**Chronic inflammation and repair – Answers**

**Pathological process identification and report writing**

Q1 What is the special name given to this combination of fibroblast cells and new blood vessels?

A1 Granulation tissue.

Q2 What would be the effect on lung function of permanent thickening of the alveolar walls by fibrous tissue?

A2 Reduced efficiency of gaseous exchange due to thickening by fibrosis, which may lead to breathlessness and respiratory failure in severely affected cases.

Q3 What is the central cell co-ordinating the process of organisation of angiogenesis with fibrosis?

A3 The macrophage.

Q4 Where is the repair taking place? What cells types are involved in REPAIR?

A4 Repair is taking place in the dermis (under and around the wound closure site) with endothelial cells forming new capillaries and fibroblasts secreting collagenous fibrous tissue.

Q5 Where is the regeneration taking place? What cells types are involved in regeneration?

A5 Regeneration is taking place at the epithelial surface by the squamous epithelial cells, which are proliferating to replace the missing epithelial cells at the site of the wound closure.

Q6 What is the origin of plasma cells and what is their function? What are the other main cell types involved in chronic inflammation?

A6 Plasma cells are mature B lymphocytes emerging from the germinal centres of lymphoid tissue. Each plasma cell makes one specific antibody (in large amounts). The other cell types in chronic inflammation are macrophages, lymphocytes and occasional eosinophils.
Q7 What is granulation tissue? What are the two main cell types present?

A7 The two cell types seen in granulation tissue are capillaries (endothelium) and fibroblasts. Granulation tissue makes fibrous tissue (mostly collagen fibres).

Q8 What chemical mediators trigger the onset of the repair process? Which cell secretes these mediators?

A8 Macrophages are the central cell recruiting endothelia with FGF & VEGF, and recruiting and stimulating fibroblasts with FGF & TGF-beta

Q9 Draw a graph showing the numbers of neutrophils, macrophages, lymphocytes, plasma cells and fibroblasts as time passes in a focus of tissue injury. What factors contribute to the changes in cellular composition that your graph shows?

Q10 What is the difference between repair and regeneration?

A10 Repair involves synthesis of fibrous tissue (to fill the space left by injured tissue) by granulation tissue. Regeneration involves replacement of lost cells by the same cell type (e.g. epithelial cells proliferate and migrate across a wound to fill the space and recreate the epithelial surface as it was before).

Q11 Which cells of chronic inflammation and/or repair are most prevalent in this case?

A11 Plasma cells are the most prevalent cells with only small numbers of macrophages and lymphoid cells and some background granulation tissue endothelial cells and fibroblasts.
This tissue is a piece of a polyp taken from the middle ear of a patient with a longstanding (chronic) infection of the middle ear. The **most prevalent cell is the plasma cell**, recognised by the eccentrically placed nucleus in which the chromatin is clumped around the periphery, reminiscent of the numbers on the face of a clock (hence “clock-faced nucleus”) and the cytoplasm, which is purple. It may sometimes be possible to see a pale vacuole or halo near to the nucleus, which is the Golgi apparatus. It is also possible to recognise a few naïve lymphocytes that have a densely stained circular nucleus that occupies most of the cell with little cytoplasm. Macrophages are also present. They are large phagocytic cells, with a pale nucleus and a pale cytoplasm that contains phagocytosed material. These chronic inflammatory cells represent the adaptive immune system (B lymphocytes becoming plasma cells with fewer T lymphocytes) responding to infection in the middle ear – the plasma cells are making antibodies against the infecting bacteria.

There is also some granulation tissue in the background of the tissue; most obvious at the periphery of the tissue, where there is a zone in which organisation is occurring. The two major cell types seen in granulation tissue are capillaries (endothelium) and fibroblasts (a few macrophages may also be seen). Some neutrophils are also present, underlining the point that, although the predominant findings are those of chronic inflammation, there is also a co-existing component of acute inflammation.

**This combination of cells of inflammation and repair is characteristic of the pathological process of chronic inflammation.**