Protein Synthesis

Making Proteins

1. Transcription
   - DNA
   - mRNA
   - RNA polymerase

2. Translation
   - rRNA
   - amino acids
   - Anticodon
   - Polypeptide chain
   - Ribosome

Protein synthesis
Why Do We Need Proteins?

1. Cell Structure
   - Cell = 80% protein

Cell membrane
Why Do We Need Proteins?

2. Cell Processes
   - Hormones (signals)
   - Enzymes (speed up reactions)
Why Do We Need Proteins?

- Membrane Channels  
  (remember transport?)

- Neurotransmitters  
  (carry nerve / brain messages)
What Do We Need For Protein Synthesis?

1. DNA

Template for making mRNA during Transcription
What Do We Need For Protein Synthesis?

2. RNA
   a. mRNA = messenger RNA
      - makes & takes copy of DNA to cytoplasm
   b. tRNA = transfer RNA
      - Matches w/ mRNA on ribosome
      - Carries AA to add to protein chain

?s 1-7
What Do We Need For Protein Synthesis?

c. rRNA = ribosomal RNA

- Part of ribosome
- Reads mRNA
- Directs tRNA
What Do We Need For Protein Synthesis?

3. Ribosome

- Reads mRNA
- Directs tRNA
- Creates peptide bonds between AAs (makes polypeptide chain)
What Do We Need For Protein Synthesis?

4. **Amino Acids** (AAs)
   - Building blocks of proteins
     - (20 AAs essential)
   - Protein = AA chain
     = polypeptide chain
   - **ORDER MATTERS!**
     AA order determines f(x) of protein
Steps of Protein Synthesis

1. Transcription (writing the “message”)
   - DNA ▶ mRNA
     messenger carries code to cytoplasm

2. Translation (reading the “message”)
   - mRNA ▶ tRNA ▶ protein (AA chain)
     message translated into a protein
Steps of Protein Synthesis

1. **Transcription**
   - DNA to mRNA

2. **Translation**
   - mRNA to Protein

   - Ribosome
Steps of Protein Synthesis

(Nucleus)

(Cytoplasm)
Transcription

DNA ➤ mRNA

1. Location = nucleus
2. Steps
   a. Enzyme binds to DNA, unzips it
   b. mRNA copy of gene made from DNA template
      *U replaces T in RNA
Transcription

3 DNA nucleotides (triplet)

► mRNA codon

Codons

Translation

- mRNA ➔ tRNA ➔ protein (AA chain)

Location = cytoplasm

(first codon in mRNA is the start codon AUG)

?s 13-17
Translation

Steps of Translation
1. mRNA moves to cytoplasm, binds to ribosome
2. tRNA *anticodon* UAC brings AA (methionine) to mRNA *codon* on ribosome
Translation

3. Ribosome moves down mRNA to next codon

4. tRNA anticodon brings & attaches next AA with peptide bond
Translation

5. tRNA leaves ribosome once AA attached
Translation

6. Steps 1-5 repeated, adding AAs until STOP CODON *
   signals end of protein

7. Polypeptide chain released from ribosome

* UAG, UAA, or UGA
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AMINO ACID FUN!!

- DNA Triplet: ACC
- mRNA codon: UGG
- tRNA anti-codon: ACC
- Amino acid: Tryptophan

Why you should know this?
Tryptophan is in TURKEY – makes you sleepy
Protein Synthesis Animation


Protein synthesis