

Chapter 2: Infection

Infection in schools

Infections in school children are common. Schools are ideal places for the spread of infectious diseases because of the large numbers of young people of different ages in close contact with each other some of whom may not have developed good personal habits or immunity to various diseases. Understanding the way different infectious diseases spread allows the correct preventive measures to be applied.

What is infection?

Micro-organisms, also known as germs, are tiny living organisms that cannot be seen by the naked eye. Germs can be found in many different places, some live in the environment, some in animals and others in humans. These germs fulfil many important functions and their presence in the human body is necessary for health. Some germs however, can cause infection. Infection develops when germs which do not usually inhabit the human body gain access, multiply and invade human tissue resulting in signs and symptoms of infection (e.g. redness, heat, swelling, fever).

Several types of germs cause infection including; bacteria, viruses, fungi, protozoa and parasites. Infectious diseases caused by bacteria include scarlet fever and meningitis. Viruses, which are much smaller than bacteria, cause diseases such as measles, mumps, rubella (German measles), chicken pox and HIV. Fungal infections include ringworm and athlete's foot and parasites include head lice and scabies.

Not all infectious diseases are contagious. Ear infections are caused by germs that are not usually passed from person to person. Chicken pox on the other hand rapidly spreads from person to person and is an example of a highly contagious infectious disease.

Who is at risk of infection?

Everyone is susceptible to infection. Once a person comes in contact with an infectious agent or germ, a number of factors influence whether or not that person becomes ill. These include; the germ itself, the number of germs required to cause infection (i.e. infectious dose) and how efficient a particular germ is at causing disease. Other factors depend on us; how strong is our immune system, have we met that germ before, are we resistant to it? Some infections result in lifelong immunity which is why most of us will only develop chicken pox or measles once in our lives, while other infections like the common cold can be caught again and again.

How do infections spread?

Infections can spread in a variety of ways: the five most common routes are:

1. Through the gastrointestinal tract, (intestines and faeces) e.g. infectious diarrhoea and hepatitis A.
2. Through the respiratory tract, (eyes, nose, mouth and lung secretions) e.g. colds and influenza.
3. Through direct contact, (skin contact, contact with saliva and other body fluids, sexual contact), e.g. bacterial skin infections such as impetigo, molluscum contagiosum, scabies, and through indirect contact with surfaces or materials such as pencils, handkerchiefs, soiled clothing and crockery and cutlery which have been contaminated by germs, e.g. influenza and the common cold.
4. Through contact with infected blood e.g. hepatitis B, hepatitis C and HIV/AIDS.
5. Through ingestion of contaminated food or water e.g. food poisoning.

Many germs can be spread even before a person develops signs of infection. The interval between contact with infection and the time symptoms develop is called the incubation period. People are often infectious during the latter part of the incubation period. For example children with measles are infectious for about 3 days before the appearance of a rash.

Furthermore, some germs can happily live in the nose and throats of people who never develop symptoms of infection, yet they can pass it to another person. These people are referred to as 'carriers'.

Spread through the gastrointestinal tract or gut

Some diseases are caused by germs which live and multiply in the intestines or gut and are passed out of the body in the faeces. For disease to spread, faeces containing these germs must be carried to the mouth and swallowed. Disease can spread when even very small amounts of faeces, amounts so small that they cannot be seen by the naked eye, contaminate hands or objects and are unknowingly brought to the mouth and swallowed. This is also known as the **faecal-oral (faeces to mouth) route of transmission** and usually occurs when hands are contaminated after using the toilet. Hands can also contaminate objects such as pencils and door-handles which are then handled, allowing the germs to pass to the next pair of hands and ultimately to the mouth of the next person, and so the infectious chain continues.

Gastrointestinal spread is responsible for the spread of most infectious diarrhoea as well as some more generalised infections such as hepatitis A. Worm infestation is also spread in this way. Anyone can catch these infections and many of them e.g. infectious diarrhoea and thread worms, can be caught again and again.

Spread through the respiratory tract

Some infectious diseases are spread by germs that can live and multiply in the eyes, airways (including the nose and mouth), and the lungs. These germs are easily passed from our nose or mouth to our hands and from there to other objects. This could be another hand, or it could be an item such as a pen or pencil. Some infections are spread by droplets that are expelled by an infected person when they sneeze, cough or talk. Droplet spread usually requires the infected person and the susceptible contact to be relatively close to one another, within about 3 feet. Examples include; common cold, influenza, meningococcal disease, mumps, rubella and pertussis (whooping cough). Other infections are spread by small aerosol droplets that remain in the air where they are carried on air currents (airborne spread) for some time after they are expelled e.g. measles, chickenpox and tuberculosis.

Direct contact

A number of infections and infestations (an infestation is when a person is infected with a parasite e.g. head lice or worms) require direct contact for transmission to occur. Some infections require only superficial contact with an infected site for infection to spread e.g. conjunctivitis (pink eye), impetigo (a bacterial skin infection), ringworm, and scabies. With others, infection is only passed if there is either direct contact with the infected site or with contaminated objects. Other infections require more intimate or prolonged contact for transmission.

Infections caused by viruses such as glandular fever (also called infectious mono, or mono, is caused by the Epstein Barr virus or EBV), cold sores (caused by the herpes simplex virus or HSV) and cytomegalovirus infection (CMV), can be spread by contact with body secretions such as saliva (EBV, HSV, CMV) and urine (CMV), or by contact with the actual lesions (HSV). All of these infections, as well as many others can also be transmitted by sexual contact.

Blood Contact

Hepatitis B, hepatitis C and HIV/AIDS are three important viral infections that are spread through contact with blood.

Infection with these blood borne viruses (BBVs) can occur if blood from an infected person gets into the bloodstream of an uninfected person. This usually requires a breach in the skin or mucous membranes (the mucous membranes are the delicate linings of the body orifices; the nose, mouth, rectum and vagina). Intact skin provides an effective barrier to these germs and infection following contact with intact skin is extremely unlikely. However, infection can occur if the skin is broken, if someone has open cuts, or if the infected blood is carried through the skin e. g. on a needle or sharp instrument.

It is also possible for infection to occur through sexual intercourse with an infected person. Infection can also be passed from mother-to-infant during pregnancy or at the time of delivery.

The potentially serious consequence of acquiring these diseases means that all blood and body fluids must be treated as potentially infectious. This is particularly important because clinical illness is not always obvious in infected individuals. Indeed most infected individuals, pupils and staff, may not even be aware that they are carriers of these viruses. School staff should therefore assume that all blood is infectious, regardless of its source. Basic good hygiene precautions should be applied on a routine basis, rather than relying on the identification of infectious pupils or staff. This is the only way to guarantee a safe environment for staff and pupils.

Spread through food or water

Food-poisoning is an illness that occurs when food or water which is contaminated by germs, or by toxic substances produced by germs, is eaten or drunk. Food which has become contaminated can then act as a vehicle to pass the germs to other people. Similarly, water that is contaminated can also act as a vehicle to pass germs to other people. Public water supplies are generally treated to prevent spread of germs. Untreated or inadequately treated water can spread water borne illness. Schools whose water supply is from a well or a small private group water scheme should ensure that the water quality is adequate for drinking purposes, food preparation etc. Further information is available in Appendix 1.