


HSC Biology

Core 3 - Search for Better Health

Focus 4

 Often we recognise an infection by the symptoms it causes. The immune response is not so obvious, until we recover.

Identify defence barriers to prevent entry of pathogens in humans:

- Skin.
- Mucous membranes.
- Cilia.
- Chemical barriers.
- Other body secretions.

Line of Defence	Description	Effect
<p>Skin</p>	<ul style="list-style-type: none"> - Tough outer barrier. <ul style="list-style-type: none"> - Cells contain keratin. - Organisms unable to penetrate. - Continuously grows by new cells replacing old cells from below. - Cells fit together tightly to form a protective layer covered by dead cells. 	<ul style="list-style-type: none"> - Prevents entry of pathogens. - Skin pores secrete substances that kill bacteria. <ul style="list-style-type: none"> - Sebum. - Lipids broken down, produce acids. - Inhibit growth of bacteria & fungi.

<p>Mucous membrane</p>	<ul style="list-style-type: none"> - Cells lining; - Respiratory tract/openings. - Urinary systems. - Reproductive systems. <p>secrete protective mucous layer.</p> <ul style="list-style-type: none"> - Must allow for exchange of substances. 	<ul style="list-style-type: none"> - Sticky mucous traps pathogens & other particles. - Mucous flushes them out. - Protection aided by antibody IgA. - Reacts with potential pathogens. - Fluids: <ul style="list-style-type: none"> - Tears. - Saliva. - Nasal secretions. - Contain lysosome, breaks down cell walls of bacteria.
<p>Cilia</p>	<ul style="list-style-type: none"> - Hair-like structures from cells lining air passages. <ul style="list-style-type: none"> - Nose. - Trachea. - Bronchial tubes. 	<ul style="list-style-type: none"> - Wave like motions push pathogens & mucus from lungs, up the throat.
<p>Chemical barriers</p>	<ul style="list-style-type: none"> - Acid in stomach. - Alkali in small intestine. - Lysozyme (enzyme) in tears. 	<ul style="list-style-type: none"> - Stomach acid destroys pathogens. - Alkali destroys resistant pathogens. - Lysozyme dissolves bacteria cell membranes. - Make inhospitable conditions.
<p>Other body secretions</p>	<ul style="list-style-type: none"> - Sweat glands. 	<ul style="list-style-type: none"> - Chemicals destroy

	- Oily secretions from glands on hair follicles.	bacteria & fungi.
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Identify antigens as molecules that trigger the immune response.

- Antigens;
 - Any molecule the body recognises as foreign.
 - Protein molecules.
 - Activate immune response.
 - Each pathogen has own antigen.
- Immune response:
 - Reaction to invasion by foreign materials.
 - Antigens.
 - Viruses, bacteria, toxins, etc.
 - Body then attempts to destroy them.
- If chemical barriers fail to remove pathogens, immune system activated.
 - Distinguishes between parts of the body & foreign particles.
 - If phagocytes (white blood cells) can't do this, body cells are destroyed.

Explain why organ transplants should trigger an immune response.

- Immune system recognises organ as foreign particles.
 - New organ surface contains antigens.
 - Organ contains proteins that are foreign.
 - Triggers antigen-antibody response.
 - Immune system recognises organ as a pathogen.
 - Immune response stimulated.
 - Attacks, destroys foreign organ.

Identify defence adaptations, including:

- Inflammation response.
- Phagocytosis.
- Lymph system.
- Cell death to seal off pathogen.

Non-specific Responses - The 2nd Line of Defence:

- **Inflammation response:**
 - Response to isolate & destroy foreign particles, prepare tissue for healing.
 - Blood vessels in affected area receive extra blood (dilate).
 - Area becomes swollen, red, hot & painful.
 - Also helps to confine pathogen.
 - Extra w.b.cs. destroy pathogen.
 - Histamines & prostaglandins in damaged tissue increase permeability of blood vessels.
 - White blood cells able to leave vessels, destroy pathogen.
 - Move into damaged tissue.
 - Dead cells & toxins removed quickly.
- **Phagocytosis:**
 - Phagocytes;
 - White blood cells.
 - Actively move from blood cells to tissues.
 - Ingest, destroy foreign material.
 - Process where cells change shape.
 - Allows them to engulf foreign particle.
 - Broken up by enzymes.
 - White blood cells (leukocytes);
 - Macrophages.
 - Small numbers in acute responses.
 - Mainly chronic inflammation due to longer life.
 - Outlive neutrophils.
 - Major role in destroying chronic infections.

- Neutrophils.
 - Active in acute inflammation.
 - Destroy cell walls.

- **Lymph System:**

- Lymphocytes:
 - Leukocytes active in chronic inflammation.
- Lymph system within tissues consists of lymph capillaries.
 - Unite → larger vessels similar to veins.
 - Pump tissue fluid away from cells, towards heart.
- Lymph glands:
 - Produce lymphocytes, added to lymph.
- Returns intercellular fluid to blood system.
- Filters cell debris.
- Produces white blood cells.
 - Used in immune response.

- **Cell Death to Seal Off Pathogen:**

- When body unable to neutralise antigen.
- Pathogens completely surrounded by *macrophage* or *lymphocytes*.
 - Form a granuloma.
 - Central core of dead tissue surrounded by layers of macrophages or lymphocytes.
 - Fibroblasts produce a tough outer wall.
- Leukocyte dies.
 - Pathogen has no food source.
 - Dies.
- This process form pus.

Gather, process and present information from secondary sources to show how a named disease results from an imbalance of microflora in humans.

- **Candidiasis or thrush:**
 - Caused by fungi:
 - Candida albicans.
 - A natural organism in the body.
 - Occurs in;
 - Mouth.
 - Respiratory tract.
 - Genital tract.
 - Gastrointestinal tract.
 - Candidiasis occurs when:
 - Imbalance in Candida albicans cells.
 - Usually kept in balance by competition from other micro-organisms.
 - eg. Lactobacilli (in gastrointestinal tract).
 - Microflora imbalance brought about by;
 - Taking antibiotics / steroids.
 - The pill.
 - Malnutrition.
 - Diabetes mellitus.