



# Secretion and the Extracellular Matrix Questions

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# Readiness Assessment Questions

# Readiness Assessment Question 1

You discover a protein and its sequence predicts an ER import signal sequence at its N-terminus but no other signal sequence in the rest of the protein. Where would you expect to find the protein?

- Lysosome
- Secretory vesicle
- Extracellular space
- Cell membrane

# Readiness Assessment Question 2

You are culturing stem cells with the goal of triggering differentiation of the cells. You plan to grow the cells on a stiff extracellular matrix to facilitate differentiation. Which component would you add to the extracellular matrix?

- Type I collagen
- Type II collagen
- Type III collagen
- Type IV collagen

# Readiness Assessment Question 3

Botulinum toxin causes extreme muscle weakness by preventing the release of neurotransmitter (acetylcholine) from motor neurons onto skeletal muscle cells. Which protein does botulinum toxin inhibit in motor neurons?

- Clathrin
- SNAREs
- Mannose-6-phosphate receptor
- Translocon

# Readiness Assessment Question 4

Arthritis is caused by inflammation in the joints between bones, which leads to destruction of the extracellular matrix in joints. Which extracellular matrix component is being degraded in arthritis?

- Type I collagen
- Type IV collagen
- Elastin
- Aggrecan (a proteoglycan)

# Readiness Assessment Question 5

Chloroquine is a drug used to treat malaria. It is a weak base that accumulates in acidic environments. What effect would chloroquine have on the secretory pathway?

- Increase glycosylation of proteins
- Increase endocytosis
- Increase secretory vesicle formation
- Increase size of lysosomes

# Application Questions

# Application Question 1

A 9-month presents with weak muscle tone and a delay in motor skills. The child's history includes episodes of sleep-disordered breathing, including obstructive sleep apnea. Physical exam finds the child's growth rate is significantly below normal. Imaging reveals several skeletal abnormalities, and a blood test measures elevated levels of lysosomal proteins arylsulfatase B and beta-glucuronidase. The activity of which protein is most likely reduced in the patient?

- A. Clathrin
- B. GlcNac-phosphotransferase
- C. SRP Receptor
- D. Translocon

# Application Question 2

A biopsy of connective tissue (extracellular matrix) from the patient shows fibroblasts with enlarged lysosomes and which lack activity of several key enzymes. Puzzling, a biopsy from the patient's liver shows cells with normal size lysosomes and which retain some enzymatic activity. What explains the relatively normal lysosomes in the liver cells?

# Application Question 3

A 24 year-old patient presents with chest and back pain but is otherwise asymptomatic. A family history reveals the patient's father and uncle died from sudden cardiac death, and his father suffered an aortic dissection. Physical exam reveals the patient has long extremities with their arm span exceeding their height. Imaging finds an aortic aneurysm, which is an enlargement of the diameter of the aorta due to changes in the mechanical properties of the wall of the aorta. Sequencing of the patient's genome would most likely identify a mutation in which gene?

- A. COL1A1 (type I collagen)
- B. FBN1 (fibrillin)
- C. HSPG2 (Perlecan, a proteoglycan)
- D. ELN (elastin)

# Application Question 4

Continuing with the patient above. A colleague refers you to a research article which found the drug losartan to be effective in reducing the size of aneurysms in patients with similar conditions. Losartan is known to reduce the amount of transforming growth factor  $\beta$  (TFG- $\beta$ ), which is a key signaling molecule and regulator of cell activity. How does this information change your conclusion about which gene is mutated in the patient?