Pathology - cell injury (pt3-B & pt 5)

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Q1. A 68-year-old man with a history of coronary artery disease is admitted to the hospital following a myocardial infarction (heart attack). He is stabilized but remains hypotensive. Blood tests reveal elevated lactate levels and low oxygen saturation. Over the next 24 hours, his condition worsens, and he develops multi-organ dysfunction.

Which of the following cellular events is most likely contributing to his multi-organ dysfunction?

A) Increased ATP production through oxidative phosphorylation due to hypoxia
B) Decreased ROS production, stabilizing mitochondrial function
C) Opening of mitochondrial permeability transition pores, leading to loss of membrane potential and cellular necrosis
D) Enhanced mitochondrial function leading to organ recovery

Q2. A 15-year-old girl presents with muscle weakness, exercise intolerance, and seizures. Genetic testing reveals a mutation in a gene encoding one of the mitochondrial electron transport chain complexes. Her lab results show elevated serum lactate

Which of the following is the most likely cellular consequence of her mitochondrial disorder?

A) Increased ATP production through alternative pathways
B) Failure of oxidative phosphorylation leading to reliance on anaerobic metabolism
C) Increased ROS production leading to protection from oxidative stress
D) Enhanced mitochondrial membrane potential preserving cellular function

Q3. A 60-year-old woman is undergoing chemotherapy for lung cancer. After several treatment cycles, she experiences significant fatigue, muscle weakness, and rapid weight loss. Her biopsy reveals cancer cell death, with high levels of apoptotic proteins in the cytoplasm and signs of mitochondrial swelling in non-cancerous tissues.

Which of the following mitochondrial events is most likely driving the apoptosis observed in her cancer cells?

A) Direct inhibition of the electron transport chain, leading to necrosis
B) Opening of mitochondrial permeability transition pores and release of cytochrome c
C) Increased ROS generation causing direct necrosis of cancer cells
D) ATP depletion due to impaired mitochondrial biogenesis, leading to apoptosis

Q4. A 55-year-old smoker presents with progressive shortness of breath. A lung biopsy shows black-colored material in alveolar macrophages. What is the most likely diagnosis?

A. Lipofuscin deposition
B. Carbon deposition (anthracosis)
C. Dystrophic calcification
D. Hemosiderosis

Q5. A biopsy of a patient's liver shows fatty change. The patient has a history of alcohol abuse. Which of the following mechanisms is responsible for this intracellular accumulation?

A. Inadequate removal of triglycerides
B. Failure to degrade a metabolite due to enzyme deficiency
C. Deposition of abnormal exogenous substance
D. Hypercalcemia leading to dystrophic calcification

Q6. A patient with advanced chronic kidney disease develops extensive calcifications in lung and kidney tissues. Laboratory tests show hypercalcemia. What is the underlying cause of the calcification?

A. Deposition in dead or injured tissues
B. Normal calcium metabolism
C. Metastatic calcification due to abnormal calcium metabolism
D. Protein accumulation due to cellular injury

Q7. biopsy of an atherosclerotic plaque reveals crystalline calcium deposits. The patient has normal calcium levels. Which of the following is the most likely explanation?

A. Dystrophic calcification due to tissue damage
B. Metastatic calcification due to hypercalcemia
C. Fatty degeneration
D. Lipid peroxidation

Q8. A 35-year-old man with hemolytic anemia has increased iron deposits in his liver, spleen, and bone marrow. What is the most likely pigment accumulating in these tissues?

A. Melanin
B. Lipofuscin
C. Hemosiderin
D. Calcium

Q9. A patient presents with severe bone pain and hypercalcemia due to bone disease. Extensive calcium deposition is noted in the kidneys. Which type of calcification is most likely present?

A. Dystrophic calcification
B. Metastatic calcification
C. Apoptotic calcification
D. Hemosiderosis

Q10. A 40-year-old woman is found to have yellow-brown pigmented granules in the cytoplasm of heart muscle cells on a biopsy. This pigment is derived from damaged cell membranes and is known as the "wear-and-tear" pigment. What is the most likely pigment?

A. Hemosiderin
B. Carbon
C. Lipofuscin
D. Melanin

True and False Questions

1. Dystrophic calcification occurs only in tissues with abnormal calcium metabolism.
2. Lipofuscin is often referred to as the "wear-and-tear" pigment.
3. In nephrotic syndrome, excess protein leaks into the urine, causing accumulation of proteins in renal tubules.
4. Hypercalcemia is always present in cases of dystrophic calcification.
5. Hemosiderosis is a systemic condition involving iron deposition in tissues.
6. Anthracosis is an endogenous accumulation of pigments in the lungs.
7. Atherosclerosis can lead to dystrophic calcification in blood vessels.
8. Apoferritin binds with calcium to form ferritin in the body.

9. Metastatic calcification occurs in normal tissues and is often associated with hypercalcemia.
10. Hyperparathyroidism can result in metastatic calcification due to high calcium levels.

Answer key

1. C
2. B
3. B
4. B
5. A
6. C
7. A
8. C
9. B
10. C

True and False

1. F
2. T
3. T
4. F
5. T
6. F
7. T
8. F
9. T
10. T