

## LEC 10 Q –CYTOLOGY:

- 1. What is the primary function of the extracellular matrix (ECM)?**
  - A) To serve as a barrier between cells
  - B) To fill spaces between cells and provide structural support
  - C) To produce energy for cells
  - D) To store genetic information
- 2. Which component is primarily found in the basal lamina?**
  - A) Type I collagen
  - B) Type IV collagen
  - C) Fibronectin
  - D) Glycosaminoglycans
- 3. What type of collagen is most abundant in bone?**
  - A) Type II
  - B) Type III
  - C) Type I
  - D) Type IV
- 4. What is the primary role of elastin in tissues?**
  - A) To provide tensile strength
  - B) To confer elasticity
  - C) To facilitate cell adhesion
  - D) To store calcium
- 5. Which of the following is a characteristic of carcinoma in situ?**
  - A) It is an invasive cancer that spreads to other tissues.
  - B) It refers to a localized tumor that has not spread.
  - C) It exclusively affects connective tissues.
  - D) It is the final stage of cancer progression.
- 6. Which of the following proteins plays a significant role in cell adhesion within the ECM?**
  - A) Elastin
  - B) Glycosaminoglycans
  - C) Fibronectin
  - D) Keratin

7. **What condition is characterized by fragile bones due to defective collagen?**

- A) Ehlers-Danlos Syndrome
- B) Marfan Syndrome
- C) Osteogenesis Imperfecta
- D) Chondrodysplasia

8. **Integrins are important for which of the following functions?**

- A) Synthesizing collagen
- B) Mediating cell-matrix interactions
- C) Producing elastin fibers
- D) Storing GAGs

9. **What type of collagen is primarily associated with cartilage?**

- A) Type I
- B) Type II
- C) Type III
- D) Type IV

10. **What is the role of lysyl oxidase in collagen synthesis?**

- A) To initiate collagen synthesis in the ER
- B) To catalyze cross-linking of collagen fibers
- C) To remove propeptides from procollagen
- D) To transport collagen to the ECM

### **Answers**

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

21. **What unique structural feature allows collagen to provide tensile strength in tissues?**
- A) Its hydrophilic nature
  - B) The presence of proline and hydroxyproline
  - C) The triple-helix structure and cross-linking
  - D) The flexibility of elastin fibers
22. **Which of the following types of collagen is primarily found in the vitreous humor of the eye?**
- A) Type I
  - B) Type II
  - C) Type III
  - D) Type IV
23. **In the context of collagen synthesis, what role does lysyl oxidase serve specifically?**
- A) Cleaves propeptides to activate procollagen
  - B) Catalyzes the formation of reactive aldehydes for cross-linking
  - C) Synthesizes the collagen triple helix
  - D) Facilitates the secretion of procollagen
24. **Which type of collagen forms a network and is crucial for the structural integrity of the basal lamina?**
- A) Type I
  - B) Type II
  - C) Type IV
  - D) Type VII
25. **How do mutations affecting prolyl hydroxylase impact collagen?**
- A) They enhance collagen synthesis.
  - B) They lead to increased tensile strength.
  - C) They cause deficiencies in hydroxyproline formation, leading to collagen fragility.
  - D) They result in excessive elastin production.
26. **Which factor is NOT considered when determining the severity of collagen-related disorders?**
- A) The specific tissues involved
  - B) The timing of the mutation

- C) The age of the individual  
D) The nature and location of the impact
- 27. In Ehlers-Danlos Syndrome, what is the primary defect that leads to tissue fragility?**
- A) Overproduction of collagen  
B) Deficiency in collagen processing enzymes  
C) Mutation in fibrillin  
D) Increased levels of elastin
- 28. What is the significance of Procollagen Type I N-Terminal Propeptide (PINP) in clinical settings?**
- A) It indicates levels of elastin synthesis.  
B) It serves as a marker for collagen degradation.  
C) It is a sensitive marker of bone formation and resorption.  
D) It directly influences collagen cross-linking.
- 29. What structural characteristic differentiates fibril-associated collagens from fibrillar collagens?**
- A) Their triple-helix structure  
B) The presence of nonhelical sequences in their structure  
C) Their location within the ECM  
D) Their specific tissue distribution
- 30. What is a potential consequence of the degradation of the basal lamina by malignant cancer cells?**
- A) Enhanced cell adhesion  
B) Restriction of tumor growth  
C) Increased potential for metastasis  
D) Stabilization of ECM components

### **Answers**

21. C  
22. B  
23. B  
24. C  
25. C  
26. C  
27. B  
28. C

29. B

30. C

**31. What is the primary component of the ground substance in the extracellular matrix (ECM)?**

- A) Proteoglycans
- B) Collagen fibers
- C) Elastin
- D) Adhesion proteins

**32. Which of the following types of collagen is classified as an anchoring fibril?**

- A) Type I
- B) Type III
- C) Type VII
- D) Type IV

**33. How does the structure of collagen contribute to its tensile strength?**

- A) Its hydrophobic properties
- B) The arrangement of collagen fibrils in parallel arrays
- C) The high concentration of glycosaminoglycans
- D) The presence of non-helical sequences in the structure

**34. In what way do glycosaminoglycans (GAGs) influence cellular behavior within the ECM?**

- A) By enhancing the rigidity of collagen fibers
- B) By providing structural support and regulating signaling
- C) By linking cells directly to the cytoskeleton
- D) By catalyzing enzymatic reactions

**35. What mechanism is involved in the transition of normal cells to cancerous cells with respect to ECM interactions?**

- A) Increased production of elastin
- B) Disruption of integrin signaling pathways
- C) Enhanced collagen cross-linking
- D) Inhibition of proteoglycan synthesis

**36. Which of the following best describes the role of integrins in relation to the extracellular matrix?**

- A) They synthesize collagen.
- B) They anchor the cytoskeleton and mediate signaling between ECM and cells.
- C) They degrade collagen fibers.
- D) They facilitate the secretion of proteoglycans.

**37. What is the significance of hydroxylysine in collagen structure?**

- A) It stabilizes the triple-helix structure.
- B) It provides binding sites for glycosaminoglycans.
- C) It is involved in cross-linking collagen fibers.
- D) It enhances the tensile strength of the fibers.

**38. Which of the following conditions is specifically caused by mutations in Type II collagen?**

- A) Osteogenesis Imperfecta
- B) Ehlers-Danlos Syndrome
- C) Chondrodysplasia
- D) Marfan Syndrome

**39. What structural feature of the basal lamina contributes to its barrier function?**

- A) High concentration of GAGs
- B) Presence of network-forming collagens
- C) Composition of glycoproteins and type IV collagen
- D) Arrangement of fibroblasts

**40. What role does the enzyme lysyl oxidase play in the context of collagen and elastin?**

- A) It modifies glycosaminoglycans.
- B) It catalyzes the cross-linking of collagen and elastin fibers.
- C) It facilitates the transport of collagen to the ECM.
- D) It synthesizes procollagen in the endoplasmic reticulum.

## **Answers**

- 31. A
- 32. C
- 33. B
- 34. B
- 35. B
- 36. B

- 37. B
- 38. C
- 39. C
- 40. B

**41. Which of the following statements correctly describes the structure of collagen?**

- A) It consists of four polypeptide chains.
- B) The basic unit is a triple helix formed by three identical chains.
- C) Cross-linking occurs primarily within the endoplasmic reticulum.
- D) Hydroxyproline is critical for stabilizing the triple-helix structure.

**42. What is a consequence of the degradation of the basal lamina in cancer progression?**

- A) Enhanced immune response to the tumor
- B) Inhibition of angiogenesis
- C) Increased likelihood of metastasis
- D) Restoration of normal cell function

**43. How do integrins transmit signals from the extracellular matrix to the cell interior?**

- A) By binding directly to DNA in the nucleus
- B) Through conformational changes that activate intracellular pathways
- C) By degrading ECM components
- D) By forming gaps between cells

**44. What role do fibroblasts play in the extracellular matrix?**

- A) They provide structural support by forming the basal lamina.
- B) They synthesize and remodel ECM components, including collagen and GAGs.
- C) They serve as immune cells within connective tissues.
- D) They produce signaling molecules that inhibit cancer cell growth.

**45. Which type of collagen is primarily associated with type I collagen in providing structural integrity to bone?**

- A) Type II
- B) Type III
- C) Type IV
- D) Type V

46. **What is the impact of a deficiency in lysyl oxidase on collagen structure?**

- A) Increased elasticity of collagen fibers
- B) Impaired cross-linking, leading to decreased tensile strength
- C) Enhanced formation of collagen fibrils
- D) Increased hydroxyproline content in collagen

47. **In what way does Marfan Syndrome primarily affect the extracellular matrix?**

- A) It leads to overproduction of Type I collagen.
- B) It causes abnormalities in fibrillin, affecting elastic fibers.
- C) It results in excessive degradation of the basal lamina.
- D) It alters the synthesis of glycosaminoglycans.

48. **What is the primary pathological mechanism underlying Osteogenesis Imperfecta?**

- A) Increased elastin production
- B) Defective synthesis of Type I collagen
- C) Excessive cross-linking of collagen fibers
- D) Accumulation of GAGs in bone tissue

49. **Which collagen type is essential for the formation of the framework in the cartilage?**

- A) Type I
- B) Type II
- C) Type III
- D) Type IV

50. **What is the role of glycosaminoglycans (GAGs) in the extracellular matrix?**

- A) They provide tensile strength to collagen fibers.
- B) They promote cell adhesion to the ECM.
- C) They retain water and regulate osmotic balance.
- D) They facilitate the synthesis of elastin fibers.

## **Answers**

- 41. D
- 42. C
- 43. B
- 44. B



- 45. D
- 46. B
- 47. B
- 48. B
- 49. B
- 50. C

**51. If a cell is observed to have mutations leading to impaired integrin function, what would you predict about the cell's interaction with the extracellular matrix?**

- A) The cell would bind more tightly to the matrix.
- B) The cell's signaling pathways would remain unaffected.
- C) The cell may have difficulty adhering to and signaling through the ECM.
- D) The cell would increase its synthesis of collagen.

**52. In a scenario where the basal lamina is compromised, what potential outcome might be expected in surrounding tissue?**

- A) The tissue would become more organized and structured.
- B) Cell migration into the tissue could increase, potentially leading to metastasis.
- C) There would be an enhanced immune response to pathogens.
- D) The tissue would be more resilient against mechanical stress.

**53. Consider a genetic disorder where collagen synthesis is deficient. How might this affect the integrity of connective tissues?**

- A) The tissues would become more rigid and less flexible.
- B) The overall strength and resilience of the tissues would decrease, leading to fragility.
- C) The tissues would gain additional elasticity.
- D) There would be an increase in the production of elastin fibers.

**54. If a researcher is studying the role of GAGs in connective tissue, what primary function should they focus on?**

- A) The ability to form strong fibrous structures.
- B) The capacity to retain water and influence cell signaling.
- C) The direct synthesis of collagen and elastin.
- D) The ability to enhance cellular adhesion to the ECM.

**55. In the context of tumor biology, why is the degradation of the extracellular matrix significant?**

- A) It strengthens the connection between cells and their surroundings.
- B) It provides a barrier to prevent the spread of cancer cells.
- C) It facilitates the invasion of malignant cells into surrounding tissues.
- D) It enhances the function of the immune system against tumors.

**56. How would you explain the importance of lysyl oxidase in maintaining the structural integrity of connective tissues?**

- A) It prevents the synthesis of collagen.
- B) It catalyzes the cross-linking of collagen, enhancing tissue strength.
- C) It facilitates the degradation of elastin fibers.
- D) It increases the hydration of the extracellular matrix.

**57. If a person has Ehlers-Danlos Syndrome, what might you expect regarding the functionality of their connective tissues?**

- A) The connective tissues would be more rigid and less elastic.
- B) The tissues would be more prone to injury and have reduced tensile strength.
- C) The tissues would exhibit increased collagen synthesis.
- D) The connective tissues would be entirely unaffected.

**58. In studying collagen disorders, how might variations in collagen types affect the clinical presentation of a patient?**

- A) Different collagen types lead to a uniform set of symptoms across disorders.
- B) Variations can result in diverse manifestations depending on tissue-specific functions.
- C) All collagen variations will primarily affect bone density.
- D) Collagen type does not significantly influence clinical outcomes.

**59. If an individual has a mutation that affects hydroxyproline formation, what potential impact might this have on their connective tissues?**

- A) It would enhance the stability of collagen fibers.
- B) It could lead to weakened collagen structure and increased fragility.
- C) It would increase the production of glycosaminoglycans.
- D) There would be no significant impact on connective tissues.

**60. When considering the relationship between extracellular matrix components and cell behavior, what is a key takeaway regarding cancer progression?**

- A) A healthy ECM always restricts tumor growth.
- B) Changes in ECM composition can alter cell signaling pathways, facilitating malignancy.
- C) ECM components have no influence on tumor dynamics.
- D) Tumors only affect surrounding cells through direct contact.

## Answers

- 51. C
- 52. B
- 53. B
- 54. B
- 55. C
- 56. B
- 57. B
- 58. B
- 59. B
- 60. B

**61. If a study found that fibroblast activity increases in response to tissue injury, what role might these cells play in the healing process?**

- A) They would degrade the extracellular matrix to promote flexibility.
- B) They would synthesize and remodel ECM components to restore tissue integrity.
- C) They would inhibit cell proliferation to prevent excessive growth.
- D) They would block the adhesion of immune cells to the injured area.

**62. In an experimental model of osteogenesis imperfecta, what underlying molecular defect would primarily be observed?**

- A) Increased production of elastin
- B) Deficient synthesis of Type I collagen
- C) Excessive cross-linking of collagen fibers
- D) Abnormal formation of glycosaminoglycans

**63. How does the structural arrangement of fibrillar collagens contribute to the functionality of tendons?**

- A) They provide a disorganized structure to enhance flexibility.
- B) They align in parallel arrays to resist tensile forces effectively.
- C) They form a rigid network to prevent all types of deformation.
- D) They allow for significant compressibility under stress.

64. **If collagen cross-linking is reduced due to a genetic mutation, what effect would this have on the tensile strength of connective tissues?**
- A) Increased tensile strength due to greater flexibility
  - B) Decreased tensile strength, leading to fragility
  - C) No significant effect on tensile properties
  - D) Enhanced tensile strength due to improved molecular interactions
65. **In the context of cell-matrix interactions, what might be the consequence of disrupted integrin signaling in epithelial cells?**
- A) Enhanced migration and invasion of these cells
  - B) Increased cell adhesion to the matrix
  - C) Impaired communication between the ECM and the cytoskeleton
  - D) Strengthened tissue barriers against tumor cells
66. **What might be inferred about the role of elastin in vascular tissues compared to collagen?**
- A) Elastin provides tensile strength, while collagen allows for stretch and flexibility.
  - B) Collagen provides rigidity, while elastin is responsible for elasticity and recoil.
  - C) Both elastin and collagen contribute equally to tensile strength.
  - D) Elastin is primarily responsible for the structural framework of blood vessels.
67. **If a patient exhibits symptoms of joint hypermobility and skin elasticity, which underlying condition might you suspect?**
- A) Osteogenesis imperfecta
  - B) Chondrodysplasia
  - C) Ehlers-Danlos Syndrome
  - D) Marfan Syndrome
68. **In studying cancer metastasis, why might the breakdown of the extracellular matrix be considered a critical event?**
- A) It enhances the production of signaling molecules.
  - B) It allows for the reformation of the basal lamina.
  - C) It facilitates the movement of cancer cells into surrounding tissues.
  - D) It strengthens the adhesion of neighboring cells.
69. **What can be deduced about the relationship between the composition of the extracellular matrix and cell behavior during development?**

- A) The ECM has no impact on cellular differentiation processes.
- B) Specific ECM components can influence stem cell fate and tissue formation.
- C) The ECM only serves as a structural scaffold without functional implications.
- D) Cell behavior is solely determined by genetic factors, independent of the ECM.

**70. How might a deficiency in proteoglycans affect the properties of the extracellular matrix?**

- A) It would increase the mechanical strength of connective tissues.
- B) It would reduce hydration and alter the signaling environment of the ECM.
- C) It would enhance the elasticity of the matrix components.
- D) It would have no significant effect on the matrix properties.

### **Answers**

- 61. B
- 62. B
- 63. B
- 64. B
- 65. C
- 66. B
- 67. C
- 68. C
- 69. B
- 70. B

**71. If a researcher is examining the role of elastin in large arteries, what specific property of elastin would be most relevant to understanding arterial function?**

- A) Its rigidity and resistance to stretching
- B) Its ability to allow for dynamic recoil and flexibility under pressure
- C) Its capacity to form strong covalent bonds with collagen
- D) Its role in facilitating immune cell attachment

**72. In cases where mutations in collagen genes lead to structural defects, how might this impact tissue function in the context of load-bearing structures?**

- A) The tissue may become more flexible and adaptable to mechanical stress.
- B) The load-bearing capacity would be compromised, leading to increased

susceptibility to injury.

C) There would be no significant impact, as other proteins compensate for the deficiencies.

D) The tissue would become excessively rigid and prone to fractures.

**73. If integrins are found to be downregulated in a type of cancer, what could be a potential consequence for tumor behavior?**

A) Decreased cell adhesion may promote tumor cell metastasis.

B) Increased cell-matrix adhesion would enhance tumor growth.

C) Tumor cells would be less likely to migrate to other tissues.

D) The cancer cells would become more differentiated and less aggressive.

**74. In understanding the mechanisms of tissue repair, what might be the consequence of elevated levels of fibroblasts in a healing wound?**

A) They would likely enhance tissue organization and structural integrity.

B) Excessive fibroblast activity could lead to fibrosis and scarring.

C) They would inhibit the proliferation of other cell types involved in healing.

D) They would only affect the production of collagen without impacting other ECM components.

**75. If a mutation disrupts the normal assembly of tropocollagen into fibrils, what would be the likely outcome in connective tissues?**

A) Enhanced tensile strength and structural integrity

B) Disorganized collagen fibers leading to weakened tissue structure

C) Increased production of elastin fibers to compensate

D) Normal collagen assembly and function would be maintained

**76. In the context of connective tissue diseases, how could an excess of glycosaminoglycans (GAGs) impact cellular interactions within the ECM?**

A) It would enhance the binding of cells to the matrix and promote tissue healing.

B) It could disrupt normal cell signaling and hydration balance, affecting tissue function.

C) It would lead to increased tensile strength in the ECM.

D) There would be no significant effect on cellular interactions.

**77. If a patient presents with symptoms consistent with Marfan Syndrome, what underlying molecular abnormality might you expect regarding the extracellular matrix?**

- A) Defective collagen synthesis
  - B) Abnormal fibrillin production leading to impaired elastic fibers
  - C) Overproduction of glycosaminoglycans
  - D) Excessive cross-linking of collagen fibers
78. **What can be inferred about the role of the basal lamina in epithelial integrity based on its composition?**
- A) It primarily serves as a barrier to pathogens without influencing cell behavior.
  - B) Its interaction with cell adhesion molecules supports the structural and functional stability of epithelial cells.
  - C) It has no significant role in supporting tissue architecture.
  - D) It only provides structural support without impacting signaling pathways.
79. **If a significant number of fibroblasts in a tissue are found to be apoptotic, what could this imply about the tissue's healing process?**
- A) The healing process would be accelerated due to reduced cellular activity.
  - B) There may be impaired synthesis of the extracellular matrix, hindering repair.
  - C) Increased inflammation would likely compensate for fibroblast loss.
  - D) The tissue would develop excessive scarring due to unregulated repair mechanisms.
80. **How does the molecular structure of collagen differ from that of elastin in relation to their respective functions in connective tissues?**
- A) Collagen provides elasticity while elastin offers tensile strength.
  - B) Collagen has a rigid structure with triple helices, while elastin is more flexible and hydrophobic.
  - C) Both proteins are identical in structure but differ in their amino acid composition.
  - D) Elastin is primarily responsible for the structural integrity of tissues, while collagen allows for stretch.

## Answers

- 71. B
- 72. B
- 73. A
- 74. B
- 75. B
- 76. B

- 77. B
- 78. B
- 79. B
- 80. B

**81. Case: A 35-year-old patient presents with joint pain and hyperelastic skin. Upon genetic testing, mutations in the COL5A1 gene are identified. What condition is most likely diagnosed, and what underlying defect contributes to the symptoms?**

- A) Osteogenesis Imperfecta; defective Type I collagen assembly
- B) Ehlers-Danlos Syndrome; abnormal synthesis of Type V collagen
- C) Marfan Syndrome; mutations affecting fibrillin
- D) Chondrodysplasia; defects in Type II collagen

**82. Case: A child is diagnosed with a severe form of Osteogenesis Imperfecta, characterized by frequent fractures and bone deformities. What would be the primary molecular defect observed in this condition?**

- A) Excessive cross-linking of collagen
- B) Defective synthesis of Type I collagen
- C) Impaired production of elastin
- D) Abnormal glycosaminoglycan composition

**83. Case: During surgery, a patient's tumor is found to have invaded surrounding tissues, degrading the basal lamina. What mechanism is likely enabling this cancerous behavior?**

- A) Enhanced integrin signaling promoting cell adhesion
- B) Increased fibroblast activity repairing the ECM
- C) Malignant cells secreting matrix metalloproteinases (MMPs)
- D) Decreased production of collagen fibers

**84. Case: A 50-year-old woman with a history of osteoporosis experiences a fracture. Biochemical markers indicate increased levels of Procollagen Type I N-Terminal Propeptide (PINP). What does this suggest about her bone remodeling process?**

- A) Bone resorption exceeds formation
- B) There is increased bone formation
- C) Collagen synthesis is impaired
- D) There is excessive collagen degradation



85. **Case: A patient presents with symptoms of short stature, scoliosis, and cardiovascular issues. Genetic analysis reveals mutations in the fibrillin gene. What syndrome is most likely indicated?**
- A) Ehlers-Danlos Syndrome
  - B) Marfan Syndrome
  - C) Osteogenesis Imperfecta
  - D) Chondrodysplasia
86. **Case: In a study on skin healing, researchers notice an increased presence of fibroblasts at the wound site. What role do these cells primarily play in the repair process?**
- A) They promote apoptosis of damaged cells.
  - B) They synthesize extracellular matrix components to facilitate healing.
  - C) They inhibit inflammation to prevent scarring.
  - D) They enhance vascularization in the area.
87. **Case: A patient with chronic joint pain and visible skin changes undergoes testing, revealing mutations in the gene coding for Type III collagen. What condition is this most likely associated with?**
- A) Marfan Syndrome
  - B) Ehlers-Danlos Syndrome
  - C) Osteogenesis Imperfecta
  - D) Chondrodysplasia
88. **Case: An elderly man is diagnosed with a degenerative joint disease linked to changes in his cartilage composition. Which type of collagen would be primarily affected in this condition?**
- A) Type I collagen
  - B) Type II collagen
  - C) Type III collagen
  - D) Type IV collagen
89. **Case: A clinical trial evaluates a new treatment targeting the degradation of the extracellular matrix in tumors. What aspect of cancer biology does this treatment aim to address?**
- A) Reducing inflammation surrounding the tumor
  - B) Preventing metastasis by maintaining ECM integrity
  - C) Enhancing the immune response against cancer cells
  - D) Promoting apoptosis of malignant cells

90. **Case: A patient exhibits signs of cardiovascular complications and skeletal deformities. Tests show an abnormality in elastic fibers. What underlying defect is likely present?**

- A) Mutations in Type I collagen
- B) Defects in the synthesis of elastin or fibrillin
- C) Impaired production of glycosaminoglycans
- D) Abnormal collagen cross-linking

### **Answers**

- 81. B
- 82. B
- 83. C
- 84. B
- 85. B
- 86. B
- 87. B
- 88. B
- 89. B
- 90. B

91. **Case: A 28-year-old female presents with recurrent soft tissue injuries, excessive bruising, and a family history of similar symptoms. Genetic testing reveals a mutation affecting Type III collagen. What is the most likely underlying mechanism that explains her symptoms?**

- A) Impaired tensile strength leading to easy tearing of connective tissues
- B) Excessive cross-linking of collagen fibers resulting in rigidity
- C) Enhanced elastin production causing instability in soft tissues
- D) Abnormal glycosaminoglycan accumulation leading to structural deformities

92. **Case: During an autopsy, a pathologist notes extensive fibrosis in the lung tissue of a patient who had a history of chronic inflammation. Which cellular activity is most likely to contribute to this excessive collagen deposition?**

- A) Increased activity of macrophages producing matrix metalloproteinases
- B) Elevated fibroblast proliferation and collagen synthesis
- C) Enhanced apoptosis of epithelial cells
- D) Reduced levels of glycosaminoglycans promoting cellular adhesion

93. **Case: A geneticist identifies a novel mutation in a patient's COL1A1 gene, resulting in a missense mutation that alters the glycine residues critical for collagen stability. What is the most significant impact of this mutation on collagen structure?**
- A) Enhanced flexibility and stretchability of collagen fibers
  - B) Reduced stability of the triple helix leading to brittle bone disease
  - C) Increased collagen density resulting in rigid tissues
  - D) Impaired cell signaling through integrin interactions
94. **Case: A clinical study investigates the effects of increased fibroblast activity in a wound healing model. If fibroblasts are overactive, what pathological consequence might arise from their excessive extracellular matrix production?**
- A) Improved tissue regeneration and rapid healing
  - B) Development of hypertrophic scars or keloids
  - C) Increased vascularization and improved nutrient delivery
  - D) Normalization of tissue structure with minimal scarring
95. **Case: A patient with a known genetic predisposition to Ehlers-Danlos Syndrome presents with arterial rupture. Which underlying defect in connective tissue structure is most likely contributing to this complication?**
- A) Inadequate elastin synthesis leading to loss of arterial elasticity
  - B) Deficient collagen cross-linking causing structural weakness in blood vessels
  - C) Excessive production of glycosaminoglycans compromising vessel integrity
  - D) Mutations in integrin receptors affecting cellular adhesion
96. **Case: An athlete reports frequent joint dislocations and skin that stretches excessively. Upon further evaluation, it is determined that her collagen synthesis is normal, but her matrix metalloproteinase (MMP) levels are significantly elevated. What is the most likely explanation for her symptoms?**
- A) Increased collagen degradation leading to weakened joint structures
  - B) Excess elastin leading to instability in connective tissues
  - C) Impaired signaling due to disrupted integrin function
  - D) Normal collagen production but insufficient glycosaminoglycan levels
97. **Case: A researcher studies a new therapeutic approach targeting the ECM in cancer treatment. The therapy aims to inhibit specific MMPs to prevent**

**tumor invasion. What aspect of tumor biology does this intervention primarily address?**

- A) Altering angiogenesis to reduce blood supply to the tumor
- B) Preventing the breakdown of the basal lamina and surrounding matrix
- C) Enhancing immune response against cancer cells
- D) Inducing apoptosis in rapidly dividing tumor cells

**98. Case: A patient diagnosed with Marfan Syndrome presents with new cardiovascular complications. Which structural protein's defect is primarily responsible for the elastic properties of the arterial walls, and how does this relate to the observed complications?**

- A) Type I collagen; insufficient tensile strength leads to arterial rupture
- B) Fibrillin; defects lead to weakened elastic fibers and arterial dilation
- C) Type III collagen; affects the structural integrity of blood vessels
- D) Elastin; reduced elasticity leads to increased arterial stiffness

**99. Case: In a cohort study, elevated levels of Procollagen Type I N-Terminal Propeptide (PINP) are noted in patients with chronic inflammatory conditions. What could this elevation indicate about the underlying tissue dynamics?**

- A) Increased collagen degradation due to inflammation
- B) Enhanced bone resorption activity
- C) Heightened collagen synthesis as part of the healing response
- D) Normal turnover of collagen with no significant implications

**100. Case: A 40-year-old patient experiences abnormal bone remodeling, resulting in frequent fractures despite adequate calcium intake. Genetic analysis reveals a mutation in the gene responsible for lysyl oxidase. How does this mutation impact collagen function in bone tissue?**

- A) It leads to excessive collagen cross-linking, increasing bone rigidity
- B) It prevents proper cross-linking of collagen fibers, reducing tensile strength
- C) It enhances collagen synthesis, improving structural integrity
- D) It increases elastin production, promoting flexibility in bone structure

## **Answers**

- 91. A
- 92. B
- 93. B
- 94. B

95. B  
96. A  
97. B  
98. B  
99. C  
100. B

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