

Gene regulation in eukaryotes

The steps where gene expression can be controlled **Slide 1**

Example: Huntington disease, glutamine expansion in Huntingtin protein inactivates transcription factor **Slide 2**

Differentiation by combinatorial expression of transcription factors **Slide 3**

Multiple transcription factors interact with RNA polymerase at promoter
Enhancer can be more than 1,000 kb away from promoter **Slide 4**

Modular nature of transcription factors **Slide 5**

Module replacement changes specificity of TF **Slide 6**

Genetic switch (remember phage lambda) **Slide 7**

Cluster of β -globin-like genes **Slide 8**

Differential expression of β -globin during development **Slide 9**

The two stages of gene activation **Slide 10**

Chromatin diseases: HbH disease is α -thalassemia caused by a mutation in the X-linked ATRX gene
ATRX is a transcription factor (SW12/SNF) that regulates gene expression via its effect on chromatin structure. ATRX is a helicase. (Textbook page 51, disease box 2)

Rett syndrome to be discussed later (methyl CpG-binding protein, MECP2).

Steroid hormones, glucocorticoid receptor **Slide 11**

The family of steroid receptor proteins **Slide 12**

Homeobox genes **Slide 13**

Drosophila bithorax mutation **Slide 14**

CG islands as regulators, methylation, imprinting (later) **Slide 15**

Aza-cytidine inhibits methylase, reactivates fetal hemoglobin expression

Example fibroblast \rightarrow muscle cell differentiation **Slide 16**

Alternative splicing Slide 17

Src protein expression in nerve cells versus other cells Slide 18

Regulation of membrane bound and soluble IgG Slide 19