Gene Expression

L A B / A C T I V I T Y

Engage: Express Yourself!

INTRODUCTION

In this activity, you will examine the DNA sequence of a Squoovian. Squoovians are inhabitants of the planet Squoo, which orbited a star a long time ago in a galaxy far, far away. Squoovians have one chromosome with only ten genes. Your job is to analyze the Squoovian DNA, determine what traits the organism has, and then sketch the organism. Make sure your traits are clearly recognizable in your drawing. To keep things simple, the gene sequences in this activity are *much* smaller than gene sequences found in real living organisms, and most of the genes have only two possible versions of the traits being expressed in your Squoovian.

THE ACTIVITY

1. You will be given a DNA sample taken from a volunteer Squoovian: Squooshy, Squeamish, Squonky, or Squiggly. (The DNA sequences for each are listed below the gene/trait table.) Write this DNA sequence in your lab notebook as well as the type of Squoovian.
2. Transcribe the DNA into the complementary mRNA. Write the mRNA sequence in your lab notebook also. (Tip: Do ***not*** try to group the letters into triplets for codons yet. You need to find the start codon for each gene sequence first.)
3. Using your codon table, analyze the mRNA sequence to figure out where each gene starts and stops, and which amino acids are coded for on the RNA. Write the amino acid sequence in your lab notebook.
4. Use the amino acid sequences to determine the traits of your Squoovian, and draw this Squoovian in your notebook showing each trait very clearly.

FOLLOW UP QUESTIONS

Answer the following questions in your notebook using complete sentences.

1. Assuming that Squoovians have eukaryotic cells like we do, where in their cells would
   a) DNA be found?
   b) ribosomes and RER be found?
   c) transcription occur?
   d) translation occur?
2. How long (number of bases) were the genes for the Squoovians? How long could they be in real life?
3. What concept from our unit on evolution determines which traits will happen in the highest numbers and which traits may disappear over time?
4. A mutation occurs in the DNA of a Squoovian. Name at least three different consequences that could occur in the protein produced due to the change in the DNA.

Gene	Amino Acid Sequence	Trait/Description
Gene 1 - body shape	met - val - pro - ala	skinny body
	met - val - pro - tyr	plump body
Gene 2 - head shape	met - leu - his	square or circular
	met - leu - ile	elongated: rectangular or oval
Gene 3 - legs	met - asp - gly - arg - thre	two legs; walks upright
	met - asp - glu - ala - thre	many legs
Gene 4 - tail	met - phe - phe - tyr	tail
	met - phe - cys - tyr	no tail
Gene 5 - fur	met - gly - leu	fur
	met - gly - ile	no fur
Gene 6 - skin/fur pattern	met - ser - arg - val	some spots or stripes on body
	met - ser - asp - val	no spots or stripes
Gene 7 - number of eyes	met - ala - thre - thre - gly - his	two eyes
	met - ala - gly - his - his - leu	number other than two eyes
Gene 8 - ear shape	met - pro - asp	rounded ears
	met - pro - glu	pointy ears
Gene 9 - ear location	met - tyr - val - pro	side of head
	met - tyr - tyr - tyr	top of head
Gene 10 - nose/antennae	met - glu - gly - his	nose
	met - glu - his - gly	antennae

Squoovian DNA samples:

Sample #1 - Squooshy Squoovian:
ATACCATGGGATGACTAATACGACGTGACTATACTTGCCCTCCTGTACTAAATACAAAACAATGA
CTAAATACCCCGAAACTATACAGGTTGCACACTAAATACCGCTGGTGGCCCGTGACTAATACGG
GTTGACTAAATACATGCACGGGACTAAATACGTTCCCGTGACT

Sample #2 - Squeamish Squoovian:
AATACCATGGGCGGACTAATACGACTAAACTATACTTGCCCTCCTGTACTAAATACAAAACAATG
ACTAAATACCCCTATACTATACAGGTTGCACACTAAATACCGCTGGTGGCCCGTGACTAATACG
GGGTCACTAAATACATGATGATAACTAAATACGTTCCCGTGACT

Sample #3 - Squonky Squoovian:
ATACCATGGGCGGACTAATACGACGTGACTATACTTGGTTCGGTGGACTAAATACAAAAAAATA
ACTAAAATACCCCGAAACTATACTCGTCTCAAACTAAATACCGGCCCGTGGTGGAAACTAATAC
GGGGTCACTAATACATGCACGGGACTAAATACGTTGTGCCCACT

Sample #4 - Squiggly Squoovian:
AAATACCATGGGCGGACTAATACGACTAAACTATACTTGGTTCGGTGGACTAAATACAAAAAAAT
AACTAAAATACCCCTATACTATACAGGTTGCACACTAAATACCGCTGGTGGCCCGTGACTAATAC
GGGGTCACTAATACATGCACGGGACTAAATACGTTGTGCCCACT