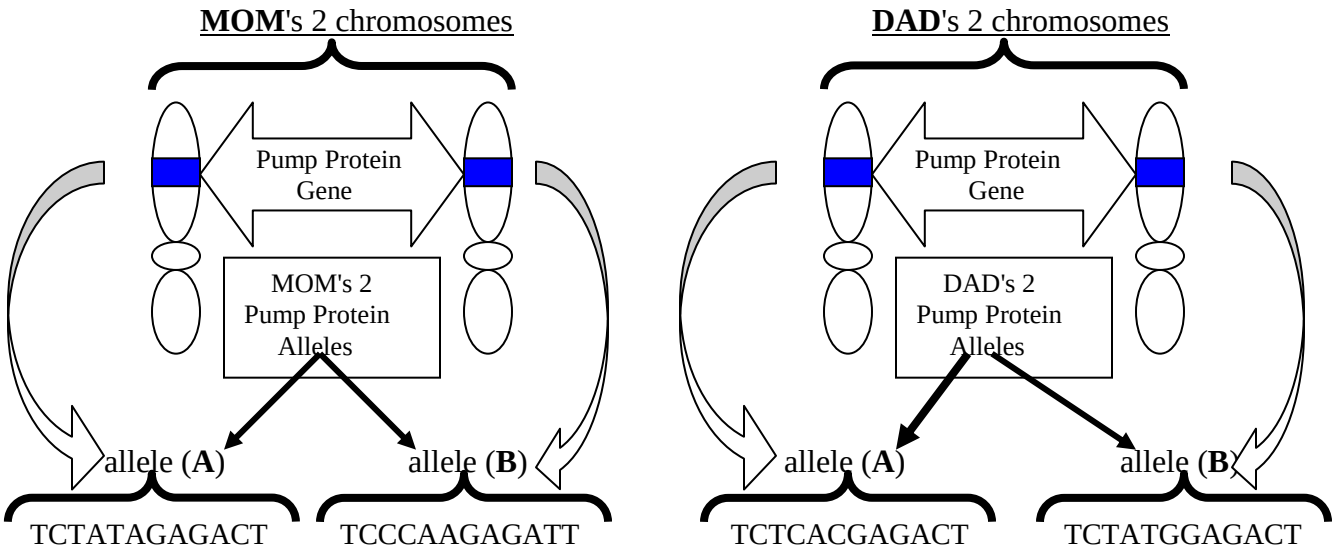
CF: PUZZLE

Cystic Fibrosis (CF) is a genetically inherited disease caused by a **recessive** mutation that results in the production of broken pump proteins. This leads to a variety of symptoms including dry, thickened mucous in the lungs; coughing, wheezing and a high risk for frequent lung infections; and slow growth due to malnutrition. This disease currently has no cure and maximun life expectancy is ~29 years of age. Below is a CF Puzzle to measure the skills you have developed during the DNA unit. First you will find a pair of chromosomes for each parent (MOM & DAD) which have gene "mailboxes" with DNA codes for making pump proteins.

Skill 1: **Transcribe** each pump protein DNA allele code into mRNA

Skill 2: **Translate** each mRNA into its corresponding (pump) protein chain

*** **Use the CODON Table on the back** ***



TRANSCRIBE

mRNA _____ _____ _____ _____

TRANSLATE

Pump Proteins _____ _____ _____ _____

_____ _____ _____ _____

Mom's Genotype letters

Dad's Genotype letters

Skill 3: Determine each parent's **genotype** based on the protein chains. Use the Pump Protein Symbol KEY (**on back**) to determine the symbol (C or c) for normal functioning or broken pump proteins

Codons in mRNA

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

Pump Protein Symbol KEY

Symbol	Protein Chain	Function?
C	Arg - Val - Leu - STOP	pump protein works fine
c	Arg - Tyr - Leu - STOP	pump protein **broken**

Skill 4 Describe each parent's **phenotype** (normal or have CF disease ?)
CF is caused by a recessive mutation. What does this mean?

How many mutant alleles must one inherit before showing CF ? **1** or **2** ← **(circle)**

parent	**Genotype**	**Phenotype** (normal or have CF disease ?)
MOM:		
DAD:		

Skill 5: **Calculate** the parent's **probability** of having an CF child **using a Punnett Square**

	Mom's Egg Varieties	
Dad's Sperm varieties		

What is the chance the parents will have a child with CF disease ? _____