Reversing the Ribosome Assembly Line to Correct Mistakes

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How do quality control steps during ribosome assembly prevent mistakes in protein production and prevent disease?

Ribosomes are protein-making machines

- DNA Transcription → mRNA Translation → Protein

- 83 ribosomal components
- Structure of a ribosome
- Translating ribosome (cartoon)

Misassembled ribosomes lead to disease

- Healthy Cell
- Ribosomopathy
- Cancer

- Yeast cells
  - Fully-assembled ribosomes
  - Misassembled ribosomes

Ribosome assembly line can correct mistakes

- Assembly Factor
- Reverse
- Fully Assembled Ribosomes

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- Das Murtey, M. and Ramasamy, P. 2016. DOI:10.5772/61720.
- www.freepik.com (macrovector and upklyak).
- www.pinclipart.com

Central Question:

- Protein is the functional component of all cells
- Protein is made by cellular machines = ribosomes
- Ribosomes are composed of 4 RNAs and 79 proteins
- Thousands of ribosomes are made every minute
- Cells spend much of their energy and resources building ribosomes

- Misassembled ribosomes → errors in protein production → disease (ribosomopathies and cancer)
- Cells must regulate ribosome assembly to support cell growth and prevent disease
- Quality control steps during assembly test ribosome structure and function

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- Ribosomes are made in a specific order, like an assembly line
- Quality control steps can temporarily reverse the ribosome assembly line
- Correcting assembly mistakes involves retrieving missing items
- Assembly checkpoints prevent early departure of misassembled ribosomes

- Fully Assembled Ribosomes
- Assembly Factor
- Reverse
- Reject
- Yeast cells