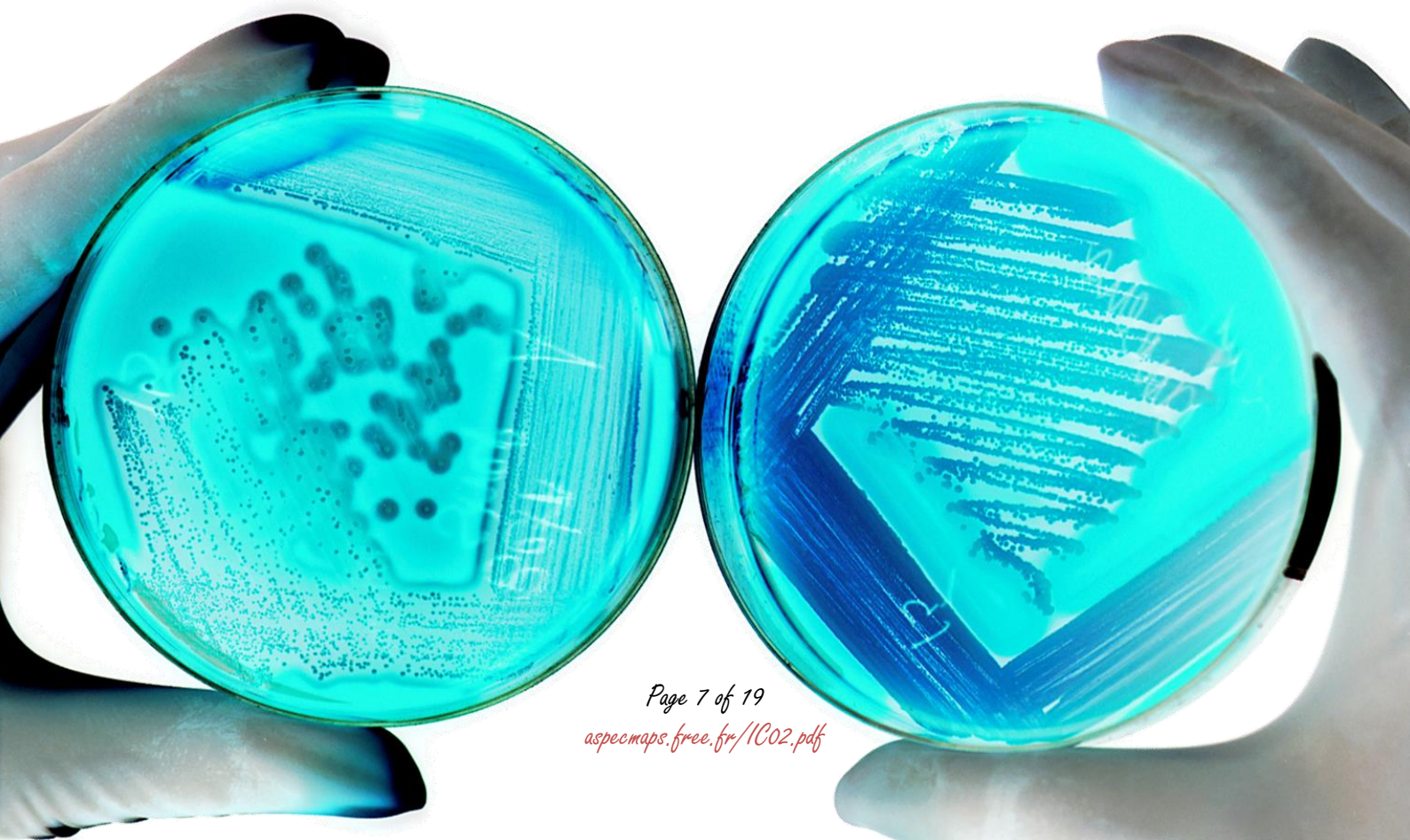
Escherichia coli



Staphylococcus aureus

Answer: **A virus** is a small infectious agent that can replicate only inside the living cells of organisms. Most viruses are too small to be seen directly even with a light microscope. Viruses infect all types of organisms, from animals and plants to bacteria. Viruses differ from bacteria in that they do not reproduce in the food, and they need a living host to replicate. They replicate by entering the cell of the host and taking over the genetic material responsible for reproduction. They can infect all types of cells, including bacteria, fungi, plants, animals, and the living cells within human beings. Viruses can be found in the environment; in water; air. Viruses target specific cells in the body, such as those in the genitals or upper respiratory tract. Some target certain age groups, such as babies or young children, such as those that cause croup. The rabies virus targets the cells in the host's nervous system. Viruses may target skin cells and cause warts. Some viral infections can be systemic - they affect many different parts of the body, causing for example runny nose, sinus congestion, cough, and body aches. A viral infection that causes, for example viral conjunctivitis is local. Viral infections that cause pain often trigger itching or burning.

Picture of MRSA Staphylococcus aureus virus



Answer → **A fungus** is a simple plant like organism, it is a eukaryotic. It reproduces sexually as well as asexually. It is normally found as a single cell. Fungi reproduce via spores. They can have a variety of shapes and sizes, and they can include yeast and molds. Generally, fungi are a concern in spoilage of food. Fungi can be beneficial. They can cause spoilage. And some fungi are pathogenic, meaning they can cause disease in humans e.g. rarely causes healthcare acquired infections (HCAI). **There are three types of fungal infections of the skin:**

Superficial mycoses - limited to the surface of the skin and hair, such as Tinea versicolor, which commonly affects young people. The chest, back, upper arms or legs may be affected. Light or reddish-brown spots appear on the skin. Sometimes the spots are not visible.

Cutaneous mycoses - occurs deeper in the skin, in the epidermis. The hair and nails may also be affected. Cutaneous mycoses are limited to the keratinized layers of skin, nails and hair. This type of mycosis is caused by dermatophytes (a group of three types of fungus that commonly causes skin disease in animals and humans), which may cause ringworm. Examples of dermatophytes are Microsporum, Trichophyton, and Epidermophyton fungi. Athlete's foot is another example of cutaneous micosis.

Picture of fungus infection

Subcutaneous mycoses - these types of infections go deeper into the skin, including the dermis, subcutaneous tissue, as well as muscle and fascia. The fascia is a band of tissue below the skin that covers underlying tissues - it separates different tissue layers and surrounds muscles. Subcutaneous mycoses tend to be long term (chronic) and are usually caused by skin penetration.

Answer: **A Parasite** differs from bacteria in that they need a living host to complete their life cycle. And generally, parasites are host specific. Parasites can be found in: Soil; Water; Air; Animals. Parasites can be acquired through consumption of water, consumption of food, and through contact of a contaminated surface.

Picture of three Triatominae or kissing bugs

1.2 Identify common illnesses and infections caused by bacteria, viruses, fungi and parasites

Examples of diseases caused by bacteria are:

- Brain (bacterial meningitis) - Streptococcus pneumoniae, Neisseria, meningitides, Haemuphilus influenzae, Streptococcus agalictaiae, Listeria monocytogenes
- Ear (otitis media) - Streptococcus pneumoniae
- Pneumonia - Streptococcus pneumoniae, Haemophilus influenzae, Staphylococcus aureus
- Upper respiratory tract infection - Streptococcus pyogenes, Haemophilus influenzae
- Gastritis (inflammation of the stomach) - Helicobacter pylori
- Food poisoning - Campylobacter jejuni, Salmonella, Shigella, Clostridium, Staphylococcus aureus, Escherichia coli
- Eye infections - Staphylococcus aureus, Neisseria gonorrheae, Chlamydia trachomatis
- Sinusitis - Streptococcus pneumoniae, Haemophilus influenzae
- Urinary tract infections - Escherichia coli, other Enterobacteriaceae, Staphylococcus saprophyticus, Pseudomonas aeruginosa
- Skin infections - Staphylococcus aureus, Streptococcus pyogenes, Pseudomonas aeruginosa.

Examples of diseases caused by viruses are: Colds, Influenza, Chicken pox, Cold Sores, Herpes, Hepatitis A and Norovirus.

Examples of diseases caused by Fungi are: Athletes Foot, Ringworm, Otomycosis (ear), Thrush.

Examples of diseases caused by parasites are: Malaria, River Blindness, Sleeping Sickness, Lyme Disease, Scabies.

1.3 Describe what is meant by "infection" and "colonisation"

Answer: **Infection** can be defined as: "Harm caused by a micro-organism" or "Invasion of the body by pathogenic organisms" or "An agent or a contaminated substance responsible for a person becoming infected" or "The pathological state resulting from having been infected."

A human with an infection has another organism inside them which gets its sustenance (nourishment) from that person; it colonizes and reproduces inside them. The human with that organism (germ) inside is called the host, while the germ or pathogen is referred to as a parasitic organism. Another name for an organism that causes infection is an infectious agent. It is only an infection if the colonization harms the host. It uses the host to feed on and multiply at the expense of the host to such an extent that his/her health is affected. The normal growth of the bacterial flora in the intestine is not an infection, because the bacteria are not harming the host.

Ainswen> **Colonisation** can be defined as "The ability of some microorganisms to live in or on a host without causing disease, e.g. Staphylococcus Aureus." or "The presence and multiplication of microorganisms without tissue invasion or damage. The colonies develop when a bacterial cell begins reproducing." or "The development of a bacterial infection on an individual, as demonstrated by a positive culture. The infected person may have no signs or symptoms of infection while still having the potential to infect others."

Colonization occurs when microorganisms inhabit a specific body site (such as the skin) but don't cause signs and symptoms of infection. Colonized pathogens have the potential to cause infection if they spread to a different site on the same patient (for example, from the skin to the urinary tract) or to another person. Depending on the microorganism, colonized pathogens can be transmitted from person to person and via inanimate objects. Person to person transmission is the major route of colonization within health care facilities. Although a person can become infected as soon as a pathogen invades, in many cases, colonization (without signs and symptoms of infection) takes place before infection occurs.

1.4 Explain what is meant by "systemic infection" and "localised infection"

Ainswen> "A systemic infection is one that affects the whole body, probably travelling in lymph or blood." Or "A systemic infection is one which may involve multiple systems (organs) in the body."

Ainswen> A localised infection describes what occurs when all infected tissue is maintained within the one area, where the infection entered. If infected tissue broke away from original site of infection and travelled to other body parts, it would no longer be localised.

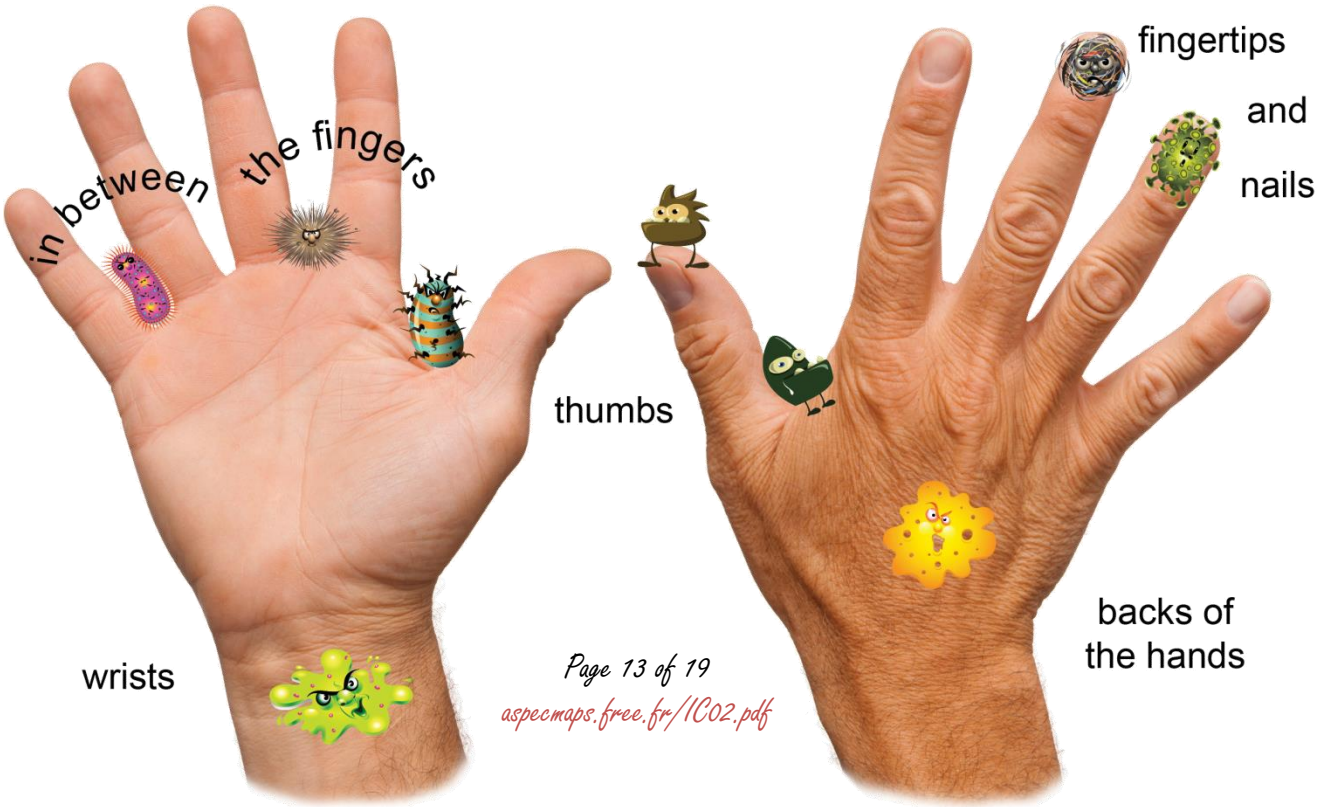
1.5 Identify poor practices that may lead to the spread of infection

An answer: Poor practices that may lead to the spread of infection are; poor hand hygiene; inappropriate use of PPE; inadequate cleaning/decontamination of environment and equipment; poor waste disposal and storage procedures.

What recommended method for effective hand washing?

The recommended method for effective hand washing is composed of six steps:
Step 1 Wet both hands and apply soap. Rub palms together until soap is bubbly.
Step 2 Rub each palm on your palm.
Step 3 Rub between your fingers on each hand.
Step 4 Rub your hands with the fingers together.
Step 5 Rub around each of your thumbs.
Step 6 Rub in circles on your palms. Then rinse and dry your hands.

Germs like to hide... remember to wash your hands thoroughly! Commonly missed areas include:



Hands are the main pathways of germ transmission during health care. Effective hand washing hygiene is therefore the most important measure to avoid the transmission of harmful germs and prevent healthcare-associated infections.

When to wash your hands?

Hand washing is the single most important and most neglected aspect of control of infection. Cross infection occurs as care staffs move from one resident to another or handle different body parts of the same resident for example bed bathing and then giving medicine. The recommended prevention method for effective hand washing include: removing pathogens and preventing infection from spreading between people. The recommended prevention for effective hand washing include: creating a protective barrier from pathogens and creating a protective barrier between people. Even if you are not in direct contact with the resident, your hands will be contaminated from handling laundry, rubbish bags, furniture or food and you could be a cause of cross contamination unless you too wash your hands regularly. Hands should be washed when they are visibly dirty as well as before starting work; each and every episode of care for a resident; handling food; putting on gloves; leaving work. As well as after using the toilet; taking a break; making a bed; removing gloves; handling blood or other bodily fluids; touching any equipment that may be contaminated with blood or bodily fluids; handling rubbish or dirty laundry.

Alcohol-based hand rub (ABHR) is the preferred method of hand hygiene in healthcare unless hands are visible soiled.

Rub hands until the product is completely dry; this will take at least 15-20 seconds if sufficient product is used. For adequate hand hygiene, remove all hand and wrist jewellery.

2 Understand the transmission of infection

2.1 Explain the conditions needed for the growth of micro-organisms

Answer: Conditions needed for the growth of micro-organisms are:

Moisture - Moisture is required to carry foods in solution into the cell, to carry wastes in solution away from the cell, and to maintain the moisture content of the cytoplasm.

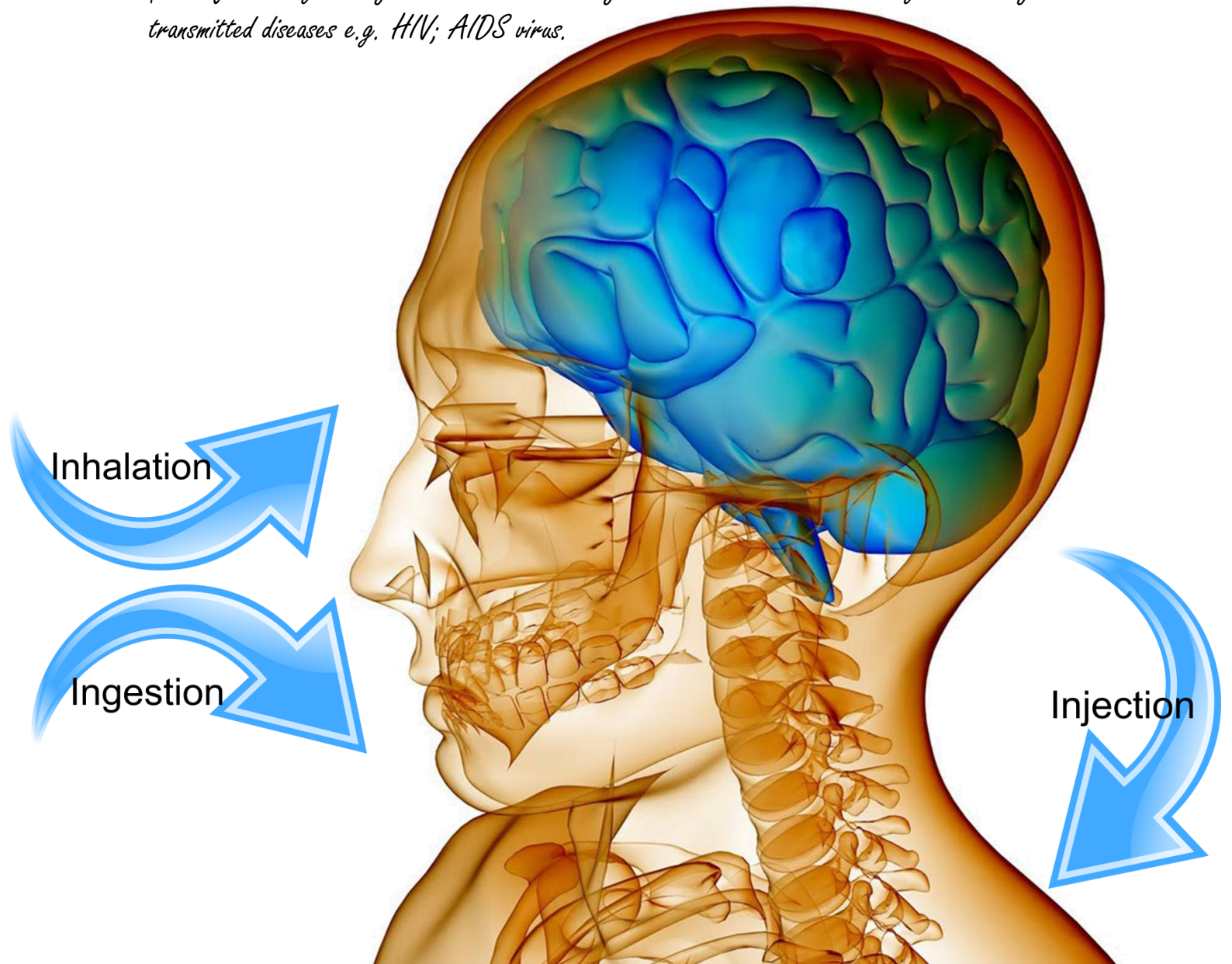
Nutrients - Lack of food hinders bacterial growth, and growth is favoured by a sufficient quantity of the proper kind of food.

Warmth - Temperature has a profound influence on the growth rate of microorganisms. Microorganisms subjected to adverse temperatures are either destroyed or are not able to multiply. The optimum temperature of a microorganism is the temperature that provides for the most rapid growth of that microorganism.

Time - Time to reproduce.

2.2 Explain the ways an infective agent might enter the body

Answer An infective agent might enter the body through a number of different ways that an infective agent (pathogenic organisms) can enter the body to cause infection. These are called Routes of infection, and include: Inhalation (breathing in droplets from coughs or sneezes into the lungs causing coughs, cold, influenza and other common airborne infections are contracted in this fashion); Ingestion (food, drink or other infected products can be swallowed and infect the stomach or bowels. Most people have experienced a pain stomach, which reveals itself in the form of diarrhoea and or vomiting); Injection (via needle stick injury, insect bites or where tubes are inserted such as catheters or wound drains); Up the urinary and reproductive systems (the infectious agent may remain localized or may enter the blood stream leading to sexually transmitted diseases e.g. HIV; AIDS virus.



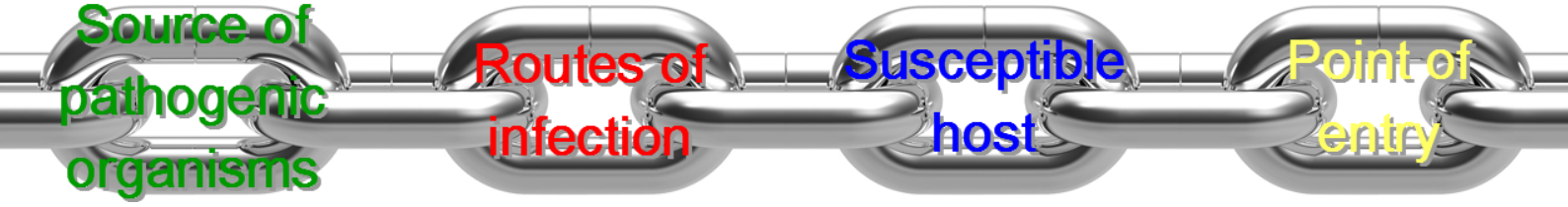
2.3 Identify common sources of infection

Answer: Common sources of infection are the following: People, contaminated laundry, contaminated food, clinical waste, contaminated equipment, dust.

2.4 Explain how infective agents can be transmitted to a person

Answer: Infective agents can be transmitted to a person via: hands, equipment, and environment.

Model of Chain of Infection



2.5 Identify the key factors that will make it more likely that infection will occur

Answer: The key factors that will make it more likely that infection will occur are the following: babies, children, old people, and people with low immunity due to illnesses or conditions.

What is infection control?

The definition of infection is the presence and multiplication of micro-organisms in the body, producing disease or illness. It is also used to describe the process of infecting, like the communication of disease.
The definition of immune system is the combined action of the body's various means of fighting infection.

Infection is a word we all use, but it is actually quite difficult to define. We can use the word in two ways:

To describe the presence of illness or disease; that could be anything from a localised infection, like a cut that has become inflamed, to influenza. These affect our entire system causing fever, aching joints, etc.
To describe the process by which someone becomes ill, through the transfer of disease from one person to another. The communication of infection can be direct or indirect contact with micro-organisms.

Infection control means taking action to prevent the spread of infectious diseases. Such diseases are mostly caused by micro-organisms which can be spread in several ways; Air-borne (in the air by breathing); Blood-borne (transfer through blood); Food-borne (food poisoning); Hand to hand contact.