

Eukaryotic Genomes: Organization, Regulation, and Evolution

Chapter 19

1. What role do histones play in DNA packing?
2. Why is control of gene expression more complex in eukaryotes than in prokaryotes?
3. Describe the effects of DNA methylation and histone acetylation on gene expression.
4. Explain the roles of enhancers and transcription factors in regulating gene expression.
5. Once mRNA encoding a particular protein reaches the cytoplasm, what four mechanisms can regulate the amount of protein active in the cell?
6. Suppose you compared the nucleotide sequences of the distal control elements in the enhancers of three genes expressed in muscle cells. What would you expect to find? Justify your answer.
7. What role is played by alternative splicing in gene regulation?
8. How can the life of a mRNA be extended? Why would a cell do this?
9. Explain the role of RNAi in regulating gene expression.
10. Imagine the mRNA degraded by a particular miRNA coded for a protein that promotes cell division in humans. What would happen if a mutation disabled the gene that codes for the miRNA?
11. Explain the role of oncogenes and tumor-suppressor genes in the development of cancer.
12. Carcinogenic mutations are likely to have different effects on the activity of proto-oncogenes than they do on tumor-suppressor genes. Explain.
13. The p53 protein can activate genes involved in apoptosis. Explain how mutations in genes coding for proteins that function in apoptosis could contribute to cancer.
14. Explain how a transposon can move within the genome.
15. How could multigene families have arisen? How are they useful to a cell?