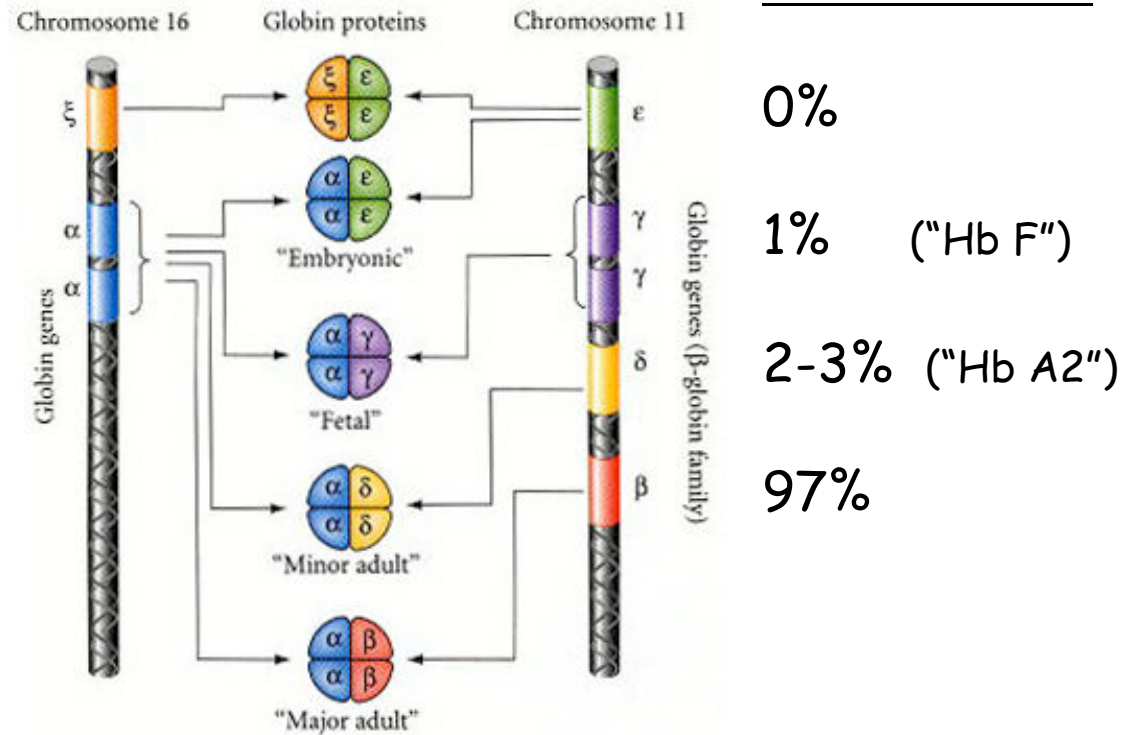


Chemical Biology 03
Oct 26, 2009

Gene Regulation
and Cell Differentiation

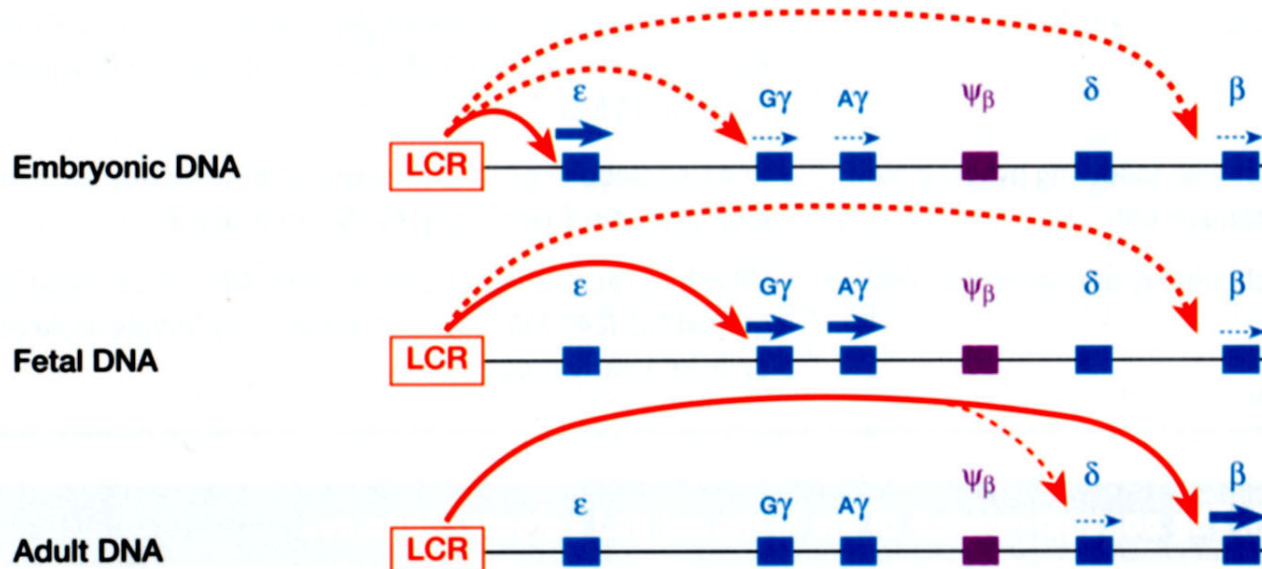
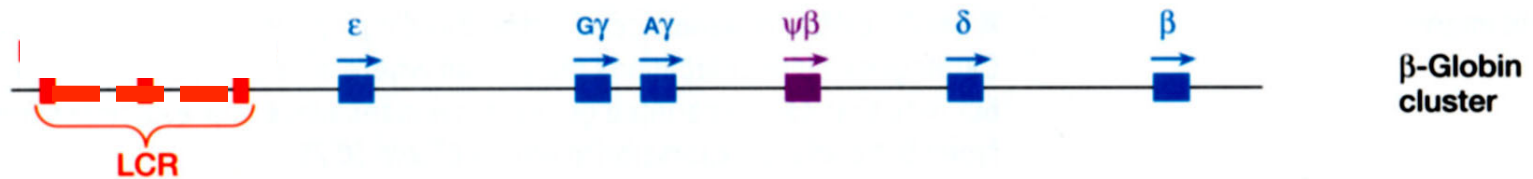
Hemoglobin In adult RBC:



Other cell types: No hemoglobin

Regulation of Gene Expression: β Globin gene cluster

- Only expressed in Red Blood Cells (cell-type specific expression)
- Expression changes over course of development
- Locus Control Region: crammed with recognition sequences for Regulators

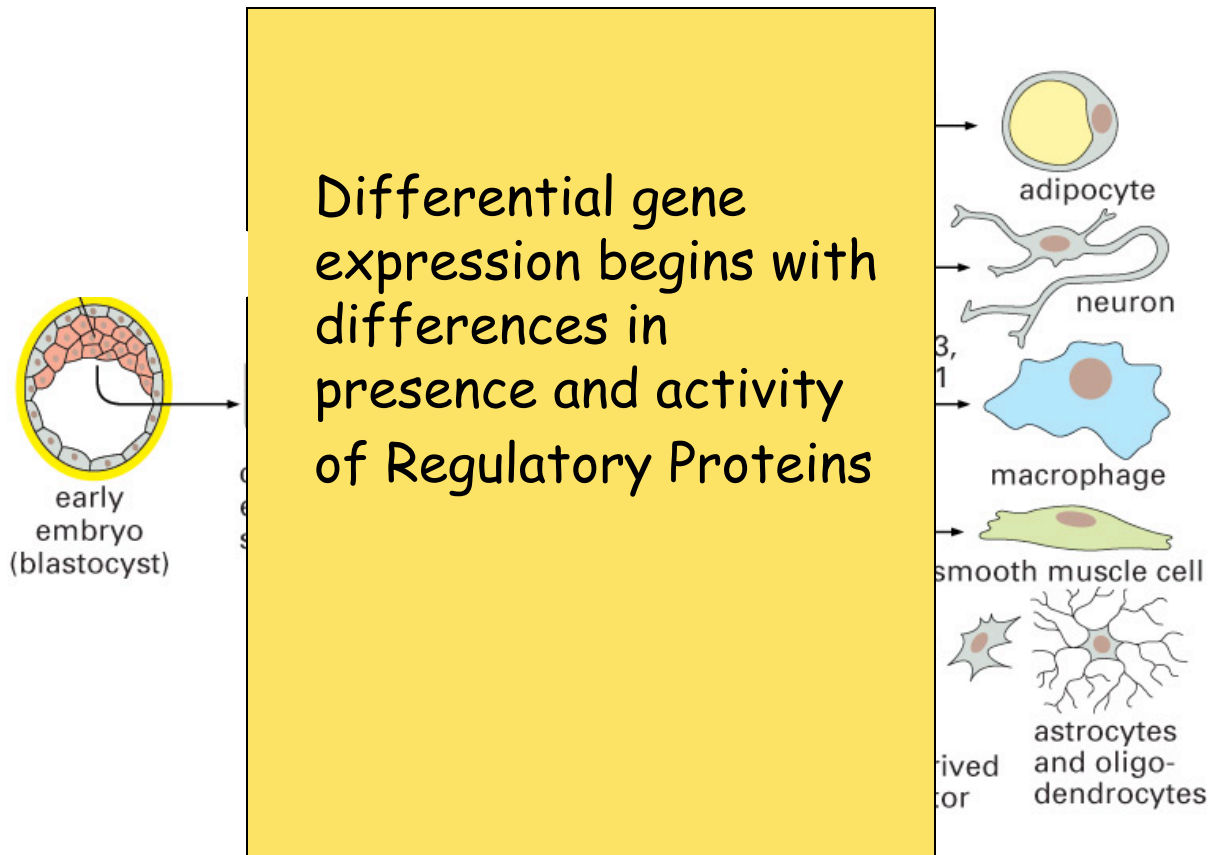


Faustino et al. 2002

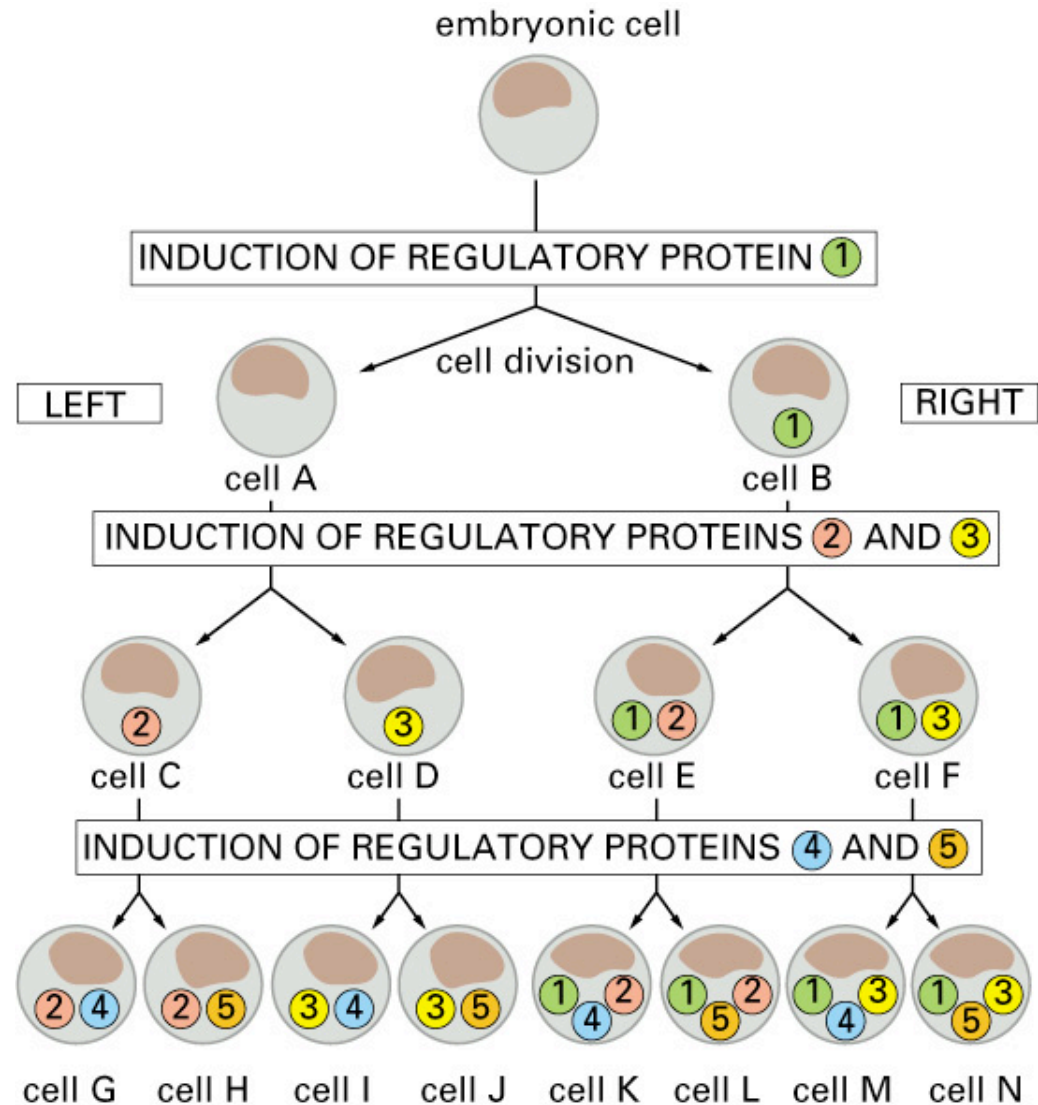
Asymptomatic Homozygous Deletion β^0 -Thalassemia in an African Individual

Cell differentiation in multicellular animals

Undifferentiated cells → Differentiated cells



Different collections of regulatory proteins in each cell type give rise to unique patterns of gene expression for each cell type



Combinatorial Control of gene expression

Transcription Regulators work as part of committee
allows multiple inputs
one can act as trigger

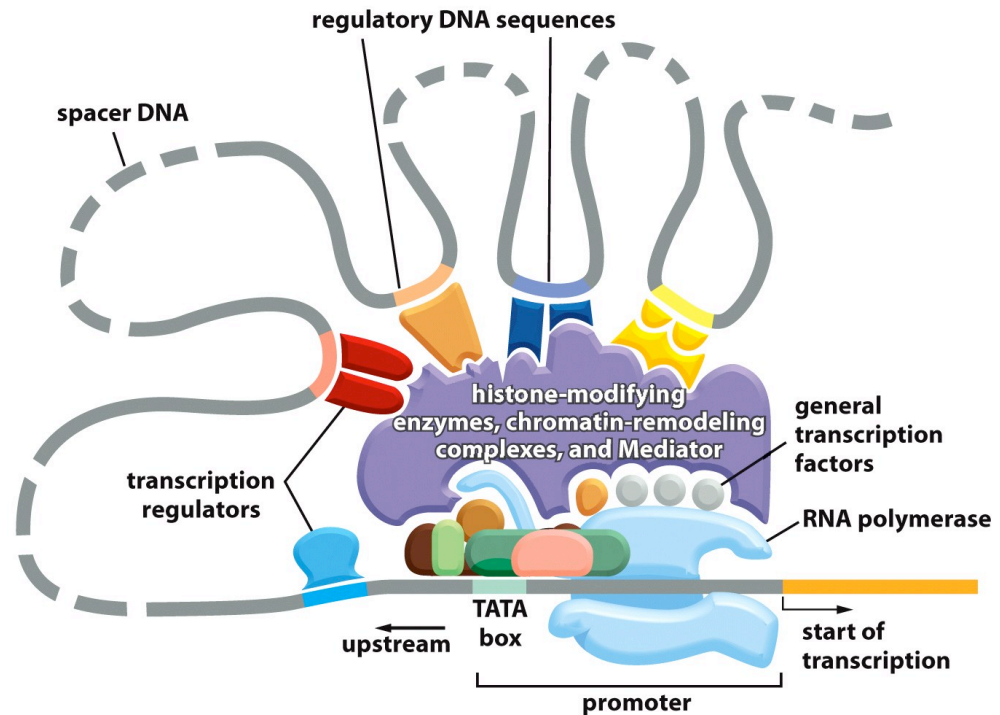
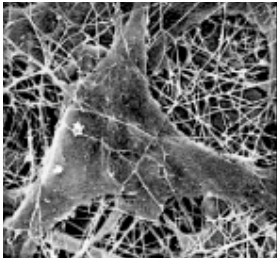


Figure 8-12 Essential Cell Biology 3/e (© Garland Science 2010)

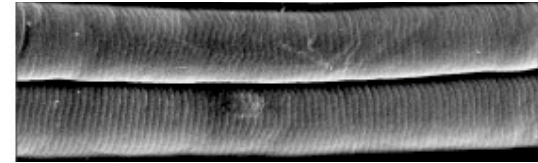
fibroblast



MyoD



Skeletal muscle fibers



Master
Regulatory
Protein

MyoD

M bs myosin II

M bs actin

M bs acetylcholine receptor

M bs creatine phosphokinase

Genes OFF

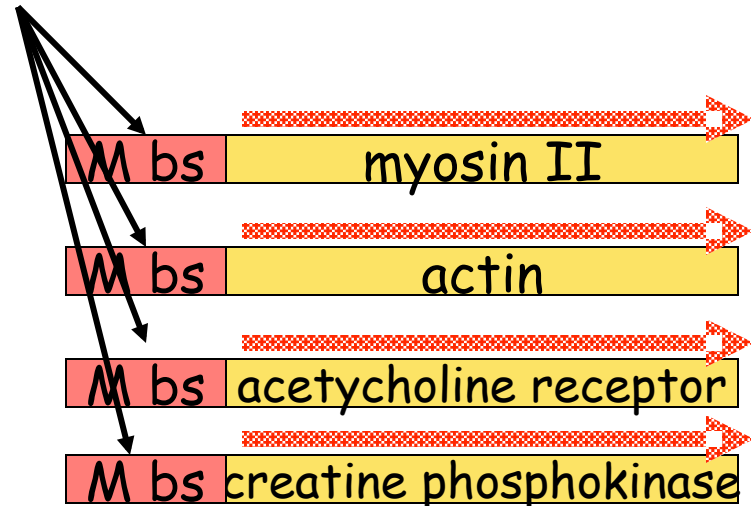
M bs myosin II

M bs actin

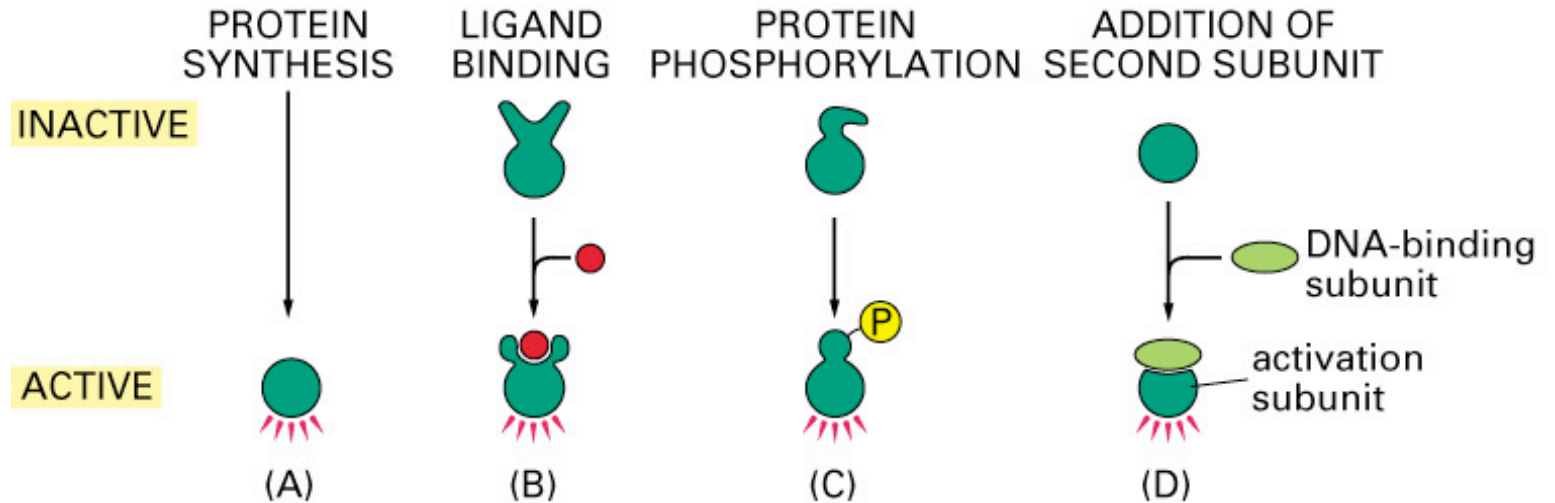
M bs acetylcholine receptor

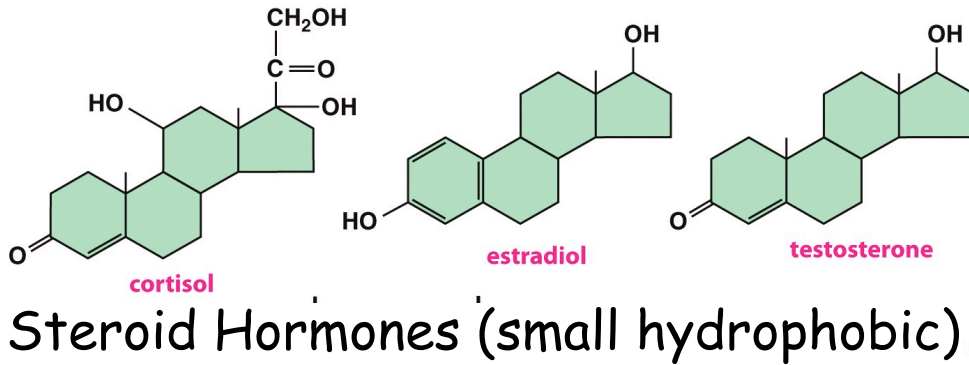
M bs creatine phosphokinase

Genes ON



How are the Gene Regulators Regulated?





"Nuclear Receptor" Class of Transcription Regulators

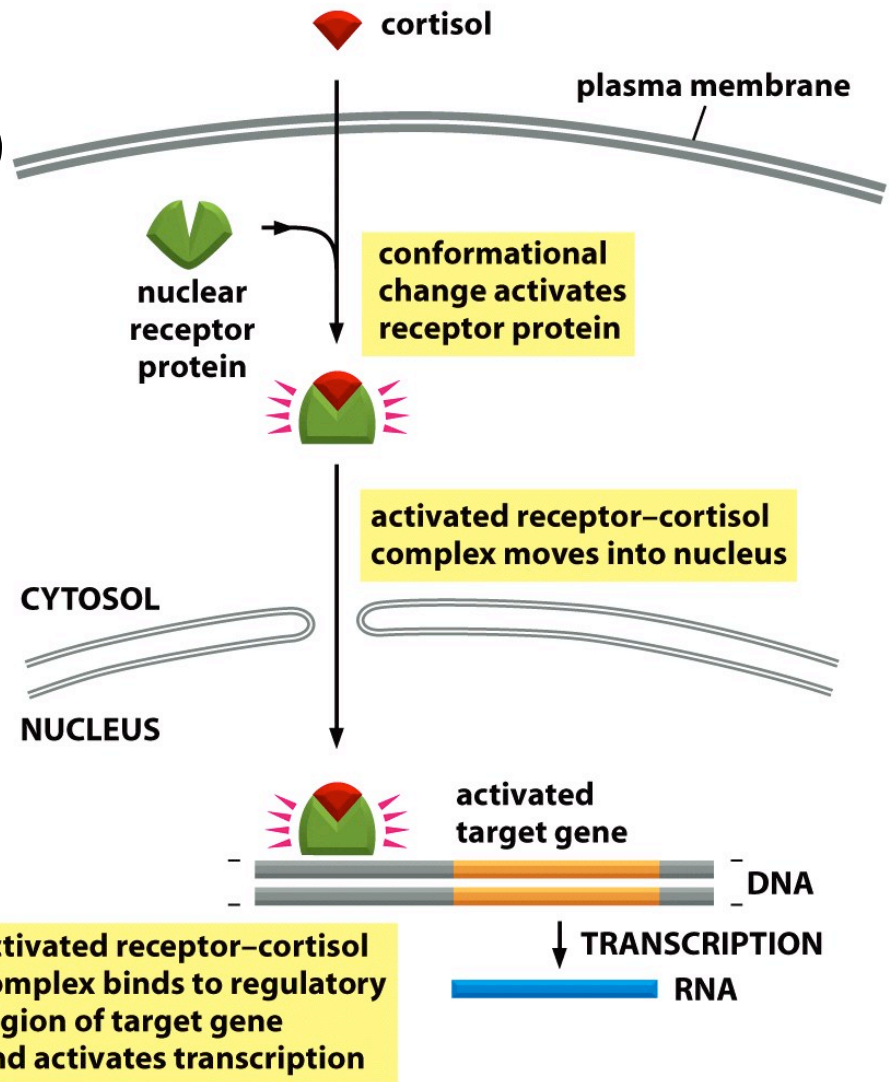
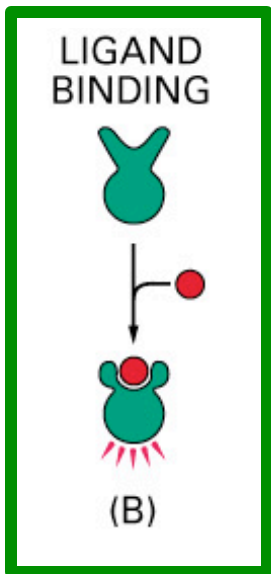
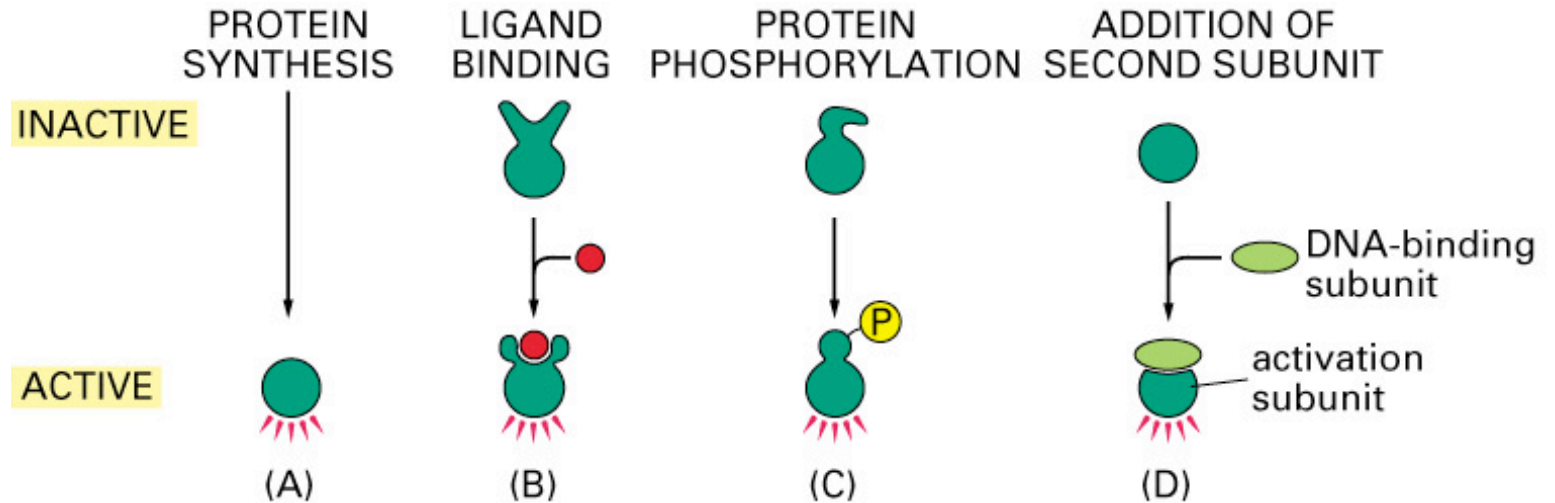


Figure 16-10 Essential Cell Biology 3/e (© Garland Science 2010)

How are the Gene Regulators Regulated?



How are the Gene Regulators Regulated?

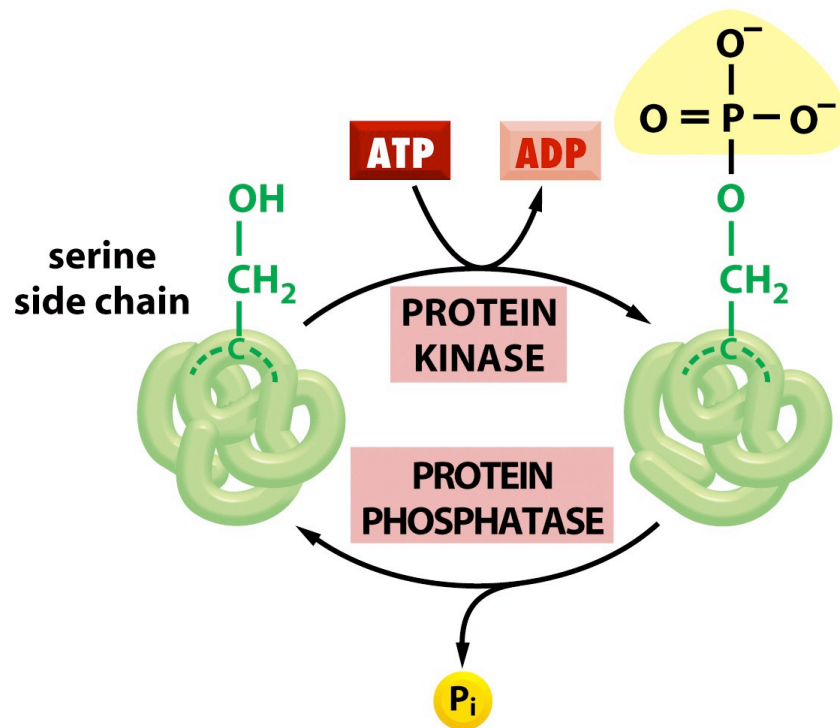
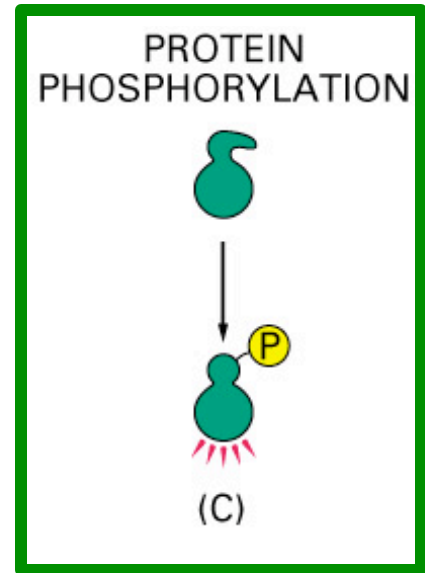
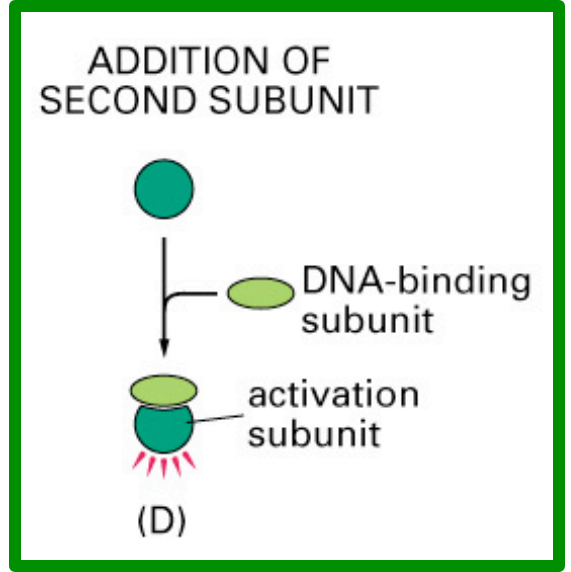
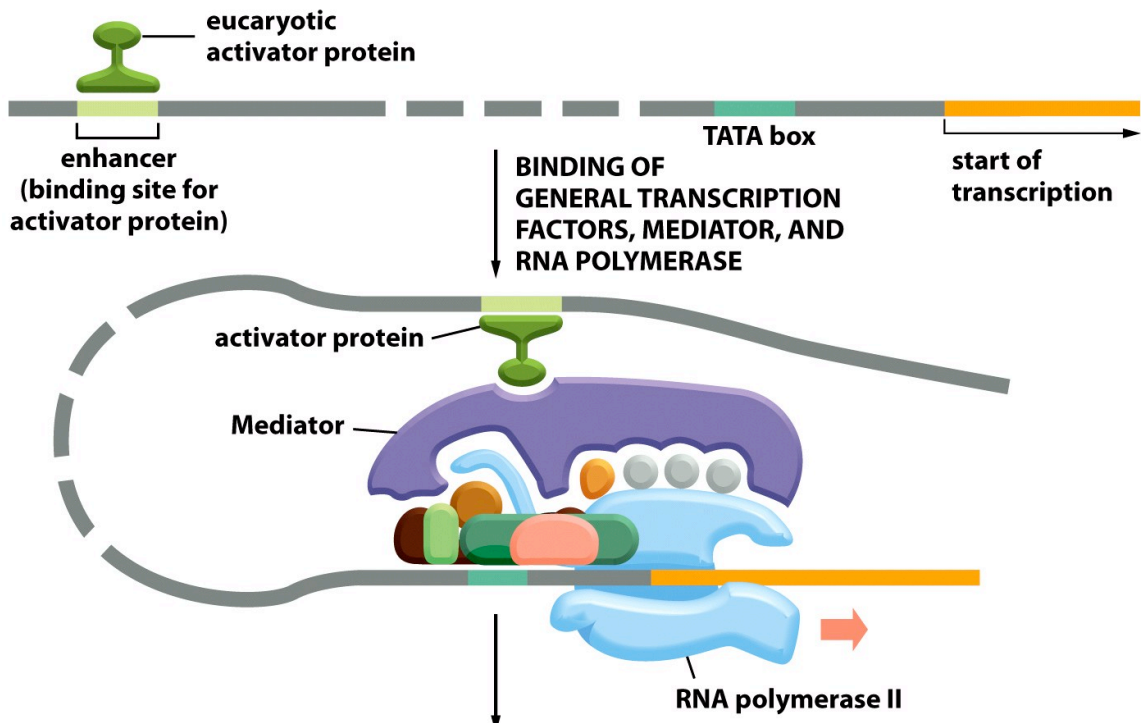


Figure 3-64a Molecular Biology of the Cell 5/e (© Garland Science 2008)





How are the Gene Regulators Regulated (continued)?

