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Peroxisomes

Study Guide — Cell Organelles

Pre-Med practice questions about peroxisomal structure, metabolism, and targeting

6 items — Study Guide with Answers

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1 **Which of the following is a primary function of peroxisomes in animal cells?**

A ATP production via oxidative phosphorylation.

B Digestion of phagocytosed bacteria.

C **Beta-oxidation of very-long-chain fatty acids and detoxification using hydrogen peroxide.** ✓

D Synthesis of ribosomal RNA.

E Packaging of proteins for secretion.

▶ **Explanation:** Peroxisomes carry out oxidative reactions, including beta-oxidation of very-long-chain fatty acids and detoxification using H2O2.

2 **Which enzyme is characteristically abundant in peroxisomes and breaks down hydrogen peroxide?**

A **Catalase.** ✓

B DNA polymerase.

C ATP synthase.

D Pepsin.

E Hexokinase.

▶ **Explanation:** Catalase decomposes hydrogen peroxide to water and oxygen, protecting cells from oxidative damage.

3 **How do most matrix proteins reach the interior of peroxisomes?**

A They are synthesized in the ER lumen and transported in vesicles.

B They are synthesized on mitochondrial ribosomes and imported.

C **They are synthesized on free cytosolic ribosomes and imported post-translationally via targeting signals.** ✓

D They diffuse directly through the peroxisomal membrane.

E They are encoded by the peroxisomal genome.

▶ **Explanation:** Peroxisomes lack their own genome; most peroxisomal proteins are made on free ribosomes and imported via specific peroxisomal targeting signals.

4 **A defect that completely eliminates functional peroxisomes in human cells would most directly lead to:**

A Loss of electron transport and oxidative phosphorylation.

B **Accumulation of very-long-chain fatty acids and certain toxins.** ✓

C Inability to perform phagocytosis.

D Failure of mitotic spindle formation.

E Inability to synthesize ribosomes.

▶ **Explanation:** Peroxisomal disorders are characterized by accumulation of very-long-chain fatty acids and other substrates normally degraded in peroxisomes.

5 **A mutant cell has normal mitochondria but completely lacks functional peroxisomes. Which metabolic defect is most specifically due to the absence of peroxisomes (rather than mitochondrial dysfunction)?**

A **Inability to complete beta-oxidation of very-long-chain fatty acids (e.g. C26:0).** ✓

B Inability to oxidize acetyl-CoA in the citric acid cycle.

C Inability to carry out glycolysis.

D Inability to perform oxidative phosphorylation.

E Inability to digest proteins internalized by endocytosis.

▶ **Explanation:** Peroxisomes are essential for initial beta-oxidation of very-long-chain fatty acids; mitochondria handle shorter chains and oxidative phosphorylation but cannot fully compensate for peroxisomal loss.

6 **In germinating oil-rich seeds of some plants, specialized peroxisomes called glyoxysomes convert stored lipids into sugars. Which metabolic pathway is especially associated with these organelles?**

A Glycolysis.

B **The glyoxylate cycle, allowing conversion of acetyl-CoA to four-carbon acids used for gluconeogenesis.** ✓

C Fermentation.

D Oxidative phosphorylation.

E The urea cycle.

▶ **Explanation:** Glyoxysomes contain enzymes of the glyoxylate cycle, which bypass decarboxylation steps of the citric acid cycle and permit net conversion of acetyl-CoA from fatty acids into carbohydrate precursors.