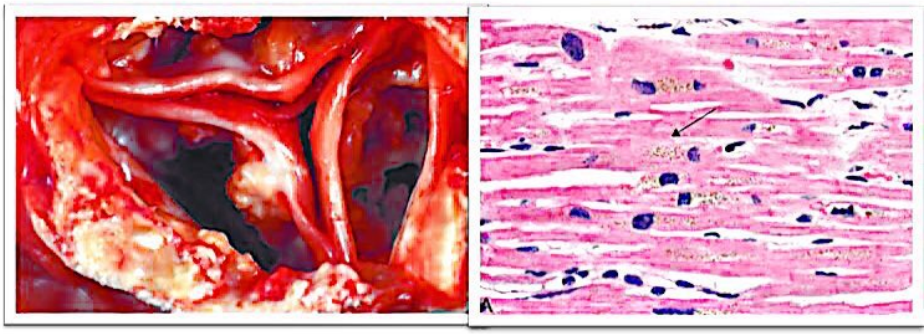
UNIVERSITY OF ZAMBIA
SCHOOL OF MEDICINE

HISTOPATHOLOGY 1
STUDY FORMATION 4.0

- CELL INJURY
- INFLAMMATION



COORDINATORS

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1. Cellular adaptations to cell injury include
   F a. Apoptosis
   T b. Atrophy
   T c. Hypertrophy
   T d. Hyperplasia
   T e. Metaplasia

2. The ubiquitin-proteasome pathway is especially active during
   F a. Pathologic hyperplasia
   F b. Pathologic hypertrophy
   T c. Atrophy
   T d. Cancer cachexia
   F e. Keloid formation

3. Causes of cell injury include
   F a. Telomere programmed lengthening
   T b. Nutritional imbalances
   T c. Genetic defects
   T d. Trauma
   T e. Oxygen deprivation

4. The subcellular responses to injury are
   F a. Apoptosis
   T b. Cytoskeletal abnormalities
   F c. Heterophagy
   F d. Hypotrophy of smooth endoplasmic reticulum
   T e. Autophagy

5. The following structures in a normal state may be directly visualized using light microscopy:
   F a. DNA
   F b. Viral inclusion bodies
   T c. Mitochondria
   T d. Bacteria
   T e. Parasites

6. Functional consequences of decreased intracellular adenosine triphosphate [ATP] during cell injury include
   T a. Clumping of nuclear chromatin
   T b. Loss of microvilli
   T c. Appearance of blebs
   F d. Reduced afflux of potassium ions
   F e. Increased pH

7. Pathologic effects of reactive oxygen species during cell injury are
   F a. Inactivation of catalase
   T b. Lipid peroxidation of membranes
   T c. Cross linking of proteins
   T d. DNA fragmentation
   F e. All the above

8. Examples of apoptosis in pathologic conditions
   F a. Involution of hormone-dependent tissues upon hormone deprivation
   F b. Elimination of potentially harmful self-reactive lymphocytes
   T c. Cell death induced by cytotoxic T lymphocytes
   T d. Atrophy inparenchymal organs after duct obstruction
   F e. All the above

9. Biomolecules involved in the death receptor [extrinsic] pathway of apoptosis include
   T a. Bid
   T b. Type 1 TNF
   T c. Fas
   T d. FasL
   T e. FLIP

10. Cellular aging results from
   F a. Mitochondrial damage
   T b. DNA damage
   T c. Accumulation of metabolic damage
   T d. Reduced regenerative capacity of tissue stem cells
   T e. Decreased cellular replication

11. Transudate is produced when there is
    - T a. Increased hydrostatic pressure
    - F b. Reduced hydrostatic pressure
    - F c. Increased colloid osmotic pressure
    - T d. Reduced colloid osmotic pressure
    - F e. Hydrostatic pressure equals colloid osmotic pressure

12. Endothelial adhesion molecules are
    - F a. L-selectin
    - F b. VLA-4 integrin
    - T c. P-selectin
    - T d. E-selectin
    - F e. All the above

13. Vasoactive amines include
    - F a. Bradykinin
    - F b. Anaphylatoxins
    - T c. Serotonin
    - T d. 5-hydroxytryptamine
    - T e. Histamine

14. Arachidonic acid metabolites with inflammatory actions include
    - T a. Prostacyclin
    - F b. Prostaglandin E1
    - T c. Prostaglandin E2
    - T d. Leukotriene B4
    - F e. Thromboxane A3

15. Endothelial effects of tumour necrosis factor and interleukin 1 are
    - F a. Increased anticoagulant activity
    - T b. Increased protease activity
    - F c. Reduced levels of acute phase proteins
    - F d. Reduced levels of platelet-derived growth factor [PDGF]
    - F e. All the above

16. Systemic effects of tumour necrosis factor and interleukin 1 are
    - F a. Increased anticoagulant activity
    - T b. Increased protease activity
    - F c. Reduced levels of acute phase proteins
    - F d. Reduced levels of platelet-derived growth factor [PDGF]
    - T e. Neutropenia

1. Atrophy
   - F a) Is a hallmark of cancer
   - T b) Is a decrease in the number of cells
   - F c) Is an increase in the metabolic activity of the cell
   - F d) Is always a pathological response
   - T e) Is the main cause of decrease in brain size in patients with Alzheimer disease

2. Which of the following may cause metaplasia
   - F a) Decreased workload
   - F b) Denervation
   - F c) Diminished blood supply
   - F d) Inadequate nutrition
   - T e) Chronic irritation of the epithelium

3. Liquefactive Necrosis
   - T a) Is caused by bacterial infection
   - F b) Is cheese-like on gross appearance
   - F c) May be caused by oedema
   - F d) Occurs in all solid organs except the heart
   - F e) Is a reversible change

4. Coagulative Necrosis
   - F a) Is caused by bacterial infection
   - F b) Is cheese-like on gross appearance
   - T c) May be caused by thrombosis
   - F d) Occurs in all solid organs except the heart
   - e) Is a reversible change

5. Calcification
   - F a) Is an adaptive response
   - F b) Is a characteristic features of metaplasia
   - F c) Occurs only in dead cells
   - T d) Is associated with benign tumours
   - T e) May cause organ dysfunction

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6. Chronic inflammation
   - F a) Is rapid in onset
   - F b) Has a short duration
   - F c) Characterized by blood and plasma protein exudation
   - T d) Characterised by macrophage accumulation.
   - F e) Is typified by neutrophils

7. Chronic inflammation
   - F a) Is characterised by the presence of neutrophils at the site of injury
   - F b) Is rapid in onset
   - F c) Is of shorter duration compared to acute inflammation
   - T d) Is associated with vascular proliferation and fibrosis
   - F e) Does not occur in solid organs

8. Which of the following is not a cellular event in acute inflammation
   - F a) Diapedesis
   - T b) Thrombosis
   - F c) Cellular transmigration
   - F d) Phagocytosis
   - F e) Margination

9. Causes of cell injury include the following
   - T a) Nutritional imbalances
   - T b) Chemical agents
   - T c) Infectious agents
   - T d) Aging
   - T e) Immunological reactions

10. Fatty change in cell injury
   - T a) Is a reversible change
   - T b) Occurs in cells participating in fat metabolism such as glial cells
   - F c) Manifested by appearance of clear vacuoles in the cytoplasm
   - F d) Is manifested by appearance of lipid vacuoles in the nucleus
   - F e) Characteristic of necrosis

11. Morphological features of reversibly damaged cell
   - T a) Swelling of endoplasmic reticulum
   - T b) Swelling of mitochondria
   - F c) Fragmentation of cell membrane
   - F d) Lysosomal rupture

T e) Clumping of chromatin

2. Necrosis

T a) Is associated with loss of membrane integrity
T b) Characteristic of infarcts in solid organs
F c) May occur in physiological conditions
F d) Is not associated with inflammation
T e) Associated with dissolution of cells

3. Cell derived mediators of acute inflammation include

T a) Histamine
T b) Serotonin
T c) Prostaglandins
F d) Bradykinin
F e) Anaphylatoxin c3a

4. Granulomatous inflammation may occur in the following diseases

T a) Tuberculosis
T b) Sarcoidosis
T c) Syphilis
F d) Malaria
F e) Pneumonia

15. Characteristics of systemic effects of inflammation

T a) Leukopenia
T b) Fever
T c) Leucocytosis
F d) Increased sweating
T e) Increased heart rate

16. Wound healing:

F a) Usually results in wounds achieving maximal strength by one month
F b) Is characterized by neovascularisation becoming maximal by 48 hours
F c) Is facilitated by steroids
T d) By secondary intention is characterized by a more intense inflammatory respc
F e) Does not usually involve contraction in the size of the wound

17. Concerning the repair of a well opposed, clean surgical incision:

T a) Dermal appendages destroyed by the incision usually recover
F b) New collagen begins to accumulate after the first week

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F c) Granulation tissue does not occur
T d) There is an initial inflammatory response
F e) 15% of original tissue strength is attained after 1 week

18. Wound healing:
T a) Is influenced by both cell-cell and cell-matrix interactions
F b) Is characterized by neovascularisation within the first six hours
F c) Is by secondary intention when a wound is created by a clean surgical incisio
f d) Leads to eventual scar formation within 24 hours
f e) Is considered abnormal if granulation tissue appears by day 5.

19. After the initial injury a surgical skin wound will usually reach 70% of the te
strength of unwounded skin at:
F a) Day 5
f b) During the second week
T c) By the end of the first month
f d) By the end of the third month
T e) A surgical wound can exceed a tensile strength greater than 60% of unwou
skin

20. Wound healing:
f a) Occurs by secondary intention in surgical wounds
f b) Is accelerated by glucocorticoids
f c) Achieves maximal wound strength at two weeks
T d) Does depend on site or size of wound
T e) Occurring by secondary intention involves abundant granulation tissue.

1) A 40 year old man is admitted to the University teaching hospital with complains of left chest pain. Blood test are carried out that show a raised Troponin I. Angiography to highlight the patients coronary arteries (blood vessels that supply blood to the heart muscle) demonstrates significant narrowing. A stent is quickly placed at the area of narrowing to allow for restoration of blood flow to the heart muscle. Restoration of blood flow to ischemic tissue can promote recovery of cells if they are reversibly injured, but can also paradoxically exacerbate the injury and cause cell death;

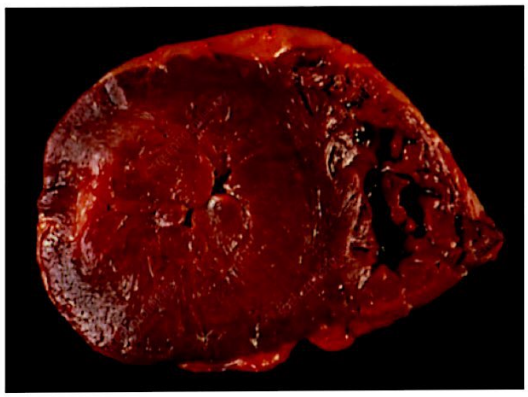
a.Describe the mechanisms of ischemic cell injury

b.What do we call the paradoxical exacerbation of injury when blood flow to ischemic tissue is restored? Explain why this happens.

c.What are the morphologic features of an irreversibly injured cell

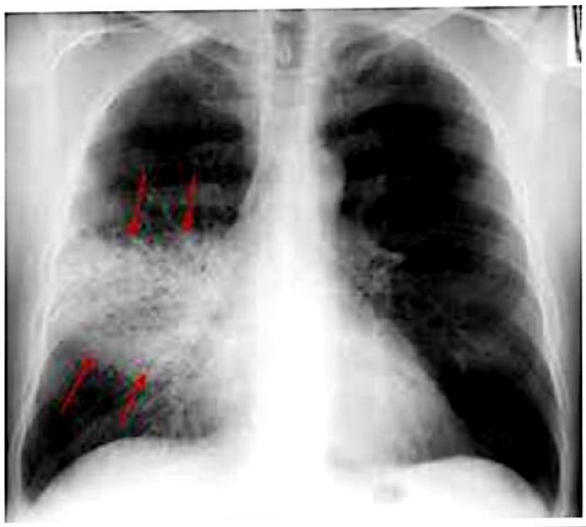
d.Briefly describe the patterns of tissue necrosis

- **2) An autopsy is done on a 78 year old man. The heart and brain are as seen in the photographs below**



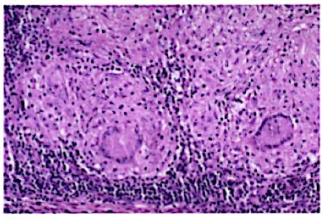
- a) What does the brain show?
- b) Name two diseases that can cause what the brain demonstrates.
- c) What does the heart show?
- d) What can cause what the heart is demonstrating?

3) A 24 year old female presents with a 5 day history of a cough, fever and associated chest pain. Full blood count done at the hospital demonstrates a raised white blood cell count with a differential white cell count showing a significantly raised polymorphonuclear count. A chest X-ray done is as shown below.



A. Given what is show in the X-ray and the clinical picture, what does the patient have?
B. What type of inflammation is taking place?
C. Describe briefly the main events leading to transmigration of leukocytes across the vessel wall during this inflammatory process.
D. Describe briefly the vascular events occurring during this inflammatory process
E. Name one other investigation that should be done in this patient?

4) A 23 year old woman presents with fever, night sweats and weight loss and a persistent cough. She also has swollen/enlarged cervical and axillary lymph nodes. A biopsy of these lymph nodes is done and demonstrates cheesy material grossly and microscopically as below



a)what is shown in the histology section above?
b)what type of inflammation is it?
c)what disease does the patient most likely have?
d)what stain should be used to highlight the pathology at histology and what will it show?
e)if a chest X-ray is done, what are we most likely to seen and why?

Note: **THE FINAL PAPER WILL BE SIMILAR TO THE MODEL PAPER BUT WILL FOLLOW TOS EXACTLY.**

1. Which of the following types of necrosis is grossly opaque and chalky white:

a) Coagulation necrosis.
b) Liquefaction necrosis.
c) Caseous necrosis.
d) Fat necrosis.
e) Gangrenous necrosis.

Key: d
Ref: Cell Injury, Death and Adaptation.

2. Which of the following types of necrosis is most commonly associated with ischaemic injury:

a) Coagulative necrosis.
b) Liquifactive necrosis.
c) Caseous necrosis.
d) Fat necrosis.
e) Gangrenous necrosis.

Key: a
Ref: Cell Injury, Death and Adaptation.

3. Dystrophic calcification is most closely associated with:

a) Hypercalcaemia.
b) Necrosis.
c) Chronic irritation.
d) Diminished blood flow.
e) Increased work load.

Key: b
Ref: Cell Injury, Death and Adaptation.

4. Localized area of ischaemic necrosis is mostly associated with:

a) Ascitese.
b) Petechiae.
c) Infarction.
d) Emboli formation.
e) Hematoma.

Key: c
Ref: Cell Injury, Death and Adaptation.

5. Metabolism is most closely associated with:

a) Diminished blood supply.
b) Increased work load.
c) Necrosis.
d) Chronic irritation.
e) Hypercalcemia.

Key: d
Ref: Cell Injury, Death and Adaptation.

6. Which of the following is a reversible change:

a) Karyorrhexis.
b) Pyknosis.
c) Karyolysis.
d) Swelling of endoplasmic reticulum.
e) Gangrenous necrosis.

Key: d
Ref: Cell Injury, Death and Adaptation.

7. After initiation of an acute inflammatory process third in a sequence of changes in vascular flow is:

a) Vasoconstriction.
b) Redness.
c) Leukocytic migration.
d) Vasodilation.
e) Slowing of the circulation.

Key: d
Ref: Acute and Chronic Inflammation.

8. Which of the following are thought to mediate, many of the systemic effects of inflammation are chemotactic and stimulate adhesion molecules:

a) Interleukin 1 (IL-1) and tumor necrosis factor.
b) C_{5a} and leukotriene B-4.
c) C_{3b}.
d) Leukotriene C_4, D_4 and E_4.
e) Bradykinin.

Key: a
Ref: Acute and Chronic Inflammation.

9. Which of the following is the hallmark of acute inflammation:

a) Neutrophils.
b) Connective tissue.
c) Macrophages.
d) Granulation tissue.
e) Granuloma formation.

Key: a
Ref: Acute and Chronic Inflammation.

10. Granuloma formation is most frequently associated with:

a) The healing process.
b) Acute inflammation.
c) Wound contraction.
d) Fibroblasts and neovascularization.
e) A persistent irritant.

Key: e
Ref: Acute and Chronic Inflammation.

11. Morphologic changes seen in chronic non-specific inflammation include an increase in:

a) Neutrophils, lymphocytes and liquefaction necrosis.
b) Neutrophils, macrophages and fibrosis.
c) Lymphocytes, plasma cells and fibrosis.
d) Giant cells, macrophages and coagulative necrosis.

Key: c
Ref: Acute and Chronic Inflammation.

12. Caseation necrosis is most characteristic of:

a) Acute myocardial infarction.
b) Tuberculosis.
c) Acute pancreatitis.
d) Cerebral infarct.
e) Pulmonary pneumoconiosis.

Key: b
Ref: Acute and Chronic Inflammation.

13. The most characteristic feature of granulation tissue is the:

a) Growth of fibroblasts and new capillaries.
b) Resemblance to a granuloma.
c) Character of the exudate.
d) Granular scar that results.
e) Presence of monocytes and fibroblasts.

Key: a
Ref: Healing and Repair.

14. The growth factor elaborated by macrophages, which recruits macrophages and fibroblasts to wound site and induces all steps in angiogenesis is:

a) Vascular endothelial growth factor.
b) Fibroblast growth factor.
c) Epithelial growth factor.
d) Platelet derived growth factor.
e) Endostatin.

Key: b
Ref: Healing and Repair.

15. A young man of 20, got a lacerated wound on his left arm, stiched-1 week later sutures were remained-healing continued but the site became disfigured by prominent raised irregular nodular scar, in next 2 months which of the following best describes the process:

a) Organization.
b) Dehiscence.
c) Resolution.
d) Keloid formation.
e) Secondary union.

Key: d
Ref: Healing and Repair.