DNA AND PROTEIN SYNTHESIS

Objective: Students will simulate the steps of protein synthesis.

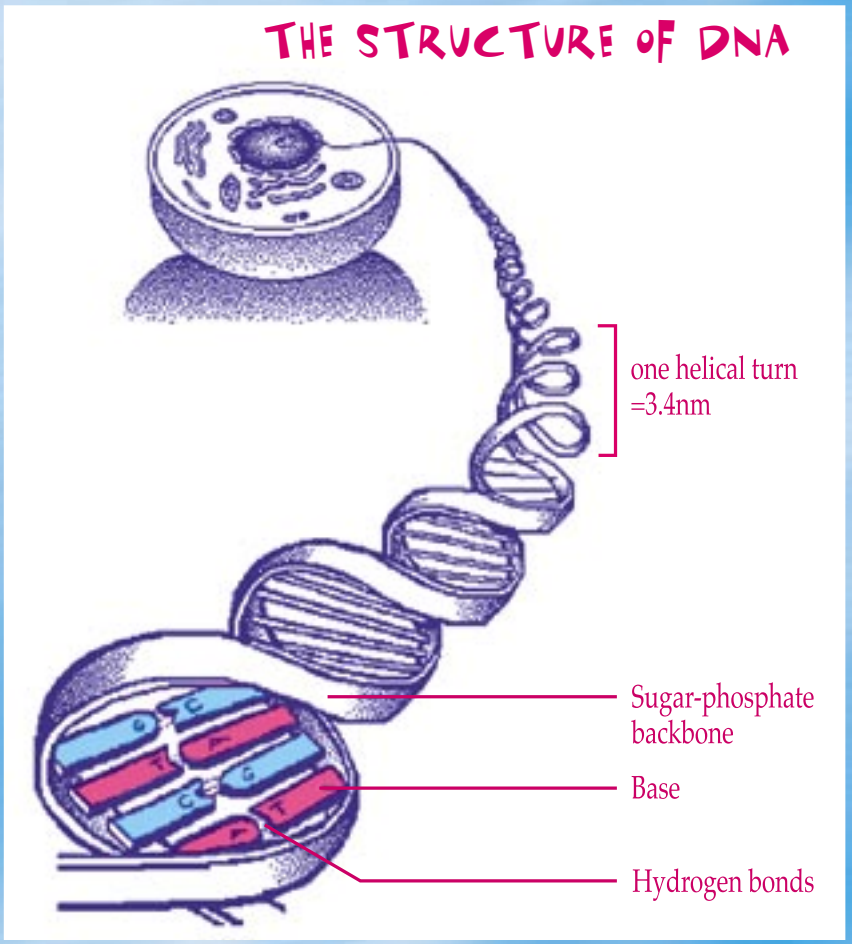
Teacher notes: This activity will give students a chance to see what happens inside a cell during protein synthesis. Note cards will represent the nitrogen base triplet codes in DNA, mRNA and tRNA and amino acids. Depending on how detailed you want the simulation, students with DNA triplet codes might actually be located in a different place in the room, simulating the nucleus, while those with mRNA codons will travel from the nucleus to the cytoplasm and the tRNA anticodons will travel through the cytoplasm, looking for the amino acids they code for and taking them to assemble in sequence at the ribosome.

Materials: Matching note card sets for each group of students—DNA triplet codes in a specific sequence, mRNA codons, tRNA anticodons, and the amino acids that they code for. The number needed is determined by the size of each group—one set per student in the group. Students will need to understand that DNA "unzips" in the nucleus to allow the mRNA strand to form codons to carry the message to the ribosome, then for tRNA to form anticodons. (See table below.)

DNA	mRNA	tRNA
A	U	A
T	A	U
C	G	C
G	C	G

Procedure:
Have students match DNA to mRNA, then mRNA to tRNA. Use the table to allow students to determine what amino acid is being coded for by the mRNA or tRNA (determined by the table they use). Number amino acids in order to form a mini-protein.

At the end of this lesson, each group will have its own mini-protein. They might put all of the sequences together to form a larger protein. For example, insulin is made up of 51 amino acids. Each amino acid sequence can be used for the next activity.



www.accessexcellence.org/AB/GG/structure.html

mRNA Codons and Amino Acids

FIRST BASE	SECOND BASE: U	SECOND BASE: C	SECOND BASE: A	SECOND BASE: G	THIRD BASE
U	UUU, UUC — Phenylalanine	UCU, UCC, UCA, UCG — Serine	UAU, UAC — Tyrosine	UGU, UGC — Cysteine	U, C
	UUA, UUG — Leucine		UAA (Stop)	UGA (Stop)	A
			UAG (Stop)	UGG Tryptophan	G
C	CUU, CUC, CUA, CUG — Leucine	CCU, CCC, CCA, CCG — Proline	CAU, CAC — Histidine	CGU, CGC, CGA, CGG — Arginine	U, C, A, G
			CAA, CAG — Glutamine		
A	AUU, AUC, AUA — Isoleucine	ACU, ACC, ACA, ACG — Threonine	AAU, AAC — Asparagine	AGU, AGC — Serine	U, C
	AUG Methionine (Start)		AAA, AAG — Lysine	AGA, AGG — Arginine	A, G
G	GUU, GUC, GUA, GUG — Valine	GCU, GCC, GCA, GCG — Alanine	GAU, GAC — Aspartic acid	GGU, GGC, GGA, GGG — Glycine	U, C, A, G
			GAA, GAG — Glutamic acid		

A table students can use that shows which amino acids go with which mRNA codons or tRNA anticodons. Many biology texts have a table like this. (From: Biology: The Web of Life, 2nd edition, copyright 2000)