CONCEPT: OVERVIEW OF EUKARYOTIC GENE REGULATION

● Gene expression is regulated at every _____ from transcription to translation

□ Transcription initiation is controlled via several factors

- *Enhancers, activators, and silencers* all control transcription

- *Transcription factors* both specialized and generalized which activate transcription

□ Transcription regulatory factors have specific DNA binding _____

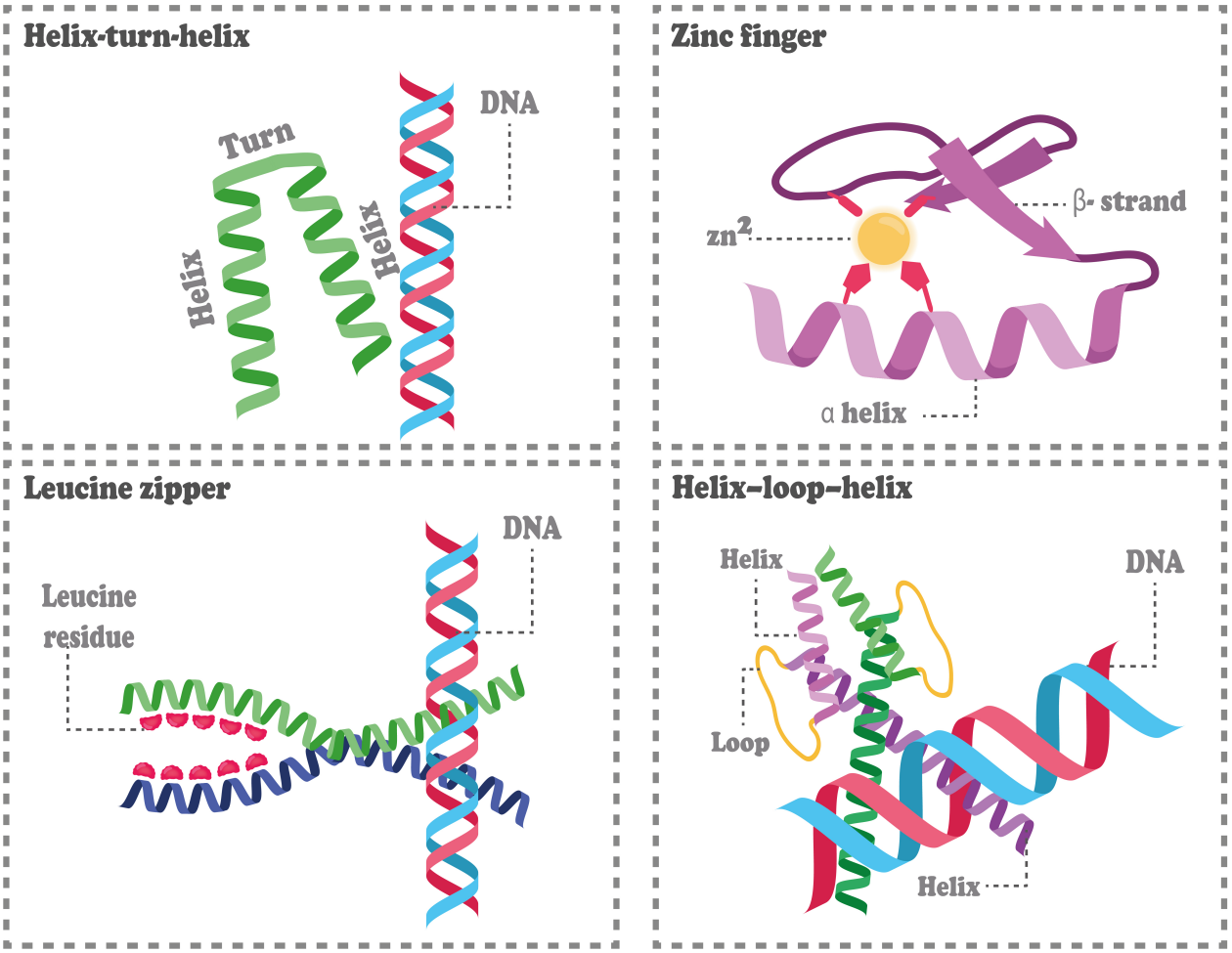
- **Helix-turn-helix:** Two alpha helices separated by a turn

- **Zinc-Finger:** Structure that binds zinc and folds into a finger like structure

- Leucine Zipper: A dimer structure that "zips" together multiple leucines

- Helix-loop-helix: Two alpha helices connected by a loop

EXAMPLE:



● Gene expression is also _____ through RNA processing, stability and translation

□ *RNA interference* uses small noncoding RNAs (miRNA or siRNAs) to degrade certain transcripts

□ RNA processing events like splicing help regulate gene expression

- **Alternative splicing** creates many different protein **isoforms** which result in different phenotypes

□ *Drosophila* sex determination is controlled through alternative splicing

- Ratio of X chromosomes to Autosomal chromosomes (**x:a ratio)**

- If the **ratio = 1** this activates ***sxl*** gene, which regulates splicing of **tra** gene

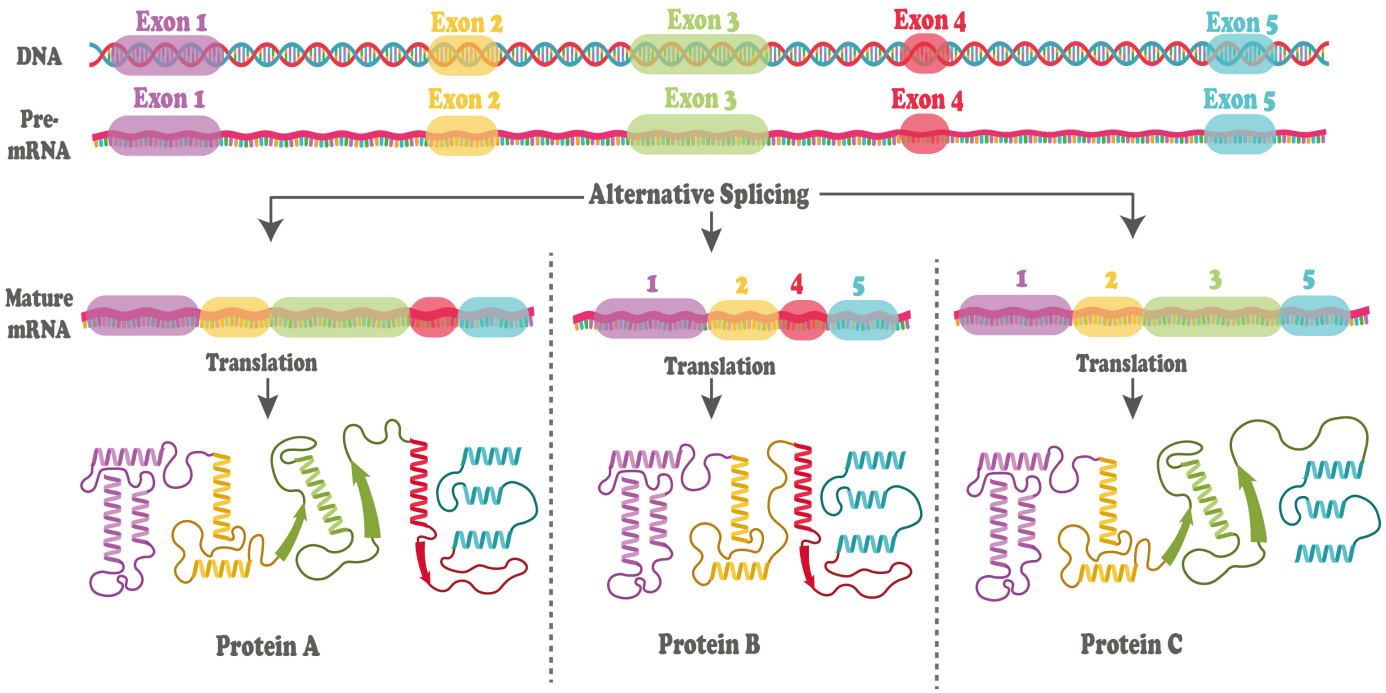
- Splicing of *tra* stimulates female-specific splicing of **dsx**

- If **ratio = 0.5** this inactivates the *sxl* gene, and therefore *tra* is nonfunctional

- Without *tra,* the male-specific form of *dsk* is produced

□ **mRNA degradation** is often gene specific and helps to regulate protein production

EXAMPLE:



PRACTICE:

1. Which of the following is NOT a DNA binding motif?
    a. Helix-Turn-Helix
    b. Zinc-Finger
    c. Helix-Finger
    d. Luecine Zipper

2. *Drosophilia* sex determination is controlled through which of the following mechanisms?
    a. Alternative splicing of the *dsx* gene
    b. Alternative splicing of *sxl* gene
    c. Inactivation of *dsx* gene
    d. Ratio of X chromosomes to Y chromosomes

3. True or False: Gene regulation in eukaryotes only occurs during the transcription stage of gene expression.
    a. True
    b. False