# 411 Lecture Outline(13 Feb '09)

1. Strategies of regulation
2. Overview of RNA pol & Transcription Initiation
3. Repressors vs. Activators of transcription
4. What about CRP-cAMP?

## Opportunities in regulation

1. Initiation of transcription
2. What else?

# Transcription regulation

1. Initiation of transcription
   - ➢change in σ factors
   - ➢direct stimulation by DNA sequence or structure
   - ➢use of repressors
   - ➢use of activators

*A little review of transcription in Bacteria…*

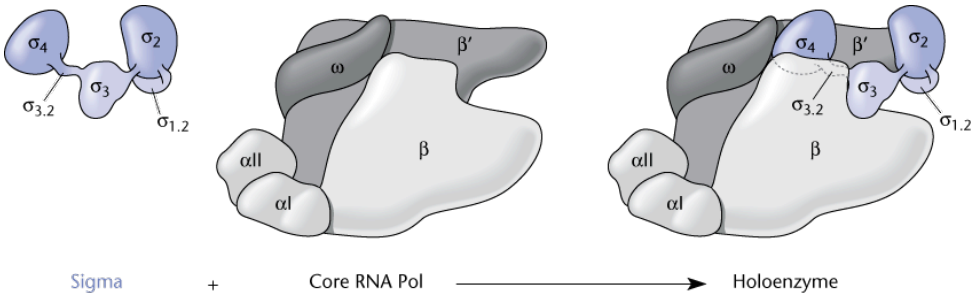



**Figure 2.3**

The Bacterial RNA pol has several subunits.

# Stereotypical bacterial promoter

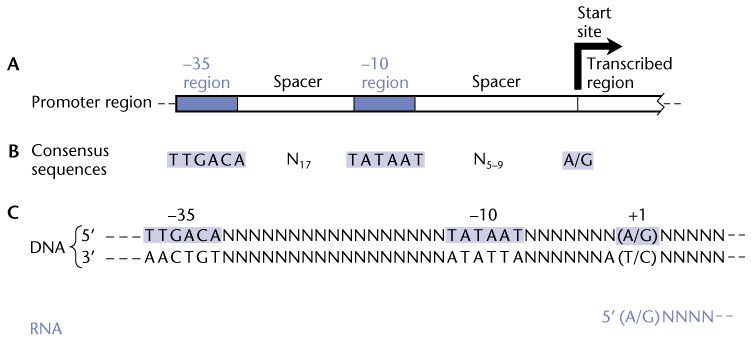



**Figure 2.6**

Promoter with this structure/sequence binds RNA pol holoenzyme with $\sigma^{70}$ with high affinity.
Different holoenzymes bind to distinct promoters.

# Sequences recognized by different holoenzymes

| **Factor** | **Use** | **-35 Sequence (Upstream)** | **Spacing** | **-10 Sequence (Downstream)** |
|---|---|---|---|---|
| $\sigma^{70}$ | normal | TTGACA | 16-18 bp | TATAAT |
| $\sigma^{28}$ | Motility Chemo-taxis | TAAA | 16-17 bp | CCGATAT |
| $\sigma^{54}$ | Nitrogen Reg. | TTGGCA (-24) | 6 bp | TTGCA (-12) |

# RNA pol/DNA/RNA complex

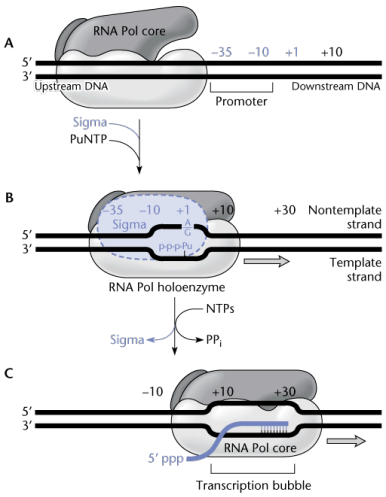



**Figure 2.7**

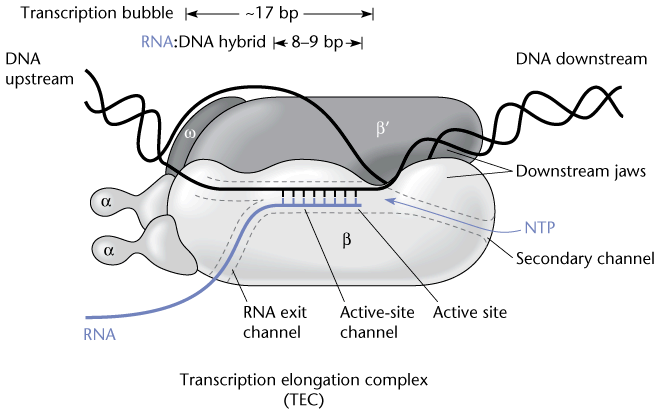
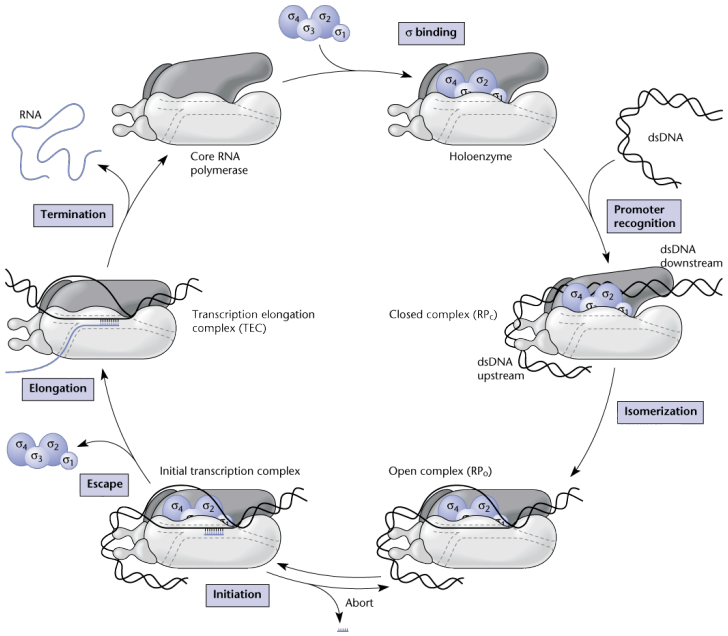



**Figure 2.16**

# Focusing on initiation…

**Figure 2.8**



# RNA pol contacts in the promoter and beyond

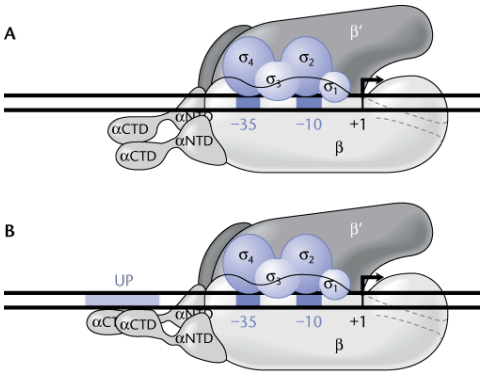
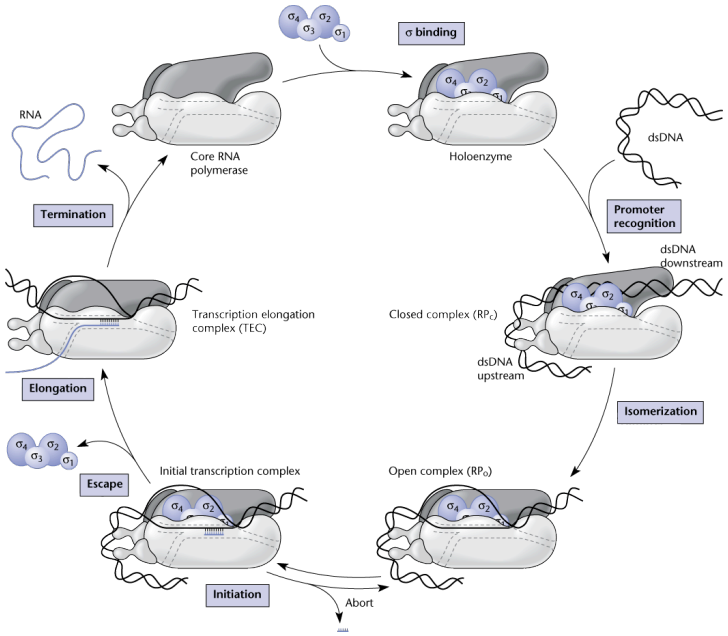



**Figure 2.13**

*B: When you absolutely, positively want to transcribe lots of RNA…*

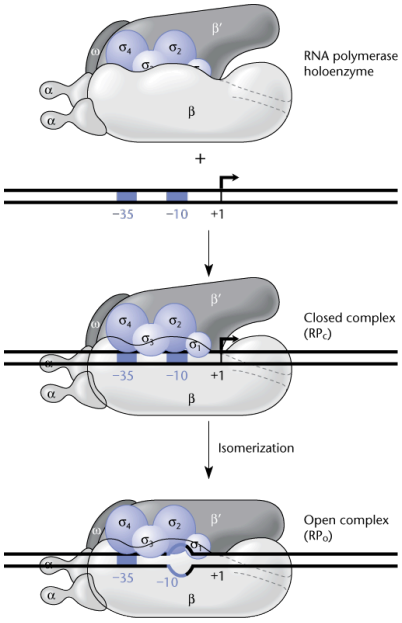
# Focusing on initiation…

**Figure 2.8**

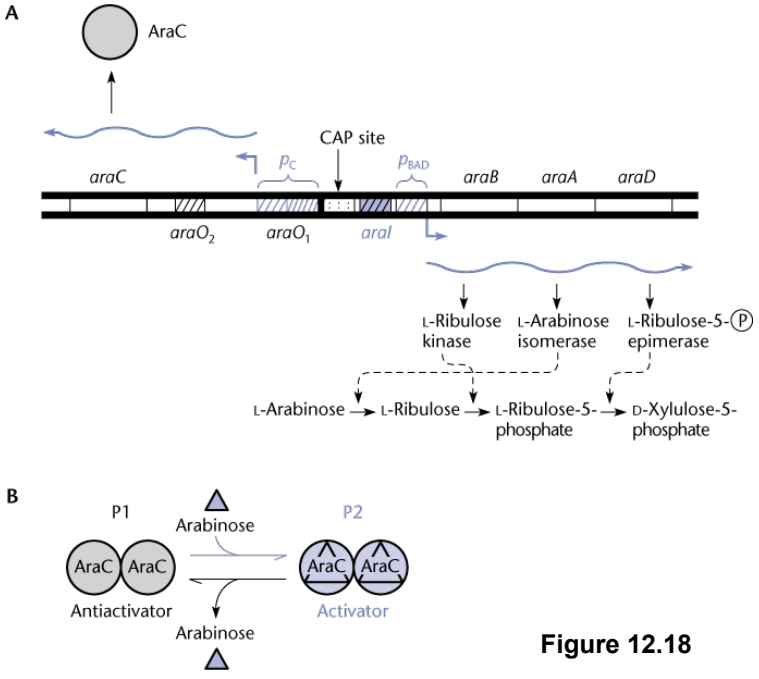


# Many opportunities to affect initiation of transcription…

Figure 2.10




# A different model of regulation: *ara*

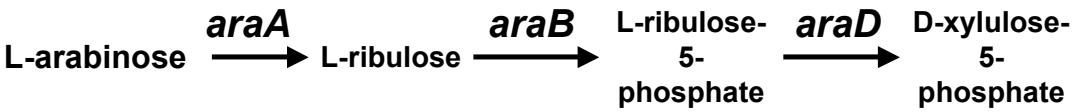



Three loci revealed in mutational analysis. (The two not shown here needed for L-Ara transport.)

Figure 12.18

# Analysis of Ara mutants

At least 4 complementation groups/genes (*araA, araB, araC* and *araD*) are defined by the Ara$^-$ mutants

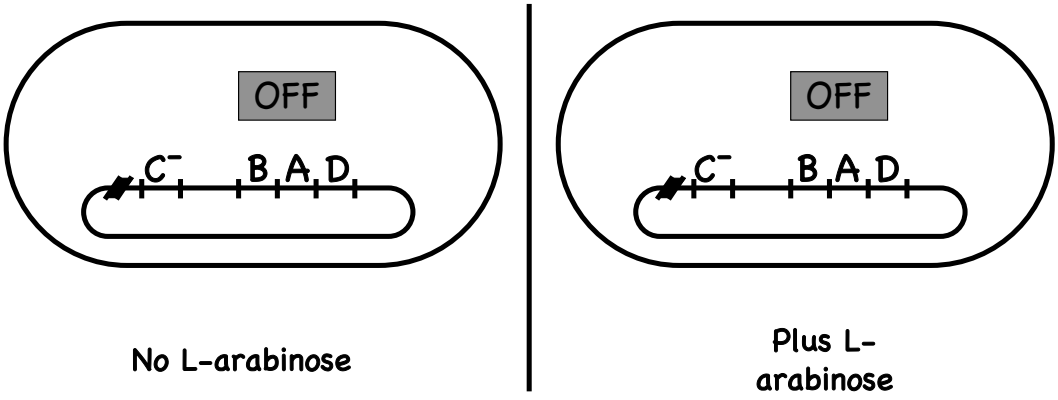



*What about araC?*

AraC mutants can grow on xylulose, so it's not further downstream.

Is AraC a regulator?

**_araC_$^-$ Mutants Are "Super-suppressed"**




What could be the function of *araC*?
*(Remember:* AraC is not the L-Ara permease)

# Action of AraC

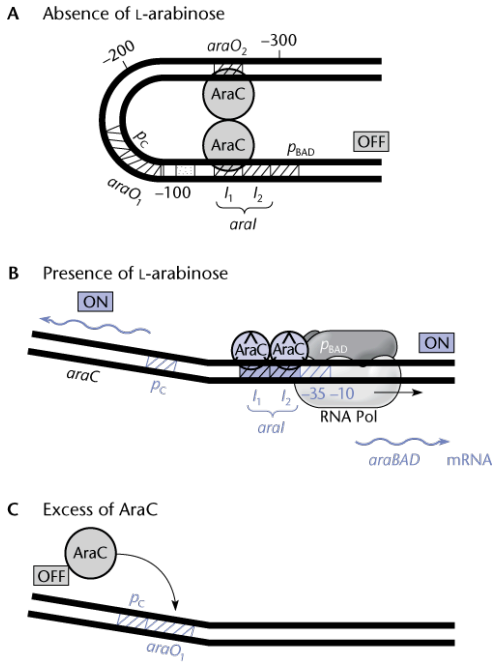



**Figure 12.20**

# cAMP-CRP and AraC

**Figure 13.4**