

# Alternative Splicing: How to Get More than One Protein from a Gene

Description: Use the word key from the “Protein Synthesis and Words” activity to demonstrate how eukaryotic cells may use one DNA sequence to code for multiple proteins. Eukaryotic cells might use the same gene or DNA sequence differently depending on where the gene is located. A brain cell might make a protein from the same gene differently than an eye cell by splicing the mRNA differently.

Modeling Alternative Splicing: (the size of the introns and exons in the DNA model are much smaller than that found in actual DNA)

1. Choose a Group of Words from the **tRNA anticodon** list in the “Protein Synthesis and Words” activity that can make more than one sentence and figure out the mRNA that would match the tRNA for each word. Example below:

**tRNA=mRNA=word instead of amino acid**

AAC = UUG = mother

AAG = UUC = wears

AAU = UUA = dresses

GGU = CCA = father

GAU = CUA = and

2. Now, make a nuclear RNA sequence from your mRNA by placing introns (CAA repeats) between useful exons (words for your sentence). The start codon AUG and the stop codon UAG are included as well (see example below).

**Nuclear RNA sequence with introns underlined and exons representing the words above:**

AUG/UUG/CAA/CAA/CAA/CUA/CAA/CAA/CCA/CAA/CAA/CAA/UUC/UUA/UAG

3. Show how introns can be cut out and exons spliced to make more than one sequence:

AUG/UUG/CAA/CAA/CAA/CUA/CAA/CAA/CCA/CAA/CAA/CAA/UUC/UUA/UAG

A. If we cut out the underlined introns, and we also cut out the exons that result in “and” and “father,” when we splice the remaining exons together, the new sequence is now one possible mRNA molecule:

**mRNA**=AUG/UUG/UUC/UUA/UAG which translates into

**tRNA anticodons/protein** (sentence) = UAC/AAC/AAG/AAU/AUC =  
Start/Mother/Wears/Dresses/Stop

B. Now cut the nuclear RNA a different way, removing the underlined introns and exons splicing the remaining exons together:

AUG/UUG/CAA/CAA/CAA/CUA/CAA/CAA/CCA/CAA/CAA/CAA/UUC/UUA/UAG

What would the new mRNA sequence be?

What would be the sequence of the tRNA anticodons and the resulting protein (sentence)?

5. Finally have students design their own nuclear RNA sequence that includes exons and introns that can be alternatively spliced using the same words from the protein synthesis activity. They can present their nuclear RNA sequence to the class and have their classmates try to figure out alternative ways to splice the RNA.