

What Is the Endoplasmic Reticulum?

Worksheet

The endoplasmic reticulum is an organelle that synthesizes proteins (rough ER) and lipids while detoxifying substances (smooth ER), acting as the cell's manufacturing and processing hub.

Questions

1. What gives rough ER its 'rough' appearance?
 - A) Folded membranes
 - B) Attached ribosomes
 - C) Lipid droplets
 - D) Calcium deposits
2. Which type of ER is responsible for detoxifying drugs in liver cells?
 - A) Rough ER
 - B) Smooth ER
 - C) Golgi ER
 - D) Nuclear ER
3. What does rough ER primarily synthesize?
 - A) Lipids
 - B) Carbohydrates
 - C) Proteins
 - D) ATP
4. The ER is directly continuous with which structure?
 - A) Mitochondria
 - B) Nuclear envelope
 - C) Cell membrane
 - D) Lysosome
5. Why do liver cells contain unusually large amounts of smooth ER?
6. A pancreatic cell needs to secrete large amounts of digestive enzymes (proteins). Which type of ER would you expect to be abundant, and why?
7. Trace a protein's path from synthesis in the rough ER to its release from the cell.
8. Define: What are the two types of endoplasmic reticulum?
9. Define: What does rough ER do?
10. Define: What does smooth ER do?

Answer Key

1. B) Attached ribosomes - Ribosomes studding the outer surface give rough ER its bumpy, 'rough' appearance.
2. B) Smooth ER - Smooth ER contains detoxifying enzymes and is abundant in liver cells.
3. C) Proteins - Rough ER's ribosomes synthesize proteins directly into the ER lumen.
4. B) Nuclear envelope - Rough ER is physically continuous with the nuclear envelope.
5. Liver cells are responsible for detoxifying drugs, alcohol, and metabolic waste. Smooth ER contains enzymes that break down and neutralize these toxic substances. More smooth ER means greater detoxification capacity, which is why liver cells are packed with it.
6. Digestive enzymes are proteins, and protein synthesis and folding happens on rough ER. Ribosomes on the rough ER translate mRNA into polypeptide chains directly into the ER lumen. The rough ER then folds and packages the proteins into vesicles for secretion, so pancreatic secretory cells are rich in rough ER.
7. Ribosomes on the rough ER synthesize the polypeptide chain, feeding it into the ER lumen. The protein is folded and modified (e.g., glycosylated) inside the rough ER. A transport vesicle buds off and carries the protein to the Golgi apparatus for further processing. The Golgi packages it into a secretory vesicle, which fuses with the cell membrane to release the protein (exocytosis).
8. Rough ER (with ribosomes) and smooth ER (without ribosomes).
9. Synthesizes, folds, and processes proteins.
10. Synthesizes lipids and steroids, detoxifies substances, and stores calcium.

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