Edexcel (B) Biology A-level

6.7 - Response to infection

Flashcards

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What is an antigen?

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What is an antigen?

Cell-surface molecule can stimulate immune response.

Usually (glyco)protein, sometimes (glyco)lipid or polysaccharide.

Immune system recognises as “self” or “non-self” = enables identification of cells from other organisms of same species, pathogens, toxins & abnormal body cells.

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Outline the process of inflammation.

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Outline the process of inflammation.

1. Damaged vessels release histamines, causing vasodilation.
2. Blood flow & permeability of blood vessels increase.
3. White blood cells & plasma into the infected tissue.

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Name the 2 types of white blood cell involved in phagocytosis.

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Name the 2 types of white blood cell involved in phagocytosis.

Neutrophils

Macrophages (can become antigen-presenting cells)

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How does phagocytosis destroy pathogens?

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How does phagocytosis destroy pathogens?

1. Phagocyte moves towards pathogen via **chemotaxis**.
2. Phagocyte engulfs pathogen via endocytosis to form a **phagosome**.
3. Phagosome fuses with lysosome (**phagolysosome**).
4. Lysozymes **digest pathogen**.
5. Phagocyte absorbs the products from pathogen hydrolysis.

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Explain the role of antigen-presenting cells (APCs).

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Explain the role of antigen-presenting cells (APCs).

Macrophage displays antigen from pathogen on its surface (after hydrolysis in phagocytosis).

Enhances recognition by T_H cells, which cannot directly interface with pathogens/ antigens in body fluid.

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Give 2 differences between specific and nonspecific immune responses.

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Give 2 differences between specific and nonspecific immune responses.

Nonspecific (inflammation, phagocytosis) = same for all pathogens.

Specific (B & T lymphocytes) = complementary pathogen.

Nonspecific = immediate.

Specific = time lag.

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Name the 2 types of specific immune response.

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Name the 2 types of specific immune response.

- Cell-mediated
- Humoral

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Outline the process of the cell-mediated response.

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Outline the process of the cell-mediated response.

1. **Complementary** T_H lymphocytes bind to foreign antigen on APC.
2. Stimulates:

a. Clonal expansion of complementary T_H cells (rapid mitosis): become **memory cells** or trigger **humoral response.**

b. Clonal expansion of **cytotoxic T cells** (T_C): secrete enzyme **perforin** to destroy infected cells.

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Outline the process of the humoral response.

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Outline the process of the humoral response.

1. **Complementary** T_H lymphocytes bind to foreign antigen on antigen-presenting T cells.
2. Release cytokines that stimulate clonal expansion (rapid mitosis) of **complementary B lymphocytes**.
3. B cells differentiate into **plasma cells**.
4. Plasma cells secrete **antibodies** with complementary variable region to antigen.

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What is an antibody? Describe its structure.

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What is an antibody? Describe its structure.

Proteins secreted by plasma cells.

Quaternary structure: 2 '**light chains**' held by disulfide bridges, 2 longer '**heavy chains**'.

Binding sites on **variable region** of light chains have specific tertiary structure **complementary to an antigen**.

The rest of the molecule is known as the **constant region**.

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How do antibodies lead to the destruction of a pathogen?

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How do antibodies lead to the destruction of a pathogen?

- Formation of antigen-antibody complex results in agglutination.
- Activation of complement.
- Opsonisation (marks microbes for phagocytes).
- Precipitation/neutralisation (makes toxins insoluble).

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What are memory cells?

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What are memory cells?

Specialised T_H/ B cells produced from primary immune response.

Remain in low levels in the blood.

Can divide very rapidly by mitosis if organism encounters the same pathogen again.

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Contrast the primary and secondary immune response.

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Contrast the primary and secondary immune response.

secondary response:

- Faster rate of antibody production.
- Shorter time lag between exposure & antibody production.
- Higher concentration of antibodies.
- Antibody level remains higher after the secondary response.
- Pathogen usually destroyed before any symptoms.

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Compare passive and active immunity.

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Compare passive and active immunity.

- Both involve antibodies
- Can both be natural or artificial

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Give examples of passive and active immunity.

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Give examples of passive and active immunity.

Passive natural: antibodies in breast milk/ across placenta.

Passive artificial: anti-venom, needle stick injections.

Active natural: humoral response to infection.

Active artificial: vaccination.

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Contrast passive and active immunity.

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Contrast passive and active immunity.

Passive	Active
No memory cells & antibodies not replaced when broken down = short-term	Memory cells produced = long-term
Immediate	Time lag
Antibodies from external source	Lymphocytes produce antibodies
Direct contact with antigen not necessary	Direct contact with antigen necessary

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Explain the principles of vaccination.

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Explain the principles of vaccination.

1. Vaccine contains dead/ inactive form of a pathogen or antigen.
2. Triggers primary immune response.
3. Memory cells are produced and remain in the bloodstream, so secondary response is rapid & produces higher concentration of antibodies.
4. Pathogen is destroyed before it causes symptoms.

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What is herd immunity?

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What is herd immunity?

Vaccinating 80-90% of population reduces available carriers of the pathogen to control disease transmission.

Protects individuals who have not been vaccinated e.g. those with a weak immune system.

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