Mitochondrial Protein Import

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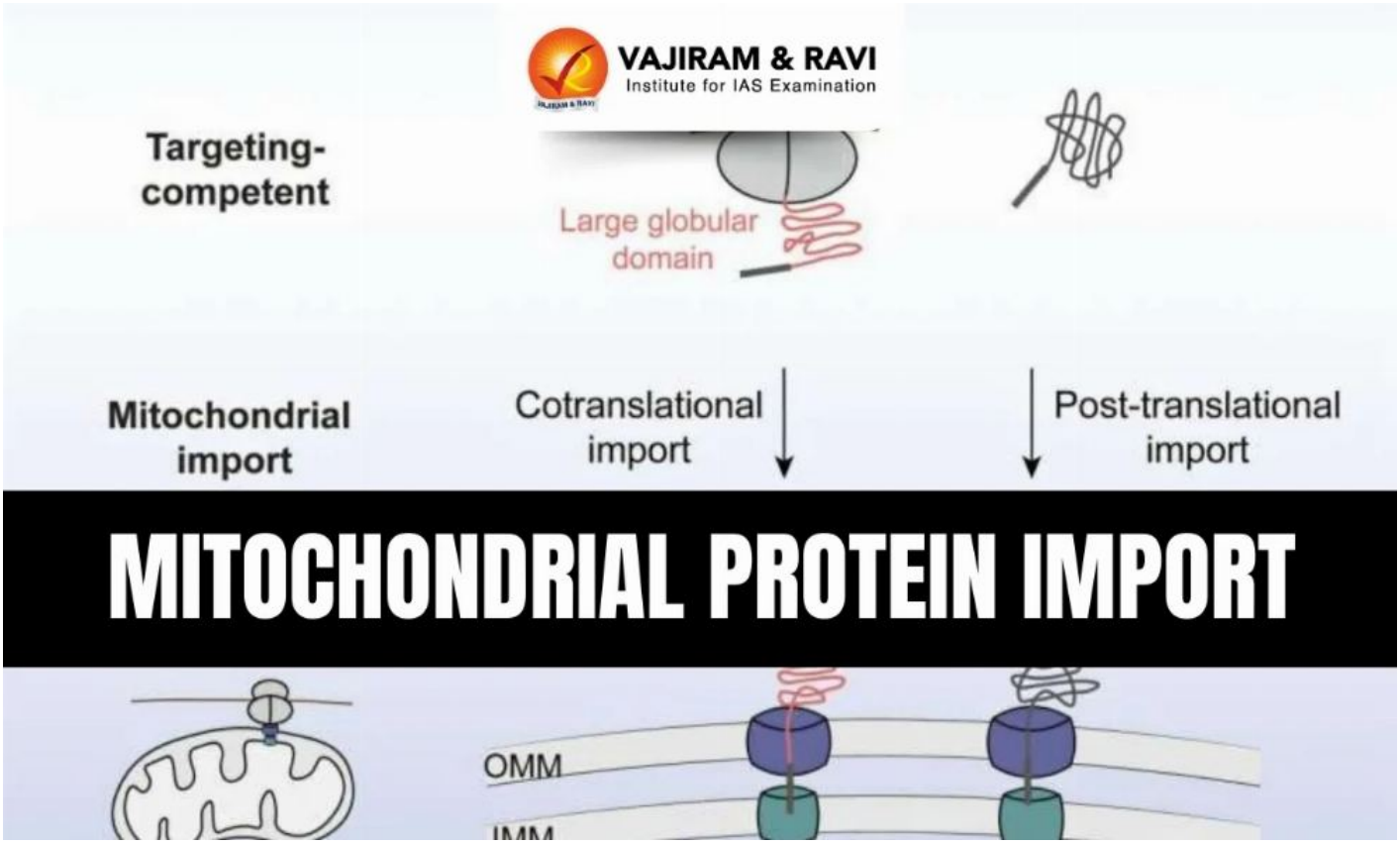

Mitochondrial Protein Import Latest News

Recently, researchers at Caltech University have uncovered new rules governing mitochondrial protein import, revising the long-standing understanding of how proteins are transported into mitochondria.

About Mitochondria

- **Mitochondria** are double-membraned organelles that generate **ATP (adenosine triphosphate)**, the universal cellular energy currency.
- They originated over **a billion years ago** through **endosymbiosis** between a primitive archaeal cell and a bacterium.
- Over time, mitochondria transferred most of their **genes to the host nucleus**, making them dependent on the host cell for protein supply.

Traditional Model of Protein Import

- Earlier, it was believed that **mitochondrial proteins are imported only after translation** is completed in the cytosol.
- Proteins were thought to fully synthesize on ribosomes before passing through mitochondrial membrane channels.

New Findings by Caltech Scientists

- Around **20% of mitochondrial proteins are cotranslationally imported**, i.e., they are imported **while still being synthesized** by ribosomes.
- This mechanism mainly applies to **large and structurally complex proteins** that require assistance during folding.
- If these proteins fully fold in the cytosol, they risk forming **irreversible structures** that block import channels.

Mechanism of Cotranslational Import

- Such proteins contain a **mitochondrial targeting sequence**, but this alone is insufficient for cotranslational delivery.
- A **second signal** is required – the **first large protein domain** that emerges during translation.
- This domain acts like a **“code to unlock the boarding pass”**, ensuring the protein is guided into mitochondria early.
- Experiments confirmed that **transplanting these domains** onto other proteins rerouted them for cotranslational import.

Source: PHY
