

LEC 5 Q – PATHOLOGY:

- 1. What is the primary cause of fatty liver disease (steatosis)?**
 - A) Inadequate protein intake
 - B) Excessive carbohydrate consumption
 - C) Inadequate removal of triglycerides
 - D) Increased alcohol consumption
- 2. Which condition is associated with the accumulation of abnormal endogenous proteins?**
 - A) Diabetes Mellitus
 - B) α 1-antitrypsin deficiency
 - C) Atherosclerosis
 - D) Nephrotic syndrome
- 3. What type of calcification occurs in dead or injured tissues while maintaining normal calcium metabolism?**
 - A) Metastatic calcification
 - B) Dystrophic calcification
 - C) Hemorrhagic calcification
 - D) Myocardial calcification
- 4. Which pigment is referred to as the "wear-and-tear" pigment and is commonly associated with aging?**
 - A) Hemosiderin
 - B) Lipofuscin
 - C) Melanin
 - D) Carbon
- 5. What is the primary mechanism behind glycogen accumulation in glycogen storage diseases?**
 - A) Excessive glucose intake
 - B) Deficiency in glycogen-degrading enzymes
 - C) Impaired insulin secretion
 - D) Increased muscle activity
- 6. Which of the following is a characteristic feature of exogenous pigment accumulation?**
 - A) Naturally produced in the body
 - B) Derived from environmental sources
 - C) Associated with normal physiological processes
 - D) Indicative of tissue damage

7. **What consequence can result from the accumulation of cholesterol in blood vessel walls?**
- A) Increased blood flow
 - B) Atherosclerosis
 - C) Decreased blood pressure
 - D) Enhanced oxygen delivery
8. **In the context of pathologic calcification, what typically causes metastatic calcification?**
- A) Local tissue necrosis
 - B) Abnormal calcium metabolism
 - C) Aging processes
 - D) Normal physiological processes

Answers

- 1 C
- 2 B
- 3 B
- 4 B
- 5 B
- 6 B
- 7 B
- 8 B

1. **In the context of fatty liver disease, which mechanism primarily contributes to the accumulation of triglycerides in hepatocytes?**
- A) Increased synthesis of fatty acids
 - B) Decreased transport of lipoproteins
 - C) Inadequate removal of normal substances
 - D) Enhanced fatty acid oxidation
2. **What is the primary pathological feature observed in Russell bodies within plasma cells?**
- A) Accumulation of lipids
 - B) Deposition of excessive immunoglobulins
 - C) Aggregation of misfolded proteins
 - D) Iron overload
3. **Which of the following conditions would most likely lead to dystrophic calcification?**

- A) Hyperparathyroidism
B) Chronic renal failure
C) Myocardial infarction
D) Osteoporosis
4. **Hemosiderin accumulation is typically associated with which of the following pathological conditions?**
- A) Vitamin D deficiency
B) Hemolytic anemias
C) Protein malnutrition
D) Myocardial ischemia
5. **Which mechanism underlies the development of metabolic derangements in glycogen storage diseases?**
- A) Impaired glycogen synthesis
B) Excessive glycogen degradation
C) Deficiency of glycogen-degrading enzymes
D) Enhanced glucose utilization
6. **What distinguishes metastatic calcification from dystrophic calcification?**
- A) The presence of necrotic tissue
B) The involvement of normal tissue and abnormal calcium metabolism
C) The types of minerals deposited
D) The histological staining properties
7. **In cases of carbon accumulation in the lungs, which clinical term describes the condition?**
- A) Silicosis
B) Anthracosis
C) Asbestosis
D) Pneumoconiosis
8. **What role does lipofuscin play in cellular aging, and what does its accumulation indicate?**
- A) It promotes cellular regeneration
B) It reflects oxidative stress and prior cellular injury
C) It enhances cellular metabolism
D) It indicates an increase in cellular replication

Answers

- 1 C
2 B
3 C

- 4 B
- 5 C
- 6 B
- 7 B
- 8 B

1. **In which scenario is the accumulation of cholesterol most likely to lead to significant cardiovascular complications?**
 - A) Increased dietary intake of saturated fats
 - B) Decreased synthesis of high-density lipoproteins (HDL)
 - C) Enhanced uptake of low-density lipoproteins (LDL) by macrophages
 - D) Elevated levels of triglycerides in plasma

2. **What is the underlying genetic mechanism responsible for glycogen accumulation in glycogen storage diseases?**
 - A) Chromosomal mutations affecting glucose transporters
 - B) Autosomal recessive mutations in enzymes responsible for glycogen degradation
 - C) Dominant mutations in glycogen synthase genes
 - D) Epigenetic modifications of metabolic pathways

3. **Which of the following best describes the histological appearance of dystrophic calcification?**
 - A) Amorphous, basophilic deposits in necrotic tissue
 - B) Highly organized, eosinophilic structures in healthy tissue
 - C) Granular, brown pigment within macrophages
 - D) Fine, crystalline deposits surrounding blood vessels

4. **What primary cellular alteration is associated with α 1-antitrypsin deficiency?**
 - A) Increased apoptosis of hepatocytes
 - B) Defective secretion of misfolded proteins
 - C) Enhanced synthesis of liver enzymes
 - D) Excessive formation of reactive oxygen species

5. **In the context of pathologic calcification, which of the following is a direct consequence of hyperparathyroidism?**
 - A) Increased absorption of calcium in the gastrointestinal tract
 - B) Decreased renal excretion of calcium
 - C) Enhanced bone resorption leading to calcium release
 - D) Formation of metastatic calcifications in soft tissues

6. **Which of the following describes the mechanism by which anoxia contributes to fatty liver disease?**
- A) Inhibition of lipid synthesis
 - B) Impairment of mitochondrial fatty acid oxidation
 - C) Increased gluconeogenesis
 - D) Enhanced protein synthesis in hepatocytes
7. **In chronic inflammation, which pigment accumulation is most indicative of prior oxidative stress and cell damage?**
- A) Melanin
 - B) Lipofuscin
 - C) Hemosiderin
 - D) Carbon
8. **What is the most significant consequence of lysosomal storage diseases on cellular metabolism?**
- A) Impaired protein synthesis
 - B) Accumulation of undigested substrates
 - C) Increased fatty acid oxidation
 - D) Enhanced cellular respiration

Answers

- 1 B
- 2 B
- 3 A
- 4 B
- 5 C
- 6 B
- 7 B
- 8 B

1. **Which of the following best describes the consequence of inadequate removal of normal substances in hepatocytes?**
- A) Steatosis leading to cirrhosis
 - B) Apoptosis due to lipid peroxidation
 - C) Increased bile acid production
 - D) Enhanced gluconeogenesis
2. **In cases of hemosiderosis, where is hemosiderin primarily found?**
- A) In circulating blood cells
 - B) Within mononuclear phagocytes of the liver, spleen, and bone marrow

- C) In the renal tubules
 - D) In adipose tissue
3. **What is the primary mechanism through which carbon dust accumulation leads to anthracosis?**
- A) Direct toxicity to lung epithelial cells
 - B) Ingestion by alveolar macrophages and transport to lymph nodes
 - C) Induction of inflammatory cytokines
 - D) Formation of reactive oxygen species
4. **Which pathological feature is most characteristic of lipid accumulation in the heart?**
- A) Fatty streaks in the coronary arteries
 - B) Myocardial hypertrophy
 - C) Lipid-laden foam cells
 - D) Interstitial fibrosis
5. **In patients with nephrotic syndrome, what leads to the accumulation of protein in renal tubules?**
- A) Decreased glomerular filtration rate
 - B) Increased protein reabsorption due to tubular injury
 - C) Excessive proteinuria leading to compensatory mechanisms
 - D) Stasis of urine flow
6. **Which pigment is most closely associated with aging and indicates prior cellular stress?**
- A) Hemosiderin
 - B) Lipofuscin
 - C) Melanin
 - D) Bilirubin
7. **In which condition would you most likely observe the deposition of dystrophic calcification?**
- A) Metastatic calcification in renal failure
 - B) Atherosclerosis
 - C) Chronic obstructive pulmonary disease (COPD)
 - D) Paget's disease of bone
8. **What role does α 1-antitrypsin play in the body, and how does its deficiency manifest pathologically?**
- A) It inhibits cholesterol synthesis; deficiency leads to hyperlipidemia
 - B) It protects tissues from proteolytic damage; deficiency causes liver damage and emphysema

- C) It facilitates fat metabolism; deficiency results in steatosis
- D) It regulates iron homeostasis; deficiency leads to hemosiderosis

Answers

- 1 A
- 2 B
- 3 B
- 4 C
- 5 C
- 6 B
- 7 B
- 8 B

1. **Which pathological mechanism primarily contributes to the liver's inability to export lipids in fatty liver disease?**
 - A) Decreased apoprotein synthesis
 - B) Increased hepatic gluconeogenesis
 - C) Enhanced lipid oxidation
 - D) Impaired lipoprotein lipase activity

2. **What specific cellular change is associated with the accumulation of neurofibrillary tangles in neurons?**
 - A) Increased mitochondrial dysfunction
 - B) Disruption of cytoskeletal integrity
 - C) Altered calcium homeostasis
 - D) Excessive lipid peroxidation

3. **In cases of lysosomal storage diseases, what is the consequence of enzyme deficiencies?**
 - A) Overproduction of lysosomal membranes
 - B) Accumulation of undigested substrates leading to cellular toxicity
 - C) Increased autophagic degradation of proteins
 - D) Enhanced synthesis of storage proteins

4. **Which mechanism underlies the pathological effects of oxidative stress seen in lipofuscin accumulation?**
 - A) DNA fragmentation
 - B) Lipid peroxidation and damage to cellular organelles
 - C) Activation of apoptosis pathways
 - D) Inhibition of protein synthesis

5. **In chronic inflammation, which cytokine is primarily responsible for promoting the accumulation of macrophages and subsequently hemosiderin?**
- A) Interleukin-1 (IL-1)
 - B) Tumor necrosis factor-alpha (TNF- α)
 - C) Interleukin-6 (IL-6)
 - D) Transforming growth factor-beta (TGF- β)
6. **What distinguishes the pathophysiology of metastatic calcification from that of dystrophic calcification on a molecular level?**
- A) The type of tissue affected
 - B) The involvement of normal versus damaged cells
 - C) The regulation of calcium-binding proteins
 - D) The role of matrix vesicles in mineralization
7. **How does increased insulin resistance in obesity contribute to hepatic steatosis?**
- A) It enhances lipid catabolism in the liver
 - B) It stimulates de novo lipogenesis while inhibiting fatty acid oxidation
 - C) It increases gluconeogenesis from amino acids
 - D) It promotes protein synthesis in hepatocytes
8. **Which of the following best describes the relationship between atherosclerosis and cholesterol accumulation?**
- A) Atherosclerosis results primarily from low-density lipoprotein (LDL) oxidation and inflammation
 - B) Cholesterol accumulation is a direct result of arterial wall hypertrophy
 - C) Atherosclerosis is purely a consequence of dietary fat intake
 - D) Cholesterol accumulation leads to the formation of healthy arterial plaques

Answers

- 1 A
- 2 B
- 3 B
- 4 B
- 5 B
- 6 B
- 7 B
- 8 A

1. **In the context of fatty liver disease, which of the following factors is most likely to lead to an increase in lipogenesis?**

- A) Decreased insulin levels
 - B) Elevated free fatty acid levels
 - C) Increased glucagon levels
 - D) Elevated carbohydrate intake
2. **What is the primary consequence of α 1-antitrypsin deficiency at the cellular level?**
- A) Accumulation of misfolded proteins causing apoptosis
 - B) Impaired degradation of oxidized low-density lipoproteins (LDL)
 - C) Enhanced activation of serine proteases leading to tissue damage
 - D) Decreased synthesis of inflammatory cytokines
3. **In which specific cellular organelle does the accumulation of lipofuscin primarily occur, and what does this indicate?**
- A) Nucleus; indicates DNA damage
 - B) Mitochondria; indicates oxidative stress
 - C) Lysosome; indicates impaired degradation
 - D) Endoplasmic reticulum; indicates protein misfolding
4. **What distinguishes the clinical manifestations of hemosiderosis from hemochromatosis?**
- A) Hemosiderosis is always asymptomatic, whereas hemochromatosis leads to organ dysfunction
 - B) Hemochromatosis is associated with iron overload due to genetic mutations, while hemosiderosis is often secondary to blood loss
 - C) Hemosiderosis leads to localized iron deposition, while hemochromatosis results in systemic deposition
 - D) Hemochromatosis primarily affects the liver, while hemosiderosis affects the spleen
5. **In the pathogenesis of atherosclerosis, what is the role of foam cells?**
- A) They facilitate cholesterol efflux from macrophages
 - B) They promote angiogenesis within plaques
 - C) They indicate chronic inflammation and contribute to plaque stability
 - D) They result from the accumulation of oxidized LDL in macrophages
6. **Which of the following mechanisms explains the relationship between diabetes mellitus and glycogen accumulation?**
- A) Decreased hepatic gluconeogenesis
 - B) Impaired insulin signaling leading to excess glycogen storage
 - C) Increased glucagon secretion stimulating glycogenolysis
 - D) Enhanced hepatic lipogenesis
7. **What histological feature is typically observed in tissues undergoing dystrophic calcification?**

- A) Biconvex mineral deposits in living tissue
- B) Basophilic, amorphous deposits within necrotic tissue
- C) Granular, eosinophilic structures in healthy tissue
- D) Crystalline deposits within living cells

8. **In the context of pathologic calcification, which of the following statements is true regarding metastatic calcification?**

- A) It primarily occurs in tissues damaged by necrosis
- B) It is a direct consequence of decreased parathyroid hormone levels
- C) It can occur in otherwise healthy tissues due to systemic hypercalcemia
- D) It is always associated with chronic inflammation

Answers

- 1 D
- 2 C
- 3 C
- 4 A
- 5 D
- 6 B
- 7 B
- 8 C

1. **Which factor is most responsible for the hepatic steatosis observed in diabetic patients?**

- A) Increased lipoprotein production
- B) Decreased fatty acid oxidation in hepatocytes
- C) Increased insulin-mediated lipolysis
- D) Enhanced gluconeogenesis in response to low blood glucose

2. **What histological characteristic distinguishes the accumulation of cholesterol esters in macrophages from other lipid accumulations?**

- A) Formation of clear vacuoles
- B) Presence of necrotic tissue
- C) Eosinophilic staining patterns
- D) Granular appearance within foamy cytoplasm

3. **Which of the following best describes the role of the endoplasmic reticulum in the pathophysiology of α 1-antitrypsin deficiency?**

- A) It enhances the folding of mutated proteins, preventing their secretion
- B) It accumulates misfolded proteins leading to cellular stress and apoptosis
- C) It increases lipid synthesis as a compensatory mechanism
- D) It facilitates the degradation of excess heme products

4. **In the context of chronic inflammation, which cell type is primarily involved in the deposition of hemosiderin?**
- A) Eosinophils
 - B) Neutrophils
 - C) Macrophages
 - D) Basophils
5. **What distinguishes the metabolic derangement observed in glycogen storage diseases from that in diabetes mellitus?**
- A) Increased glycogen synthesis in diabetes versus decreased in glycogen storage diseases
 - B) Impaired glycogen breakdown in glycogen storage diseases versus normal in diabetes
 - C) Elevated glucose levels in diabetes versus hypoglycemia in glycogen storage diseases
 - D) Enhanced lipogenesis in diabetes versus impaired in glycogen storage diseases
6. **Which of the following mechanisms underlies the development of atherosclerotic plaques?**
- A) Direct toxicity of cholesterol to endothelial cells
 - B) Recruitment of inflammatory cells and smooth muscle proliferation
 - C) Decreased synthesis of high-density lipoproteins (HDL)
 - D) Increased secretion of growth factors by adipocytes
7. **In the process of dystrophic calcification, which cellular event is most commonly observed?**
- A) Increased osteoblastic activity
 - B) Cellular necrosis or injury
 - C) Enhanced mineralization of living tissues
 - D) Proliferation of endothelial cells
8. **What is the main difference in the deposition patterns of exogenous versus endogenous pigments in tissues?**
- A) Exogenous pigments are more commonly associated with systemic diseases
 - B) Endogenous pigments often indicate tissue damage, whereas exogenous do not
 - C) Exogenous pigments typically result from environmental exposure, while endogenous are produced by the body
 - D) Endogenous pigments can be broken down and reused, while exogenous cannot

Answers

- 1 B
- 2 D
- 3 B
- 4 C
- 5 B
- 6 B
- 7 B
- 8 C

Extra Hard Multiple-Choice Questions

1. **In the context of fatty liver disease, what is the impact of anoxia on lipid metabolism in hepatocytes?**
 - A) It stimulates increased fatty acid oxidation
 - B) It enhances lipoprotein production
 - C) It leads to the accumulation of triglycerides due to impaired lipid transport
 - D) It increases ketogenesis as a compensatory mechanism

2. **Which type of calcification is most likely to occur in cases of chronic kidney disease due to secondary hyperparathyroidism?**
 - A) Dystrophic calcification
 - B) Metastatic calcification
 - C) Physiological calcification
 - D) Heterotopic calcification

3. **What histological change would you expect to see in the renal tubules of a patient with nephrotic syndrome?**
 - A) Increased collagen deposition
 - B) Presence of foamy macrophages
 - C) Accumulation of proteinaceous casts
 - D) Destruction of glomerular tufts

4. **In which condition is the presence of Russell bodies most commonly observed, and what do they signify?**
 - A) In chronic inflammation; they signify excessive antibody production
 - B) In chronic kidney disease; they indicate protein overload
 - C) In viral infections; they represent viral inclusions
 - D) In liver cirrhosis; they indicate excessive lipid accumulation

5. **What is the primary molecular mechanism leading to the formation of foam cells in atherosclerosis?**

- A) Increased synthesis of HDL particles
 - B) Uptake of modified LDL via scavenger receptors
 - C) Enhanced cholesterol efflux
 - D) Decreased inflammation in arterial walls
6. **How does the accumulation of hemosiderin in tissues reflect underlying pathophysiological processes?**
- A) It indicates acute inflammatory responses
 - B) It is a marker for tissue hypoxia
 - C) It represents excess iron storage due to repeated blood transfusions or hemolysis
 - D) It suggests increased erythropoiesis in response to anemia
7. **Which process characterizes the alteration in cellular function in lysosomal storage diseases?**
- A) Accumulation of toxic metabolites due to enzyme deficiencies
 - B) Enhanced cellular respiration due to increased substrate availability
 - C) Decreased cellular proliferation due to nutrient deprivation
 - D) Induction of apoptosis through oxidative stress
8. **In patients with chronic inflammation, which pigment is indicative of previous oxidative damage and aging?**
- A) Lipofuscin
 - B) Hemosiderin
 - C) Melanin
 - D) Bilirubin

Answers

- 1 C
- 2 B
- 3 C
- 4 A
- 5 B
- 6 C
- 7 A
- 8 A

Case 1: A 45-year-old male presents with fatigue, weight gain, and elevated liver enzymes. He has a history of obesity and consumes alcohol regularly. An ultrasound shows an accumulation of fat in the liver.

- 1. What is the most likely underlying mechanism for his liver condition?**
 - A) Increased lipogenesis due to insulin resistance
 - B) Enhanced fatty acid oxidation
 - C) Decreased triglyceride synthesis
 - D) Impaired export of lipoproteins

- 2. Which of the following factors is most likely contributing to his condition?**
 - A) Increased exercise levels
 - B) Excessive carbohydrate intake
 - C) High HDL cholesterol levels
 - D) Low fructose consumption

Case 2: A 30-year-old woman presents with progressive shortness of breath and recurrent liver problems. Laboratory tests reveal a deficiency in α 1-antitrypsin, and a liver biopsy shows the accumulation of abnormal proteins.

- 1. What is the primary pathological consequence of her condition?**
 - A) Increased production of inflammatory cytokines
 - B) Impaired protein synthesis in the liver
 - C) Accumulation of misfolded proteins leading to cellular damage
 - D) Enhanced degradation of oxidized LDL

- 2. What clinical manifestation might you expect to see in this patient?**
 - A) Development of lung emphysema
 - B) Increased risk of myocardial infarction
 - C) Enhanced insulin sensitivity
 - D) Elevated HDL levels

Case 3: A 5-year-old child is brought in for developmental delays and frequent infections. Genetic testing reveals a deficiency in an enzyme responsible for glycogen degradation.

- 1. What is the primary effect of this enzyme deficiency?**
 - A) Accumulation of glycogen in various tissues
 - B) Enhanced glucose metabolism

- C) Decreased lipid synthesis
- D) Increased protein catabolism

2. **Which of the following tissues is most likely to show significant accumulation of glycogen?**
- A) Cardiac muscle
 - B) Liver
 - C) Adipose tissue
 - D) Brain

Case 4: A 60-year-old male presents with chest pain and is found to have significant narrowing of the coronary arteries. His lipid profile shows elevated LDL levels.

1. **What mechanism is primarily responsible for the formation of atherosclerotic plaques in this patient?**
- A) Decreased cholesterol intake
 - B) Recruitment of inflammatory cells and lipid accumulation
 - C) Increased HDL synthesis
 - D) Enhanced vascular smooth muscle proliferation
2. **Which of the following lifestyle changes would most likely benefit his condition?**
- A) Decreasing physical activity
 - B) Increasing saturated fat intake
 - C) Reducing smoking and increasing exercise
 - D) Avoiding carbohydrates completely

Answers

Case Number	Question Number	Correct Answer
1	1	A
1	2	B
2	1	C
2	2	A
3	1	A
3	2	B
4	1	B
4	2	C

Case 1: A 50-year-old woman with a history of type 2 diabetes and obesity presents with jaundice and abdominal discomfort. A liver biopsy reveals macrovesicular steatosis and evidence of portal inflammation.

- 1. What is the most likely pathophysiological mechanism contributing to her liver condition?**
 - A) Increased free fatty acid mobilization from adipose tissue
 - B) Impaired hepatic β -oxidation of fatty acids
 - C) Decreased insulin signaling leading to excessive gluconeogenesis
 - D) Enhanced hepatic lipogenesis due to hyperglycemia
- 2. Which of the following complications is she at the highest risk for?**
 - A) Hepatic adenoma
 - B) Acute liver failure
 - C) Cirrhosis and hepatocellular carcinoma
 - D) Hepatic steatosis alone

Case 2: A 40-year-old male presents with chronic cough and progressive shortness of breath. He has a known α 1-antitrypsin deficiency. A CT scan reveals emphysema and liver cirrhosis.

- 1. What is the underlying mechanism that leads to lung damage in this condition?**
 - A) Excessive neutrophilic proteolytic activity due to the lack of inhibition
 - B) Impaired surfactant production in the alveoli
 - C) Direct oxidative damage to lung tissue
 - D) Increased mucus production and blockage of airways
- 2. Which of the following treatment options would be most beneficial for this patient?**
 - A) Supplemental oxygen therapy
 - B) Enzyme replacement therapy for α 1-antitrypsin
 - C) High-dose corticosteroids
 - D) Antiviral medications

Case 3: A 10-year-old boy presents with developmental regression, seizures, and hepatosplenomegaly. Genetic testing confirms a lysosomal storage disorder due to enzyme deficiency.

1. **What is the primary mechanism leading to neurological impairment in this condition?**
 - A) Accumulation of neurotoxic metabolites
 - B) Increased oxidative stress in neurons
 - C) Impaired synaptic transmission due to lipid accumulation
 - D) Loss of myelination in neural pathways

2. **Which type of clinical intervention is most likely to improve the patient's condition?**
 - A) Dietary modification to reduce fat intake
 - B) Gene therapy to correct the enzyme deficiency
 - C) Immunotherapy to enhance neuronal repair
 - D) Physical therapy to improve motor skills

Case 4: A 70-year-old male with a history of hypertension and hyperlipidemia presents with acute chest pain and is diagnosed with myocardial infarction. An angiogram reveals significant atherosclerotic lesions.

1. **What cellular process is primarily responsible for the instability of the atherosclerotic plaque in this patient?**
 - A) Smooth muscle cell proliferation
 - B) Apoptosis of macrophages within the plaque
 - C) Fibrous cap rupture due to inflammation
 - D) Increased endothelial repair mechanisms

2. **Which of the following preventive measures would be most effective in reducing the risk of future cardiovascular events for this patient?**
 - A) Increasing dietary cholesterol intake
 - B) Initiating a regimen of statins and antiplatelet therapy
 - C) Reducing physical activity to prevent strain
 - D) Smoking cessation without further medical intervention

Answers

Case Number	Question Number	Correct Answer
1	1	B
1	2	C
2	1	A
2	2	B
3	1	A
3	2	B
4	1	C
4	2	B

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