**Review Worksheet ANSWERS: Internal Non-Specific Defences**

1: List the FIVE key non-specific internal defences the body uses to react to foreign substances or tissue damage:

(5 marks)

*Natural Killer Cells (1)*

*Phagocytosis (1)*

*Inflammation (1)*

*Fever (1)*

*Lymphatic System (1)*

2: What type of blood cells are Natural Killer Cells (NKC), and what specific type of cell are they related to?

(1 mark)

*NKC are a type of white blood cell (0.5). They are related to lymphocytes, another type of white blood cell.(0.5)*

3: How do NKC neutralise pathogens?

(3 marks)

*They release chemicals that destroy cell membranes (1) and release cytokines (1) that attract other immune cells (1).*

4: What stops NKC from damaging healthy cells?

(4 marks)

*Healthy cells have proteins on their surface (0.5) that act as “self” markers (0.5) so they can be identified as normal tissue so they don’t get attacked.(0.5)*

*Damaged cells (0.5) such as those infected by virus (0.5), or cancer cells, (0.5) do not have as many “self” markers (0.5) so are more likely to be targeted by NKC.(0.5)*

5: What is a phagocyte? What cell type are they? Give specific examples of phagocytes.

(4 marks)

*Phagocytes are cells that can engulf and digest (0.5) micro-organisms and cell debris (0.5). Several types of leukocyte (WBC) are phagocytes (0.5), for example neutrophils, eosinophils and monocytes. (0.5)*

6: How do phagocytes get to the site of injury or diease?

(3 marks)

*Some phagocytes are in the blood (0.5) and move into the tissues at the site of injury (0.5). Macrophages (0.5) are a type of phagocyte that is always within the tissues (0.5). Some are fixed in place and detect and consume passing pathogens (0.5), and others wander through the tissues.(0.5)*

7: When does the process of Inflammation occur, and what is its function?

(2 marks)

*Inflammation occurs in response to any tissue damage (0.5), and reduces spread of pathogens (0.5), removes damaged tissue and cell debris (0.5), and begins the repair process (0.5)*

8: Describe the steps of inflammation in detail, from the moment of tissue injury until the stage is set for tissue healing.

(11 marks)

*A: Tissue damage occurs (0.5). Pathogens may or may not be introduced and continue damage (0.5)*

*B: Tissue damage (0.5) causes Mast Cells (0.5) to release Histamine (0.5) and Heparin (0.5)*

*Histamine causes local capillaries (0.5) to dilate and become leaky (0.5), to allow leukocytes to enter the area of tissue damage (0.5). This causes redness, heat, swelling and pain. (0.5)*

*Heparin prevents clotting in the immediate area. (0.5)*

*C: Complement proteins (0.5) are activated (0.5) and attract phagocytes (0.5), which are able to enter the tissues due to the leaky, dilated vessels in the area (0.5). The phagocytes engulf and digest dead cells and bacteria. (0.5)*

*D: Once pathogens are cleared (0.5), mast cells and complement (0.5) cease chemical messaging (0.5). Local capillaries return to normal (0.5), phagocytosis stops (0.5) and the stage is set for tissue healing (0.5).*

9: Important signs of inflammation are redness, heat, swelling and pain. Explain why these occur during inflammation:

(5 marks)

*Redness and heat (1) occur due to the local vasodilation at the site of injury (1). Swelling and pain occur (1) due to the capillary leakage of fluid into the tissue (1), and the triggering of nociceptors.(1)*

10: Fever is part of the body’s generalised immune response to infection. What is the purpose of raising body temperature in response to infection?

(1 mark)

*The body raises temperature to combat pathogens (0.5). These are generally less able to reproduce and do damage at higher body temperatures. (0.5)*

11: What are pyrogens, and what is their effect?

(2.5 marks)

*Pyrogens are fever causing chemicals (0.5). They affect the hypothalamus (0.5) so that the homeostatic set-point (0.5) for body temperature (0.5) is set to a higher level.(0.5)*

12: How does the body respond to the higher homeostatic set point for temperature caused by the pyrogens?

(3.5 marks)

*The body responds by activating a warming response (0.5) to bring body temperature up (0.5) to the new set point (0.5), for example via vasoconstriction (0.5), shivering (0.5), and seeking warmth (0.5). This brings the body temperature up to the fever point. (0.5)*

13: What happens after the infection has been dealt with and pyrogens are no longer produced?

(1 mark)  
  
*The hypothalamus (0.5) resets to the normal temperature set point of 37C. (0.5)*

14: How does the body respond when set point returns to normal?

(1 mark)

*The body initiates a cooling response (0.5) – vasodilation (0.5), sweating (0.5), feeling too hot and removing clothing (0.5).*

15: What are some possible negative consequences of the fever response?

(1 mark)

*Prolonged and/or very high fever can cause damage and even death. (1)*

16: What is the lymphatic system and how does it work?

(3 marks)

*The lymphatic system is a network of vessels (0.5) that removes intracellular fluid that has escaped the capillaries (0.5), and transports it via a series of lymph nodes (0.5) and then returns it to the blood circulation.(0.5) It has no pump (0.5) and relies on action of skeletal muscles during normal body movement to transport lymph.(0.5)*

17: What is the function of the lymph nodes in internal non-specific defence against disease?

(5 marks)

*The lymph nodes filter the lymph (0.5), trapping cell debris (0.5), foreign particles (0.5) and micro-organisms (0.5). They contain lymphoid tissue (0.5), composed of large numbers of lymphocytes (0.5) and macrophages (0.5) which engage in phagocytosis (0.5) and also have a role in specific immunity (0.5). Lymphocytes can become inflamed when dealing with pathogens. (0.5)*

18: Draw and label the parts of the reflex arc on the diagram below:

(6 marks – half mark per label)

