



Origins of Cell Compartmentalization

EVO-1.A.1

Membrane-bound organelles evolved from once free-living prokaryotic cells via endosymbiosis.

EVO-1.A.2

Prokaryotes generally lack internal membrane-bound organelles but have internal regions with specialized structures and functions.



Origins of Cell Compartmentalization

EVO-1.A.3

Eukaryotic cells maintain internal membranes that partition the cell into specialized regions.

EVO-1.A.1

Membrane-bound organelles evolved from once free-living prokaryotic cells via endosymbiosis.

EVO-1.A.2

Prokaryotes generally lack internal membrane-bound organelles but have internal regions with specialized structures and functions.



**Origins of Cell
Compartmentalization**

EVO-1.A.3

Eukaryotic cells maintain internal membranes that partition the cell into specialized regions.

EVO-1.B.1

Membrane-bound organelles evolved from previously free-living prokaryotic cells via endosymbiosis.



Which organelle do prokaryotes have?

- A. Endoplasmic reticulum**
- B. Lysosome**
- C. Nucleus**
- D. Ribosomes**

Which organelle do prokaryotes have?

D. Ribosomes



Prokaryotes do NOT have membrane bound organelles. This means the only organelle they have is the ribosome.



Which is larger?

- A. Eukaryotic cells**
- B. Prokaryotic cells**

Which is larger?

A. Eukaryotic cells



Eukaryotic cells are larger than prokaryotic cells. This is due to the compartmentalization found in eukaryotic cells that is not found in prokaryotic cells.

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How are eukaryotic cells able to be larger?

How are eukaryotic cells able to be larger?



Eukaryotic cells have membrane bound organelles that compartmentalize the cell. Each organelle completes a function for the cell and it divides up the volume, so it aids to allow the volume to be larger but still efficient.

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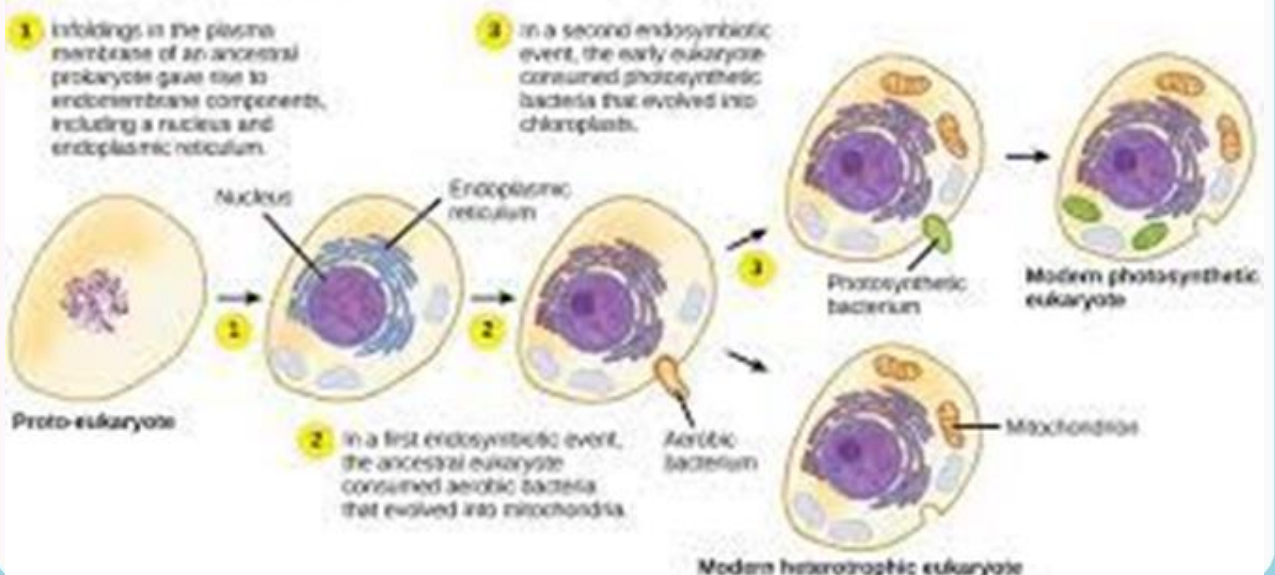
What is the endosymbiotic theory?



What is the endosymbiotic theory?

Endosymbiotic theory states that an ancestral eukaryotic cell engulfed a prokaryotic cell.

The ENDOSYMBIOTIC THEORY





Which was engulfed first?

- A. Chemosynthetic prokaryote**
- B. Photosynthesis prokaryote**

Which was engulfed first?

**A. Chemosynthetic
prokaryote**



The chemosynthetic prokaryote was engulfed first because ALL eukaryotic cells have mitochondria (chemosynthetic prokaryote) but only some eukaryotic cells have a chloroplast (photosynthetic prokaryote)

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What evidence do we have that chemosynthetic prokaryotes were engulfed first?

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What evidence do we have that chemosynthetic prokaryotes were engulfed first?

All eukaryotes have a mitochondria (aka the chemosynthetic prokaryote) but not all have a chloroplast (aka the photosynthetic prokaryote).

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What evidence do we have of endosymbiotic theory?



What evidence do we have of endosymbiotic theory?

- * Mitochondria and chloroplast are similar in size to prokaryotes**
- * Mitochondria and chloroplast have circular DNA**
- * Mitochondria and chloroplasts can divide by binary fission**
- * Mitochondria and chloroplasts have ribosomes similar to prokaryotic ribosomes**

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Prokaryotes have regions with specialized structures and functions

A. True

B. False

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Prokaryotes have regions with specialized structures and functions

A. True



Even though they are not broken into compartments by membrane bound organelles, they are still able to undergo a lot of the same reactions within regions with specialized structures.

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**What is a BIG difference
between prokaryotes and
eukaryotes?**

What is a BIG difference between prokaryotes and eukaryotes?



Prokaryotes lack membrane-bound organelles.

Eukaryotes have membrane-bound organelles.



Mitochondria & Chloroplast are theorized to be endosymbionts

- A. True**
- B. False**

**Mitochondria &
Chloroplast are theorized
to be endosymbionts**

A. True



**The endosymbiotic theory states
that an ancestral cell engulfed a
chemosynthetic prokaryote
(mitochondria) and a
photosynthetic prokaryote
(chloroplast)**

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Identify evidence of the mitochondria and/or chloroplast being an endosymbiont?

Identify evidence of the mitochondria and/or chloroplast being an endosymbiont?



- * Circular DNA**
- * Ribosomes (similar size to prokaryotes)**
- * Replicates by binary fission**
 - * Double membrane**



Which was engulfed first...

- A. Chemosynthetic prokaryotes**
- B. Photosynthetic prokaryotes**

Which was engulfed first...

A. Chemosynthetic prokaryotes



The chemosynthetic prokaryote was engulfed first which describes why all eukaryotic cells have a mitochondria but not all have a chloroplast (which comes from the photosynthetic prokaryote)

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What evidence do you have the chemosynthetic prokaryotes engulfed first?

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What evidence do you have the chemosynthetic prokaryotes engulfed first?



All eukaryotes have a mitochondria (chemosynthetic prokaryote) but not all eukaryotes have a chloroplast (photosynthetic prokaryote)