



Key Stage 3

Infection Prevention and Control (IPC): Vaccinations

Teacher Guidance

Background Information

Our immune system generally fights any pathogenic microbes that may enter our bodies and helps keep us healthy. It has three major lines of defence:

1. **Stopping pathogens entering the body**

Our skin is the first line of defence stopping many harmful microbes entering our body. The mucus and cilia (tiny hairs) in our nose trap any microbes and stop them entering our lungs. Our stomach contains acid which may kill some harmful microbes and keep us healthy. Even the tears in our eyes produce enzymes (although this is a chemical, not a physical barrier) that kill bacteria.

2. **Non-specific White Blood Cells (WBC)**

These WBCs are known as phagocytes and are non-specific because they will literally try to engulf and kill anything, they are not fussy. They engulf and digest foreign bodies by a process known as phagocytosis. They also trigger an inflammatory response by causing blood (makes the area red and hot) and plasma (makes the area swell up) to flow to the infected area. All this enables the right cells to get to the area and fight the infection.

3. **Specific White Blood Cells (WBC)**

These WBCs are specific in that they target microbes only. All invading microbes have a unique molecule on their surface called an antigen. When these WBCs come across an antigen they don't recognise they start to produce proteins called antibodies. The antibodies then attach to the antigens marking them for destruction by other WBCs. The antibody will ONLY attach to the specific antigen for which it was created. Antibodies are created rapidly by the WBCs and flow around the blood attaching themselves to the invading microbe or pathogen. When all the pathogens are destroyed, the antibodies stay in the blood ready to fight the disease should it return. In this way, the body maintains a memory of the disease making you immune to many diseases you have already had. If the pathogen attacks again the body is ready and quickly produces antibodies to fight the infection.

We can help our immune system fight microbes by getting vaccinated. Vaccines are used to prevent, NOT treat infection. A vaccine is usually made from weak or inactive versions of the same microbes that make us ill. In some cases, the vaccines are made from cells which are similar to, but not exact copies of, the microbe cells that make us ill. Some diseases are caused by a toxin the microbe

produces so some vaccines contain a substance that is similar to the toxin known as a toxoid. Examples are: Cholera and Diphtheria. When the vaccine is introduced into the body the immune system attacks it as if harmful microbes were attacking the body. The WBCs create lots of antibodies to attach to the antigens on the surface of the vaccine. Because the vaccine is an inactivated or extremely weakened version of the microbe the WBCs successfully eliminate all the microbial cells in the vaccine and the vaccine will not make you ill. By successfully eliminating all the vaccine antigens, the immune system remembers how to combat those microbes. The next time microbes carrying the same antigen enter the body, the immune system is ready to fight it before it has a chance to make you ill.

In some cases, the immune system needs reminding, and this is why some vaccinations require booster jabs. Some microbes, such as the influenza virus, are tricky and change their antigens. This means that the immune system is no longer equipped to fight them. For this reason, we have annual flu vaccinations.

The use of vaccines has meant that some previously common diseases, e.g. smallpox, have now been eradicated. The re-emergence of other diseases in a population, e.g. measles, may be due to not vaccinating a large enough proportion of the population. Epidemics can be prevented by vaccinating a large enough part of the population or by a sufficient proportion of the population becoming infected and developing natural immunity leading to herd immunity. However, vaccination can be preferential because of the long-term side effects of having certain diseases

SW2 World Map Activity

Students should research which vaccinations are required for travel around the world.

Other vaccinations may also have been included in their answers. Note that vaccine requirements can update frequently. For the most up to date information, visit [NHS Fit for Travel](#).

Canada:

MMR; DTaP (Diphtheria, Tetanus and Polio); Typhoid; Hep. A; Hep. B; Rabies

South America:

MMR; DTaP; Typhoid; Hep. A; Hep. B; Rabies; Yellow Fever; Malaria

Western Europe:

MMR; DTaP; Typhoid; Hep. A; Hep. B; Rabies

Africa:

MMR; DTaP; Typhoid; Hep. A; Hep. B; Rabies; Yellow Fever; Encephalitis; Cholera; Meningitis

Russia:

DTaP; Typhoid; Hep. A; Hep. B; Rabies; Encephalitis

Far East:

MMR; DTaP; Typhoid; Hep. A; Hep. B; Rabies; Encephalitis

Asia:

MMR; DTaP; Typhoid; Hep. A; Hep. B; Rabies; Encephalitis; Cholera

Australia:

MMR; DTaP; Typhoid; Hep. A; Hep. B; Rabies; Encephalitis