# SURVIVING CHALLENGES FROM ORGANISMS THAT CAUSE DISEASE

**Summary**


- Disease is any condition that impairs normal functioning of the body.
- Infectious diseases are caused by another organism (pathogen) or pathogenic agent and can be transmitted from one host to another.
- Non-infectious diseases are due to factors other than pathogenic agents.
- Most diseases have an incubation period between the time of infection by the pathogen and the onset of disease symptoms.
- Some bacteria are pathogens.
- Bacteria can be identified by their shape, form of colony, reactions to stains, and nutritional requirements.
- All viruses are obligate intracellular parasites and all cause disease (are pathogens).
- Viruses consist of a nucleic acid core surrounded by a protein coat. They rely on their host cell for replication.
- Prions are pathogenic agents even smaller than viruses. They are protein in nature.
- Some fungi are pathogens of plants or animals.
- Some protozoans are pathogens.
- Protozoan parasites may rely on a vector organism or intermediate host to transmit them to new hosts.
- Multicellular parasites include flukes, tapeworms and roundworms. Many have complex life cycles, including two or more different hosts, to help them disperse.
- Some arthropods, such as ticks and fleas, are ectoparasites and can cause minor diseases or act as a vector organism for microscopic pathogens.
- Infection by pathogens can be prevented by quarantining infected organisms and using antiseptics and disinfectants to clean wounds and surfaces that may house bacteria and fungal spores.
- Chemicals can be used to fight pathogens in the body. Antibiotics are powerful chemicals naturally secreted by fungi that are effective against bacteria and other organisms.
- All organisms have defence mechanisms to protect them from infectious diseases.
- Plants have physical barriers such as a waxy cuticle, hairs and thorns.


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- Plants may use resins and waxes to protect wounds on their surface from microscopic infections. Plants also secrete chemicals such as phytoalexins that are effective in destroying or deterring a range of pathogens.

- Pathogens need to enter the body of their host. 'First lines of defence' prevent this entry. In humans, the skin and mucous membranes form the 'first line of defence'. Blood clotting and wound repair help to maintain the skin's integrity.

- 'Non-specific defences' - phagocytes, blood complement proteins and inflammation - are activated on entry of a pathogen. Virus-infected cells secrete interferons, which help protect surrounding cells from viral infection.

- 'Specific defences' against infecting pathogen are based on the host's immune system recognising 'self' from 'non-self' using MHC markers.

- 'Specific defences' involve production of antibodies by lymphocytes: B-cells, and T-cells.

- Antibodies are Y-shaped protein molecules produced by B-cells that are capable of responding to a specific antigen. When activated, B-cells clone to produce plasma and memory cells. Plasma cells produce large amounts of specific antibody. Memory cells can be quickly activated upon reinfection by the pathogen, providing long-lasting immunity against that pathogen.

- T-lymphocytes come in several forms, including T-helper cells and cytotoxic T cells.

- B-cells clone under the control of lymphokines and interleukins secreted by T-helper cells.

- Cytotoxic T-cells produce powerful cytotoxins to kill virus-infected cells and cancerous cells and also cause rejection of transplanted organs.

- T-cells also act against specific antigens. When activated, T-cells divide repeatedly to produce effector and memory cells. They also rely on secretions from T-helper cells to do this.

- Natural killer cells, another group of lymphocytes, are only partly specific in their action. They produce powerful toxins to kill virus-infected or tumour cells.

- Vaccination injects the antigen of a particular pathogen into the patient. This stimulates the immune system to produce antibodies and memory cells, which provide long-lasting immunity. This is active, artificial immunity.

- Antibodies given directly to a person provide short-term, passive immunity. This immunity is only temporary, as the immune system has not been stimulated to produce memory cells.

- Autoimmune diseases occur when the immune system fails to distinguish self from non-self and starts attacking tissues of the body itself.

- Allergies are exaggerated immune responses to normally harmless substances.

- Immune-deficiency diseases occur when the immune system does not function effectively, rendering the patient vulnerable to normally harmless or minor pathogens