LEC 4 Q –PATHOLOGY:

1. **What is the primary characteristic of apoptosis?**

   A) Uncontrolled cell swelling and lysis

   B) Programmed cell death with minimal inflammatory response

   C) Accumulation of damaged cells

   D) Sudden cell rupture

   Answer: B

2. **Which of the following best describes the cellular changes during apoptosis?**

   A) The cell membrane is disrupted and cellular contents leak out.

   B) The cell shrinks, and the nucleus undergoes fragmentation.

   C) The cell swells, and organelles are randomly destroyed.

   D) The cell replicates DNA and divides into new cells.

   Answer: B

3. **Which pathway of apoptosis is primarily controlled by the Bcl2 family of proteins?**

   A) Death receptor (extrinsic) pathway

   B) Mitochondrial (intrinsic) pathway

   C) Both pathways equally

   D) Neither pathway

   Answer: B

4. **What role do apoptotic bodies play in the process of apoptosis?**

   A) They initiate the inflammatory response.

   B) They signal phagocytes for engulfment and clearance.

   C) They promote cell division and growth.

   D) They increase the permeability of the plasma membrane.

Answer: B

5. **Which of the following is a physiologic cause of apoptosis?**

    A) DNA damage from radiation

    B) Viral infections

    C) Hormonal deprivation in the endometrium

    D) Accumulation of misfolded proteins

    Answer: C

6. **What is the primary function of autophagy?**

    A) To promote cell division in response to growth factors.

    B) To recycle cellular components during nutrient deprivation.

    C) To initiate the inflammatory process in damaged tissues.

    D) To prevent the formation of apoptotic bodies.

    Answer: B

7. **Which statement accurately describes the relationship between apoptosis and autophagy?**

    A) Both processes lead to cell swelling and inflammation.

    B) Autophagy is a form of programmed cell death similar to apoptosis.

    C) Apoptosis is an irreversible process, while autophagy can be adaptive.

    D) Both processes are exclusively pathogenic.

    Answer: C

8. **What triggers the activation of caspases in the mitochondrial pathway of apoptosis?**

    A) The release of growth factors

    B) The activation of death receptors on the cell surface

    C) The leakage of cytochrome c from mitochondria

    D) The fusion of autophagic vacuoles with lysosomes

Answer: C

9. **Which of the following statements is true regarding the role of phagocytes in apoptosis?**

   A) Phagocytes initiate apoptosis by releasing cytokines.

   B) Phagocytes clear apoptotic bodies without causing inflammation.

   C) Phagocytes undergo apoptosis themselves after engulfing apoptotic bodies.

   D) Phagocytes are not involved in the process of apoptosis.

   Answer: B

10. **What is a key distinction between necrosis and apoptosis?**

    A) Apoptosis always leads to inflammation, while necrosis does not.

    B) Necrosis is a programmed process, whereas apoptosis is uncontrolled.

    C) Apoptosis involves cell shrinkage, while necrosis involves swelling.

    D) Both processes are identical in terms of cellular response.

    Answer: C

11. **In which situation would you expect apoptosis to occur as a protective mechanism?**
    - A) During excessive cellular proliferation
    - B) When cells sustain irreparable DNA damage
    - C) During the development of self-reactive lymphocytes
    - D) In response to nutrient-rich environments

    Answer: C) During the development of self-reactive lymphocytes

12. **What triggers the intrinsic pathway of apoptosis?**

    A) Activation of death receptors on the cell membrane

    B) Growth factor withdrawal and cellular stress

    C) Leakage of cellular contents into the extracellular space

    D) Recruitment of phagocytes to the site of injury

    Answer: B

13. **What is the role of the Fas ligand in the extrinsic pathway of apoptosis?**

    A) It prevents apoptosis by activating survival signals.

    B) It binds to Fas receptors, leading to the activation of caspase-8.

    C) It initiates autophagy in damaged cells.

    D) It causes mitochondrial membrane permeability.

    Answer: B

14. **Which of the following is NOT a feature of autophagy?**

    A) Formation of autophagic vacuoles

    B) Digestion of cellular components by lysosomes

    C) Increased inflammation in surrounding tissues

    D) Recycling of nutrients during starvation

    Answer: C

15. **What would likely occur if autophagy fails in a cell?**

    A) The cell would undergo enhanced apoptosis.

    B) The cell would replicate uncontrollably.

    C) The cell would maintain normal function.

    D) The cell would become necrotic.

    Answer: A

16. **What is a common outcome of the accumulation of misfolded proteins in a cell?**

    A) Increased cellular energy production

    B) Induction of apoptosis

    C) Promotion of autophagy

    D) Enhanced cellular repair mechanisms

    Answer: B

17. **Which of the following conditions is a pathological trigger for apoptosis?**

A) Normal hormonal changes during menstruation

B) Nutrient scarcity leading to cellular stress

C) Damage from chemotherapy or radiation

D) The natural turnover of skin cells

Answer: C

18. **What does the term "self-eating" in the context of autophagy refer to?**

A) Cells dividing uncontrollably

B) Cells digesting their own damaged components

C) Phagocytes engulfing dead cells

D) Cells undergoing necrosis

Answer: B

19. **Which of the following is a characteristic feature of apoptotic cells?**

A) Swelling and lysis of the cell

B) Condensation of chromatin and fragmentation of the nucleus

C) Leakage of cellular contents into the extracellular space

D) Formation of large, necrotic areas in tissues

Answer: B

20. **What is the role of Bcl-2 proteins in the intrinsic pathway of apoptosis?**

A) They promote the release of cytochrome c from mitochondria.

B) They inhibit the activation of pro-apoptotic proteins.

C) They directly activate caspases.

D) They cause the cell to swell and rupture.

Answer: B

21. **Which type of cell death is characterized by inflammation and damage to surrounding tissues?**

A) Apoptosis

B) Autophagy

C) Necrosis

D) Pyroptosis

Answer: C

22. **During which physiological process is apoptosis crucial for tissue remodeling?**

    A) Inflammatory response

    B) Embryonic development

    C) Wound healing

    D) Immune response

    Answer: B

23. **In what scenario would autophagy primarily serve as a protective mechanism?**

    A) During cell division

    B) In response to nutrient deprivation

    C) When pathogens invade cells

    D) During excessive cell proliferation

    Answer: B

24. **What happens to the cell's mitochondrial membrane during the intrinsic pathway of apoptosis?**
    - A) It remains unchanged.
    - B) It becomes more permeable, allowing proteins to leak out.
    - C) It ruptures completely, causing necrosis.
    - D) It fuses with the plasma membrane.

    Answer: B

25. **Which of the following statements about apoptosis is correct?**

    A) It leads to the formation of large necrotic areas in tissues.

    B) It can be triggered by both physiological and pathological stimuli.

    C) It always results in an inflammatory response.

D) It is an unregulated process.

Answer: B

26. **What is the consequence of failing to remove self-reactive lymphocytes through apoptosis?**

    A) Enhanced immune function

    B) Development of autoimmune diseases

    C) Increased apoptosis in other lymphocytes

    D) Promotion of tissue repair

    Answer: B

27. **What initiates the extrinsic pathway of apoptosis?**

    A) The accumulation of misfolded proteins

    B) Binding of ligands to death receptors on the cell surface

    C) DNA damage beyond repair

    D) Mitochondrial dysfunction

    Answer: B

28. **How does autophagy contribute to cellular homeostasis?**

    A) By preventing cell death under all circumstances

    B) By recycling damaged organelles and proteins

    C) By increasing cellular metabolism

    D) By promoting cell division and growth

    Answer: B

29. **Which process is primarily responsible for clearing apoptotic cells from tissues?**

    A) Phagocytosis by macrophages

    B) Inflammatory response

    C) Autophagic degradation

D) Necrotic cell lysis

Answer: A

30. **Which of the following best describes the relationship between apoptosis and cancer?**

    A) Increased apoptosis always leads to cancer development.

    B) Cancer cells often evade apoptosis, leading to uncontrolled growth.

    C) Apoptosis has no impact on cancer development.

    D) Apoptosis only occurs in benign tumors.

    Answer: B.

Case Scenario

A 45-year-old woman presents to her primary care physician with fatigue, weight loss, and a new-onset rash. Laboratory tests reveal elevated liver enzymes, and a biopsy of the skin lesion shows inflammatory infiltrates and necrotic tissue. Further investigation indicates the presence of autoantibodies.

The physician suspects an autoimmune condition and explains the processes of apoptosis and autophagy in the context of immune regulation and tissue homeostasis.

1. **What is the most likely underlying mechanism leading to the accumulation of self-reactive lymphocytes in this patient?**

    A) Increased apoptosis of lymphocytes

    B) Failure of apoptosis in self-reactive lymphocytes

    C) Enhanced autophagy of immune cells

    D) Overproduction of cytokines

    Answer: B

2. **In the context of this patient's condition, which of the following best describes the role of apoptosis?**

    A) It promotes inflammation in tissues.

    B) It is responsible for eliminating damaged or self-reactive cells.

C) It enhances cellular proliferation in the immune system.

D) It prevents the recycling of cellular components.

Answer: B

3. **If this patient's condition progresses and her cells begin to accumulate misfolded proteins, which cellular response is most likely to be activated?**

   A) Increased necrosis

   B) Enhanced apoptosis

   C) Suppressed autophagy

   D) Increased cell division

   Answer: B

4. **Which of the following pathways is likely to be involved in the apoptosis of the patient's self-reactive lymphocytes?**

   A) Mitochondrial (intrinsic) pathway

   B) Death receptor (extrinsic) pathway

   C) Both pathways equally

   D) Neither pathway

   Answer: B

5. **Considering the role of autophagy in this patient's immune system, what might be the consequence of impaired autophagy?**

   A) Increased apoptosis of healthy cells

   B) Enhanced immune tolerance

   C) Accumulation of damaged organelles and proteins

   D) Improved response to infections

   Answer: C

Case Scenario

A 60-year-old man presents to the emergency department with jaundice and abdominal pain. A liver biopsy reveals significant cellular damage, with both necrotic and apoptotic cells observed. The patient has a history of heavy alcohol use and recently underwent chemotherapy for lung cancer.

Laboratory tests indicate elevated levels of misfolded proteins in his serum. The medical team is concerned about the balance between apoptosis and autophagy in the context of his liver health.

1. **Given the patient's history of heavy alcohol use, what cellular mechanism is most likely contributing to the accumulation of misfolded proteins?**

    A) Increased apoptosis

    B) Impaired autophagy

    C) Enhanced cell division

    D) Decreased necrosis

    Answer: B

2. **What cellular response is likely activated in the liver cells due to DNA damage from chemotherapy?**

    A) Increased autophagy to recycle damaged components

    B) Apoptosis to eliminate irreparably damaged cells

    C) Enhanced inflammation to promote healing

    D) Proliferation of liver cells

    Answer: B

3. **Which pathway of apoptosis is most likely engaged due to the patient's exposure to chemotherapy?**

    A) Mitochondrial (intrinsic) pathway

    B) Death receptor (extrinsic) pathway

    C) Both pathways equally

    D) Neither pathway

    Answer: A) Mitochondrial (intrinsic) pathway

4. **If the patient's liver cells fail to effectively undergo autophagy, what could be a potential consequence?**

    A) Increased apoptosis of healthy liver cells

    B) Enhanced detoxification of harmful substances

    C) Accumulation of damaged organelles and proteins

    D) Improved regenerative capacity of the liver

    Answer: C

5. **What would be the expected histological findings in the liver biopsy, considering both apoptosis and necrosis are present?**

    A) Swollen hepatocytes with disrupted membranes

    B) Membrane-bound apoptotic bodies and cellular shrinkage

    C) Increased cellular proliferation and inflammatory cell infiltration

    D) Normal liver architecture with no signs of cell death

    Answer: B

Case Scenario

A 30-year-old woman presents with fatigue, joint pain, and a skin rash. Laboratory tests reveal the presence of autoantibodies. A biopsy of her skin shows signs of apoptosis and inflammatory infiltrates.

1. **What mechanism is likely failing in this patient, contributing to the persistence of self-reactive lymphocytes?**

    A) Increased autophagy

    B) Impaired apoptosis

    C) Enhanced inflammation

    D) Decreased cell proliferation

    Answer: B

2. **In this case, what is the physiological role of apoptosis that is not functioning properly?**

A) It promotes cell division.

B) It eliminates damaged or self-reactive cells.

C) It enhances immune response.

D) It prevents inflammation.

Answer: B) It eliminates damaged or self-reactive cells.

Case Scenario 2: Chemotherapy Side Effects

A 55-year-old male with lung cancer receives chemotherapy and later presents with jaundice and abdominal pain. A liver biopsy shows both necrotic and apoptotic cells.

3. **What cellular process is likely being activated in response to DNA damage from chemotherapy?**

   A) Apoptosis of irreparably damaged liver cells

   B) Increased autophagy to remove damaged proteins

   C) Enhanced cellular proliferation

   D) Decreased inflammation

   Answer: A

4. **Which pathway is primarily responsible for apoptosis in this patient due to chemotherapy?**

   A) Mitochondrial (intrinsic) pathway

   B) Death receptor (extrinsic) pathway

   C) Both pathways equally

   D) Neither pathway

   Answer: A

Case Scenario

A 60-year-old man with a history of heavy alcohol consumption presents with ascites and liver dysfunction. Laboratory tests reveal elevated levels of misfolded proteins in his serum.

5. **What cellular mechanism is likely impaired in this patient, leading to the accumulation of misfolded proteins?**

    A) Increased apoptosis

    B) Impaired autophagy

    C) Enhanced cell division

    D) Decreased necrosis

    Answer: B

6. **If this patient's liver cells are unable to perform autophagy, what is a likely consequence?**

    A) Increased apoptosis of liver cells

    B) Enhanced liver regeneration

    C) Accumulation of damaged organelles and proteins

    D) Decreased inflammation

    Answer: C

Case Scenario

An 80-year-old woman presents with signs of frailty and muscle wasting. Histological examination of her muscle tissue shows increased levels of apoptotic cells.

7. **What is the most likely explanation for the increased apoptosis observed in the muscle tissue of this elderly patient?**

    A) Normal aging process leading to cellular turnover

    B) Increased autophagy compensating for muscle loss

    C) Dysfunctional apoptosis leading to muscle hypertrophy

    D) Enhanced immune response in muscle tissue

Answer: A

8. **What role does apoptosis play in the muscle tissue of elderly patients?**

    A) It prevents muscle loss.

    B) It allows for the removal of damaged or dysfunctional cells.

    C) It enhances muscle regeneration.

    D) It promotes inflammation in muscle tissue.

    Answer: B

Case Scenario

A 25-year-old woman is undergoing a routine check-up during her menstrual cycle. She reports normal symptoms, but a biopsy of the endometrial tissue reveals extensive apoptosis.

1. **What physiological process is responsible for the apoptotic death of endometrial cells at the end of the menstrual cycle?**

    A) Hormonal stimulation

    B) Hormone deprivation

    C) Increased blood flow

    D) Viral infection

    Answer: B

2. **What is the outcome of this physiological apoptosis in the context of her menstrual cycle?**

    A) It promotes inflammation.

    B) It leads to tissue regeneration.

    C) It facilitates the shedding of the endometrium.

    D) It increases cell proliferation.

    Answer: C

Case Scenario

A 50-year-old male patient with a history of heavy smoking presents with shortness of breath. A biopsy of lung tissue shows extensive apoptosis due to DNA damage.

3. **What is the primary reason for the apoptosis observed in the lung tissue of this patient?**

    A) Nutritional deficiency

    B) Viral infection

    C) DNA damage from carcinogens

    D) Hormonal imbalance

    Answer: C

4. **Which pathway is most likely activated in the apoptosis of these damaged lung cells?**

    A) Mitochondrial (intrinsic) pathway

    B) Death receptor (extrinsic) pathway

    C) Both pathways equally

    D) Neither pathway

    Answer: A

Case Scenario

A 70-year-old woman is hospitalized due to prolonged immobility. During her hospital stay, her muscle mass significantly decreases. Muscle biopsy shows signs of autophagy.

5. **What role does autophagy play in the context of muscle atrophy in this patient?**

    A) It promotes muscle regeneration.

    B) It recycles cellular components for energy.

    C) It leads to increased apoptosis.

    D) It enhances inflammation.

Answer: B

6. **If autophagy fails in this patient, what could be a potential outcome?**

    A) Increased muscle mass

    B) Decreased muscle function

    C) Enhanced recovery

    D) Improved overall health

    Answer: B

Case Scenario

A 35-year-old man is evaluated for autoimmune symptoms. Laboratory results show the presence of self-reactive lymphocytes. Biopsy reveals these cells undergoing apoptosis.

7. **What is the significance of apoptosis in the elimination of self-reactive lymphocytes?**

    A) It enhances the immune response.

    B) It prevents the development of autoimmune diseases.

    C) It leads to tissue damage.

    D) It promotes cellular proliferation.

    Answer: B

8. **Which mechanism might be impaired if self-reactive lymphocytes persist?**

    A) Apoptosis

    B) Autophagy

    C) Cell division

    D) Differentiation

    Answer: A) Apoptosis

Case Scenario

A 40-year-old woman is diagnosed with an acute viral infection. Tissue samples show both necrotic and apoptotic cells in affected areas.

9. **What role does apoptosis play in the context of viral infections?**

    A) It allows for the proliferation of infected cells.

    B) It eliminates infected cells to control the infection.

    C) It enhances the inflammatory response.

    D) It promotes necrosis of surrounding tissue.

    Answer: B

10. **What factors may trigger the apoptotic pathways in response to the viral infection?**

    A) Nutritional availability

    B) Growth factor signaling

    C) Damage-associated signals

    D) Hormonal changes

    Answer: C

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