

**UFABC**

**Bacharelado em Biotecnologia**

# Transcrição

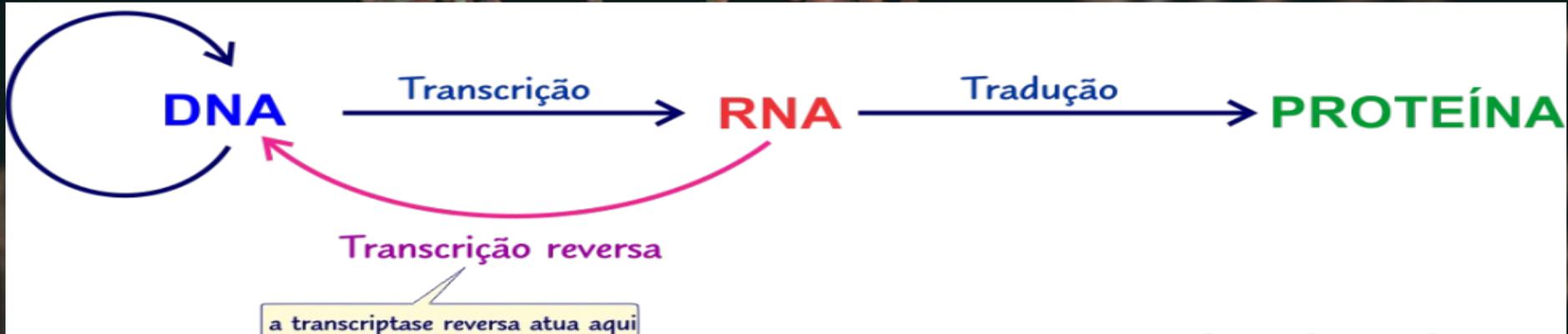
Proteínas recombinantes

Sergio Daishi Sasaki

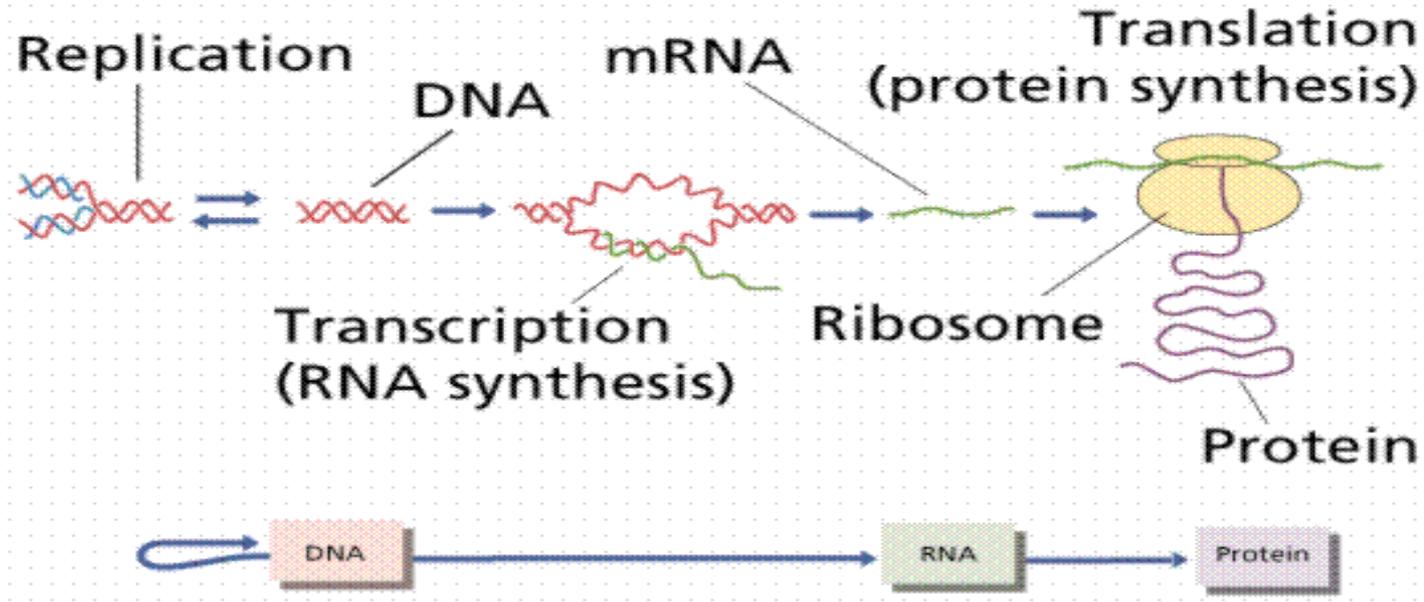
(NHZ6006-18)



Universidade Federal do ABC



# Via de armazenamento e da transmissão da informação genética

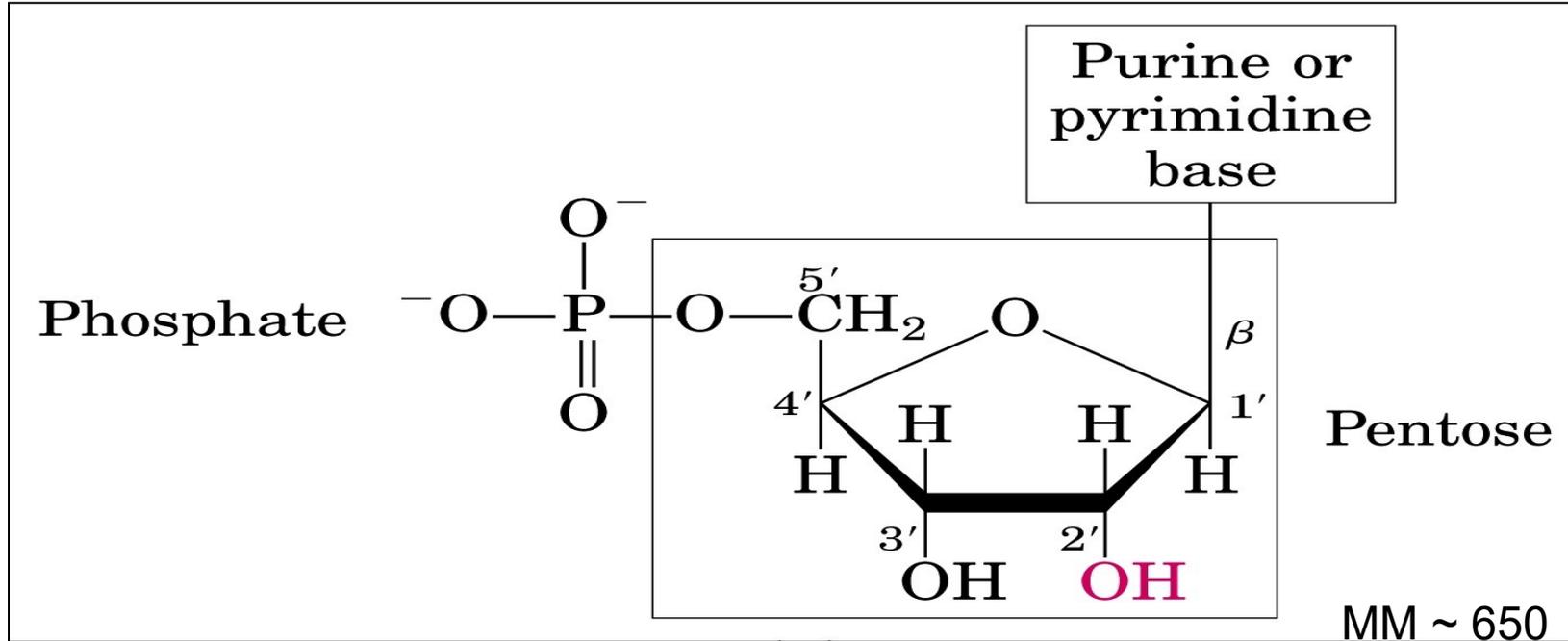


## Velocidade dos processos

Bactérias (37°C):

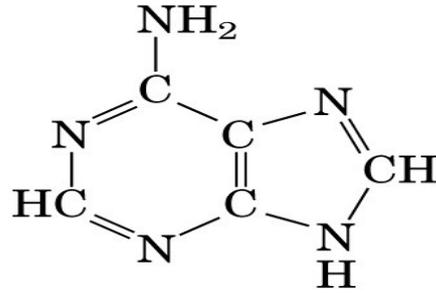
- DNA
  - 1000-2500 nucleotídeos/seg
- RNA
  - ~40 nucleotídeos/seg
- Proteínas
  - ~15 aminoácidos/seg

## Nucleotídeo

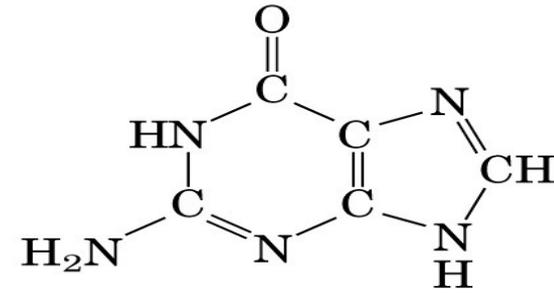


# Natureza Química dos Nucleotídeos

Bases Nitrogenadas  
Principais

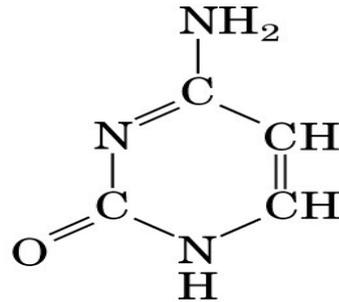


Adenine

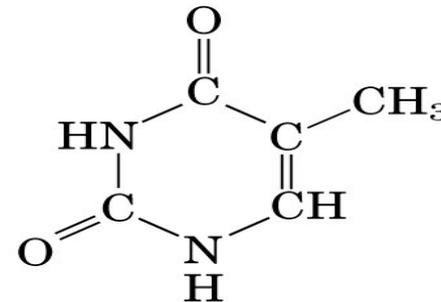


Guanine

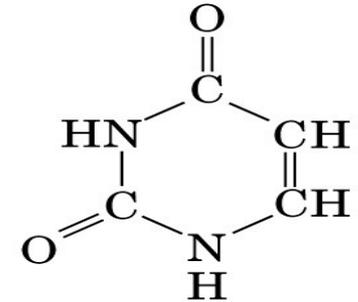
## Purines



Cytosine



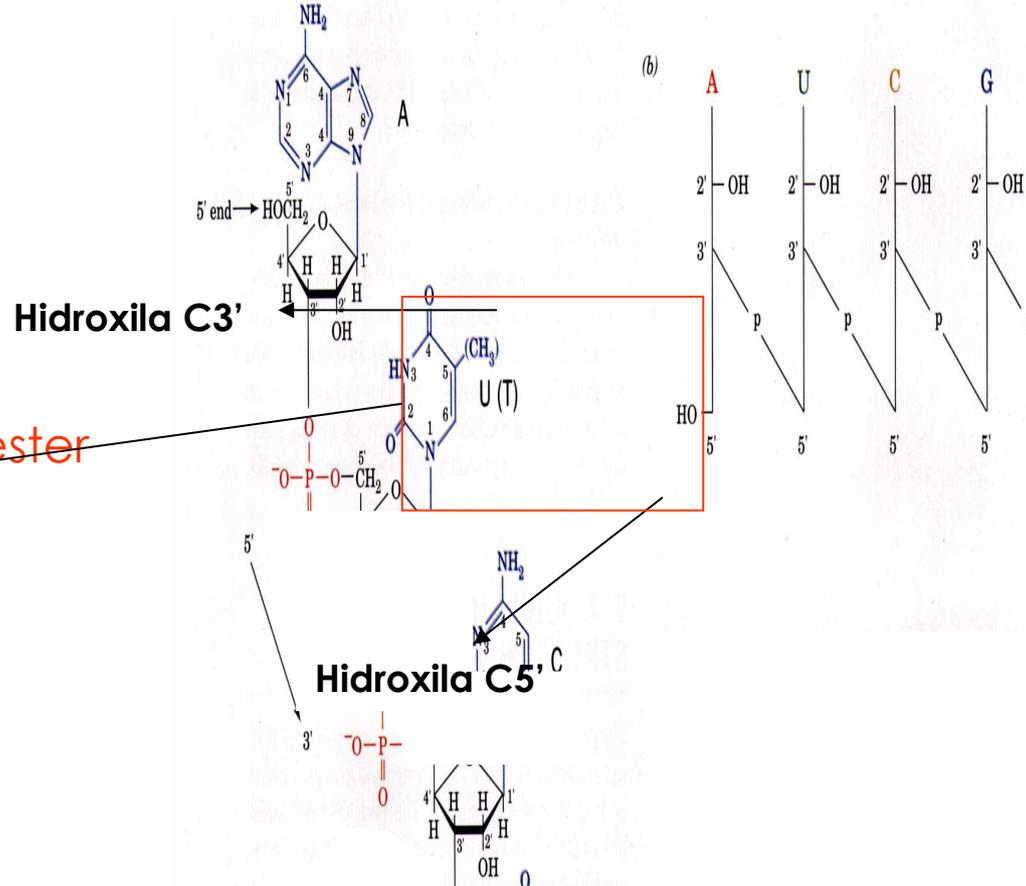
Thymine  
(DNA)



Uracil  
(RNA)

## Pyrimidines

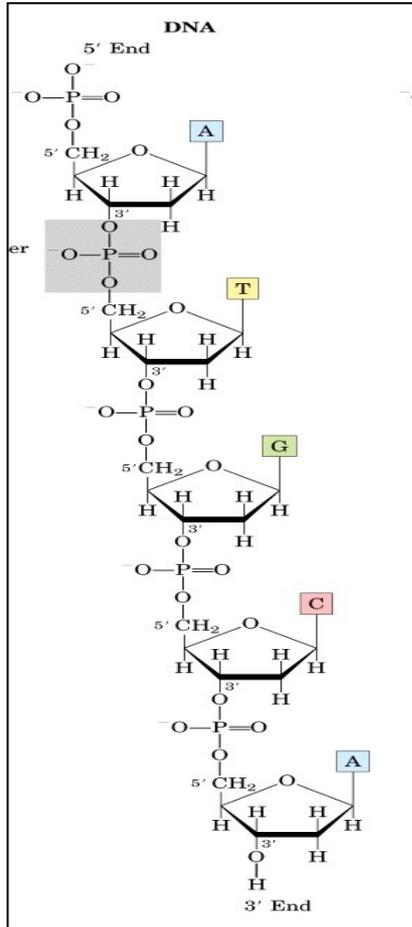
# Ácidos Nucléicos



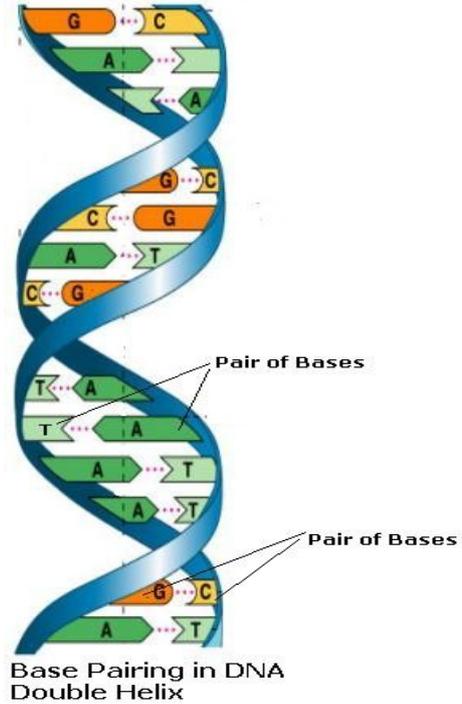
3'-5' Ligação fosfodiéster

Ponte de grupos fosfato

## Estrutura primária

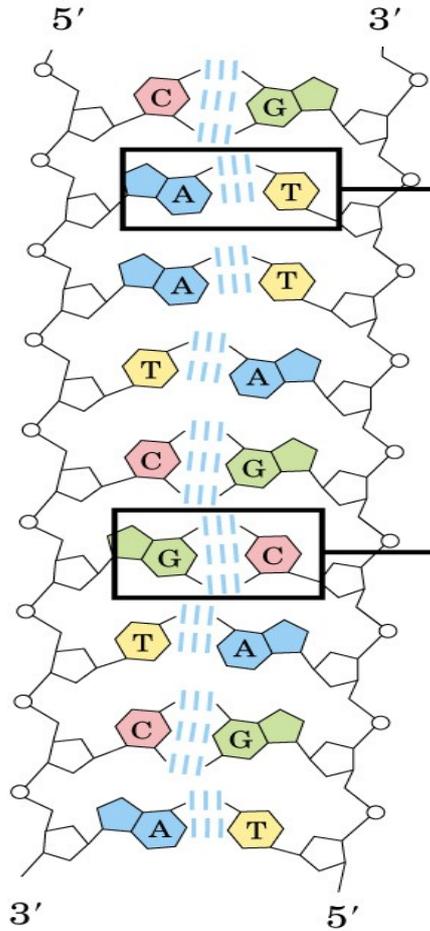


## Estrutura secundária

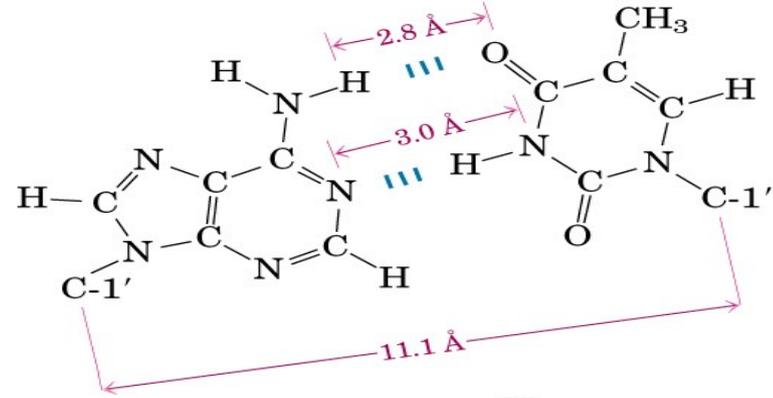


Copyright © Pearson Education, Inc., publishing

# Estrutura do DNA

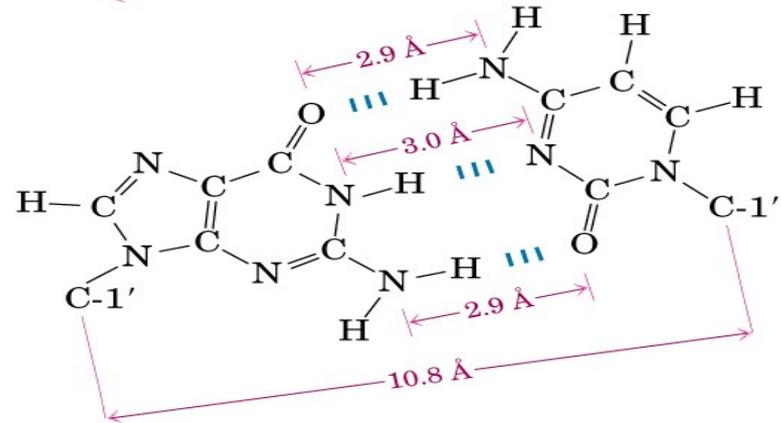


Adenine



Thymine

Guanine

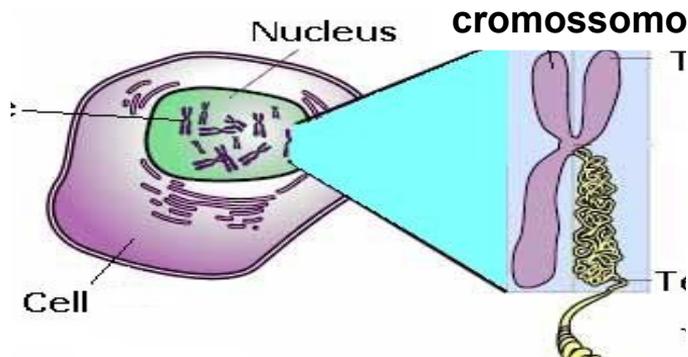


Cytosine

# Estrutura do DNA

## Estrutura terciária

### Eucariotos



Two chromatids  
(10 coils each)

One coil  
(30 rosettes)

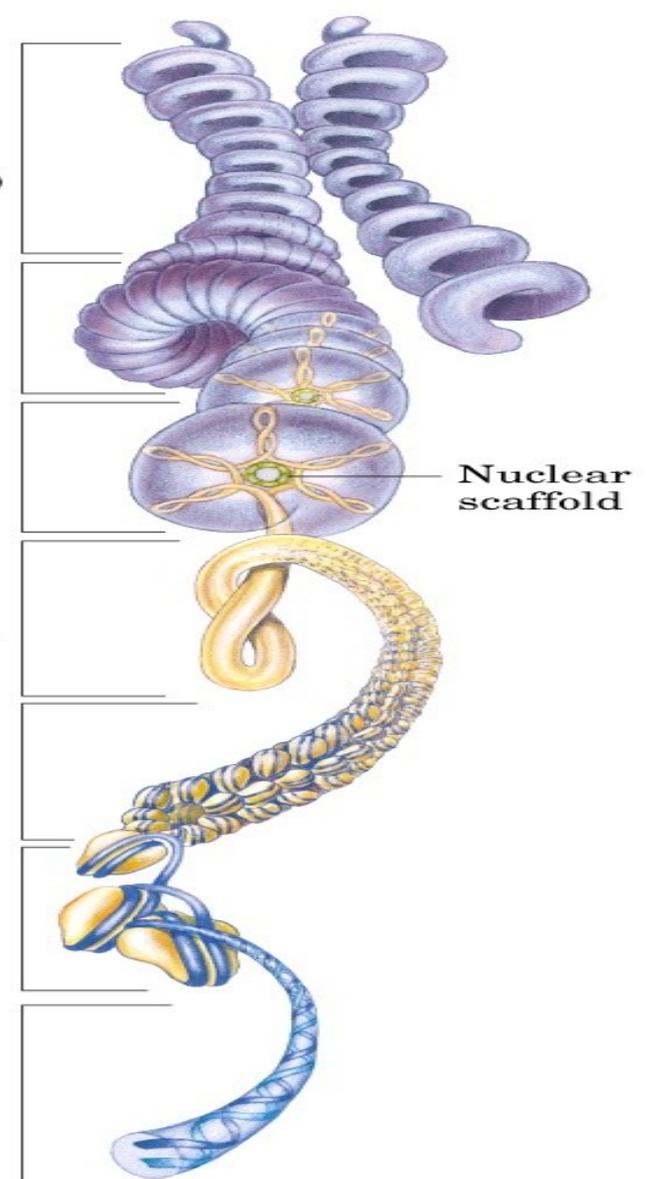
One rosette  
(6 loops)

One loop  
(~75,000 bp)

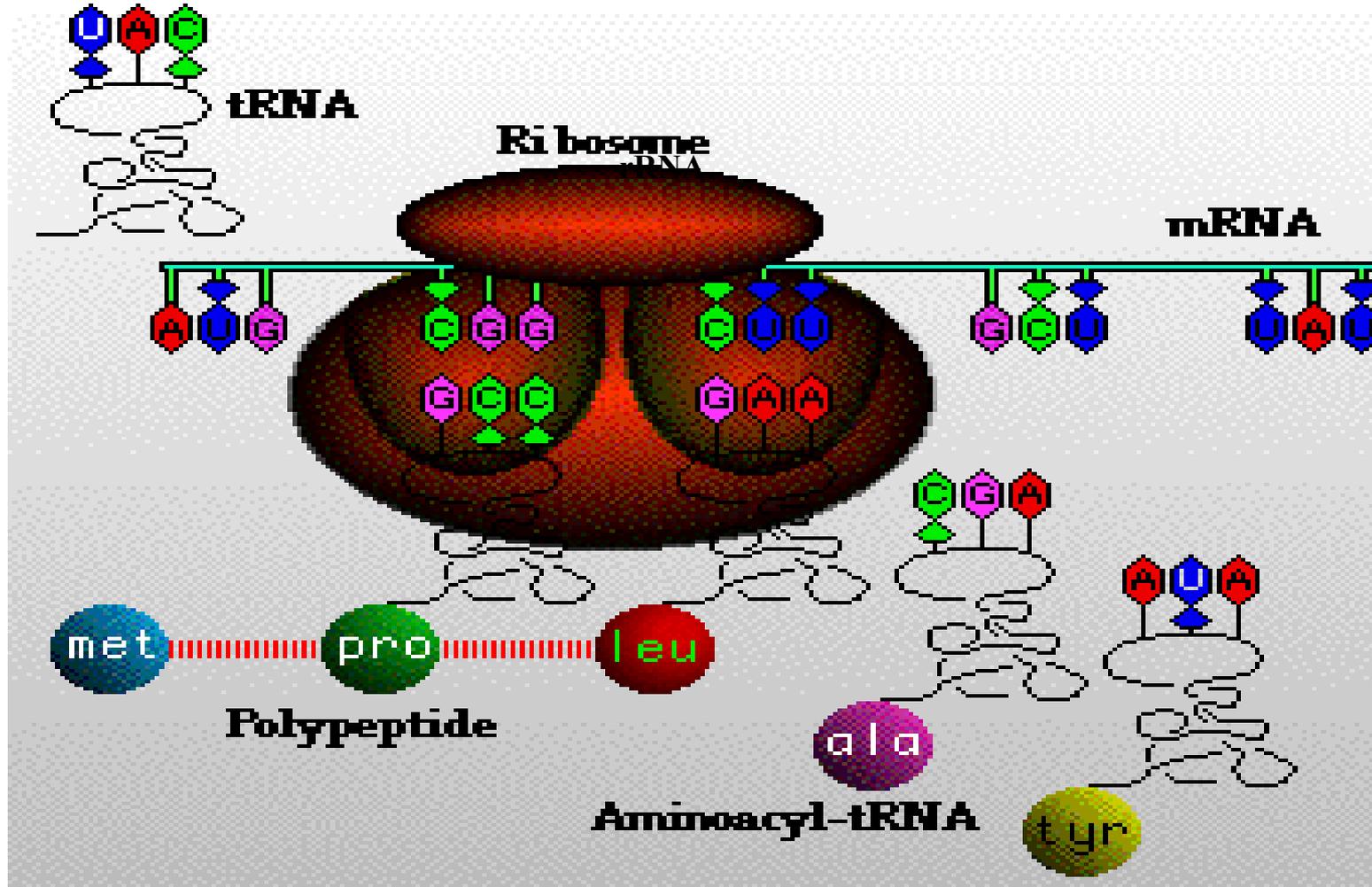
30 nm Fiber

“Beads-on-a-string”  
form of  
chromatin

DNA

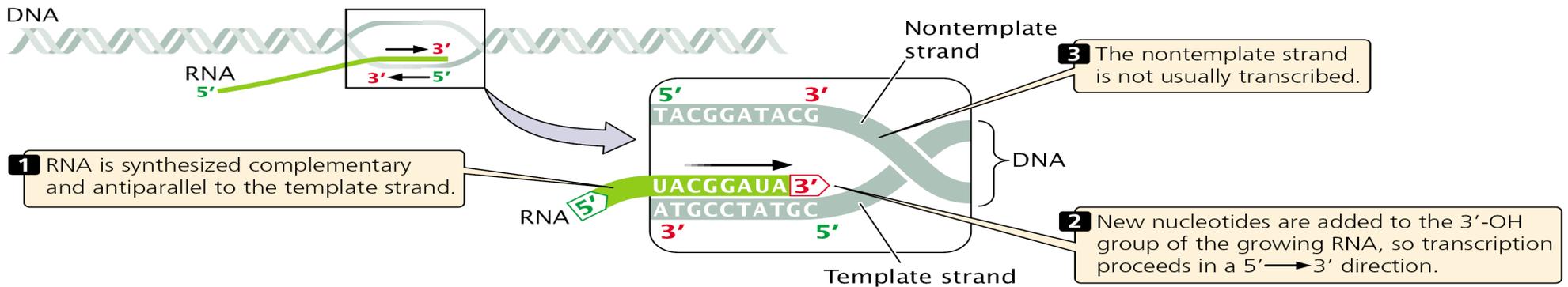


## Diferentes Classes de RNA e suas Funções



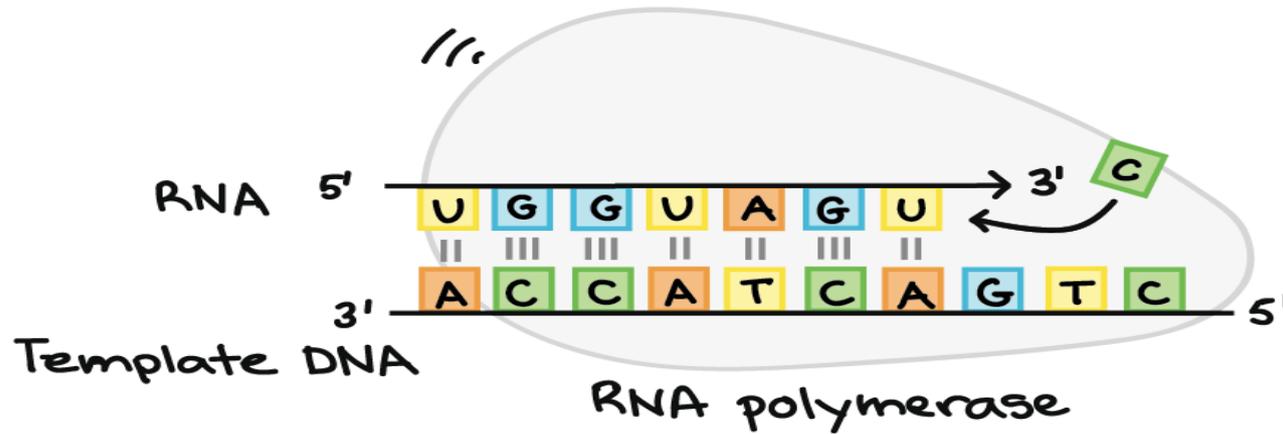
# Transcrição

A transcrição ocorre no sentido 5' → 3'



# Transcrição

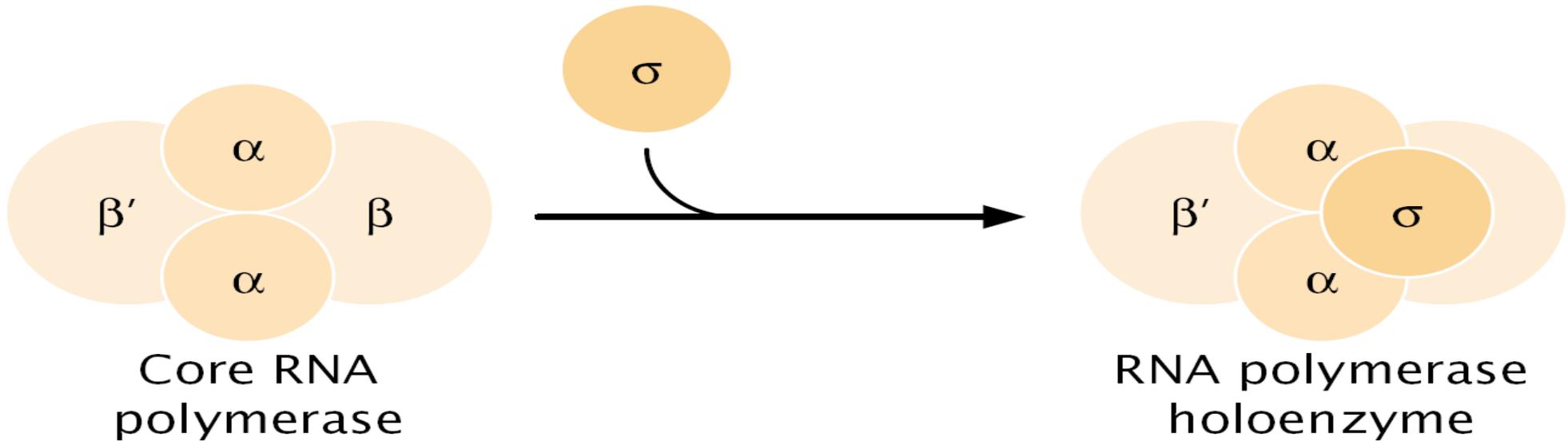
A transcrição ocorre no sentido 5' → 3'



# Transcrição

Células bacterianas possuem um único tipo de RNA polimerase

**(a)**



# Transcrição

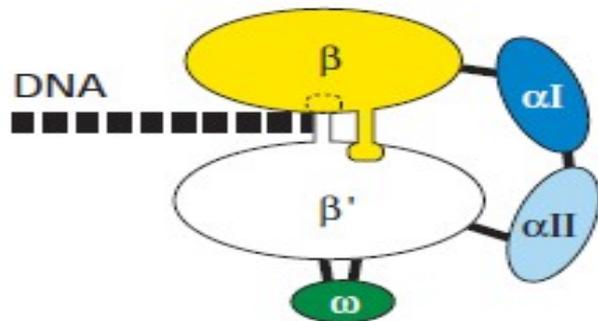
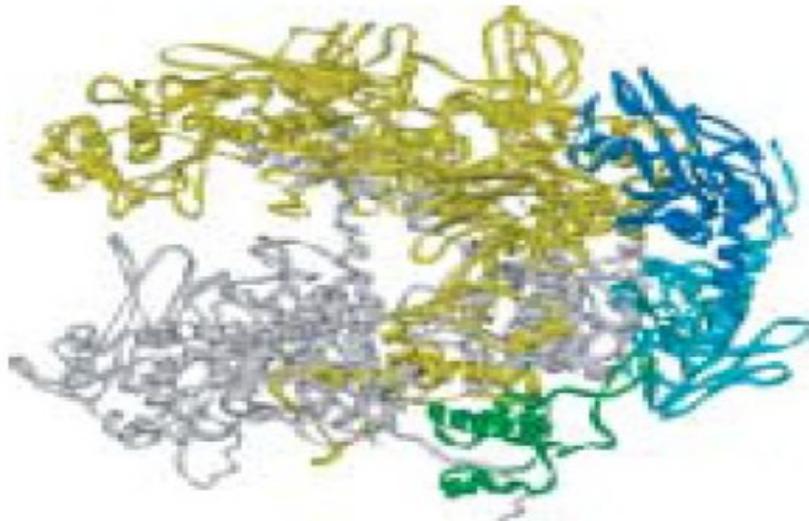
## A RNA polimerase possui 4 tipos de subunidades

Gene	Produto	Funções
<i>rpoA</i>	2 subunidades $\alpha$ (40 kDa cada)	Montagem da enzima Reconhecimento do promotor Ligação de alguns ativadores
<i>rpoB</i>	subunidade $\beta$ (155 kDa)	centro catalítico
<i>rpoC</i>	subunidade $\beta'$ (160 kDa)	
<i>rpoD</i>	subunidade $\sigma$ (32-90 kDa)	Especificidade pelo promotor

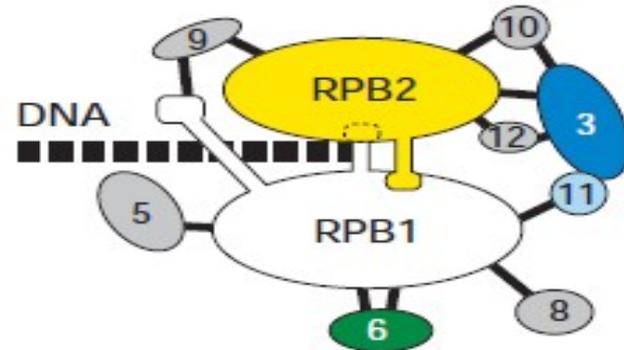
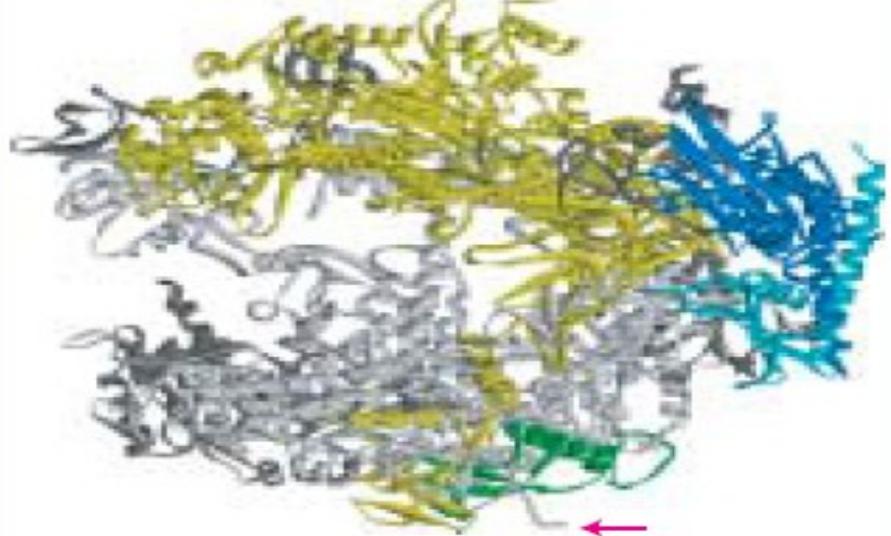
Enzima de *E. coli* = 465 kDa

# Transcrição

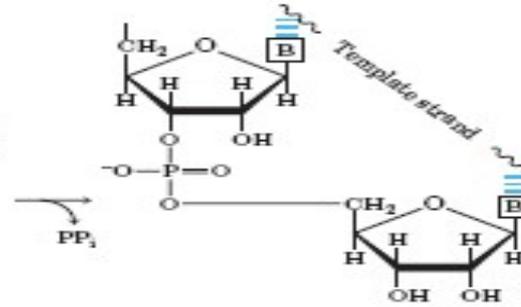
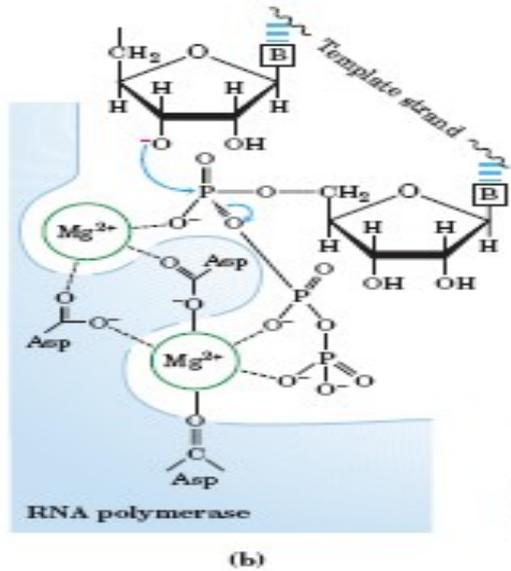
(a) Bacterial RNA polymerase



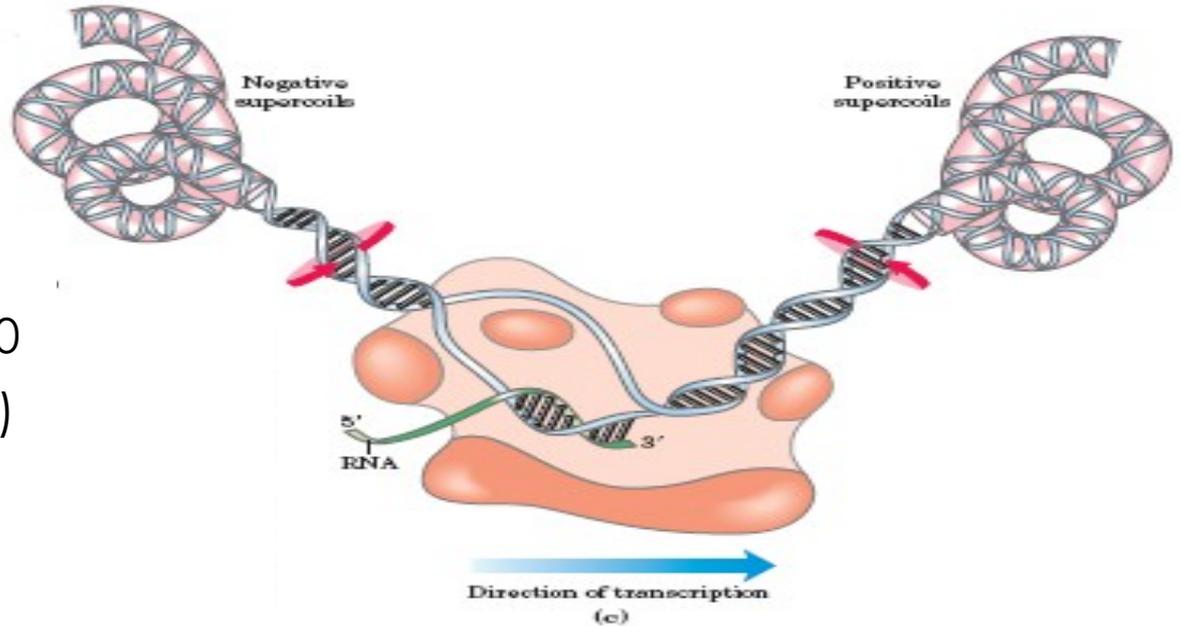
(b) Yeast RNA polymerase II



# Transcrição *E. coli*



50 to 90 nucleotides/s.



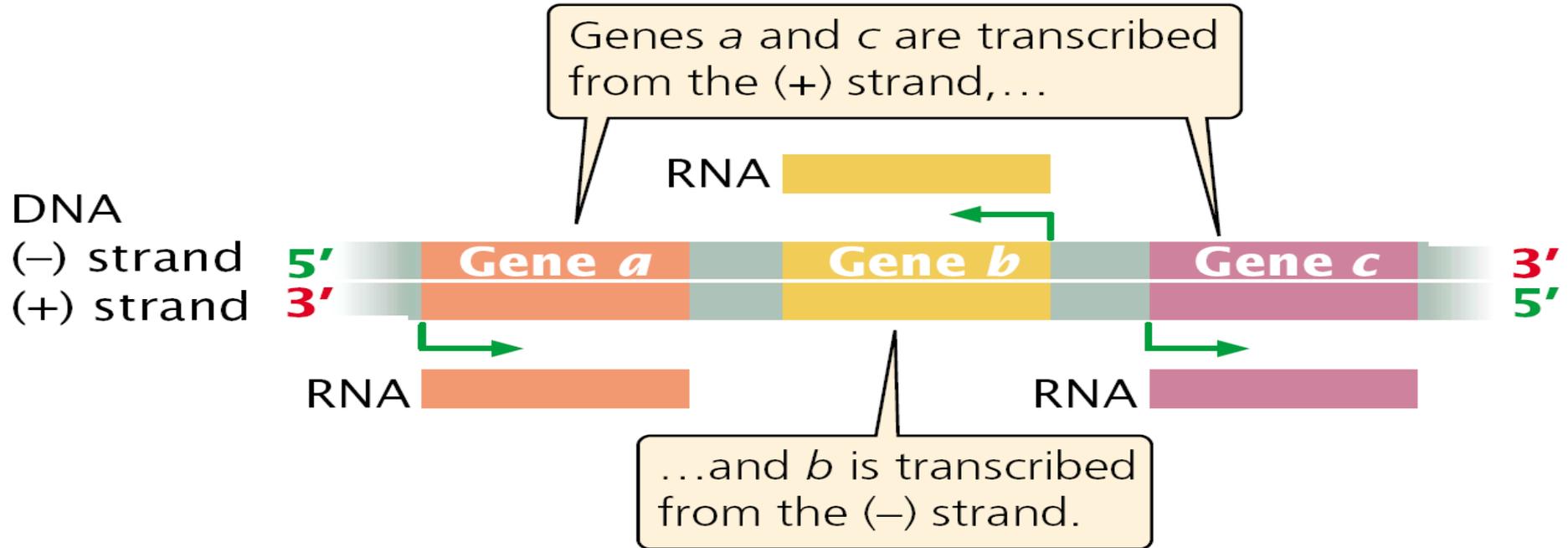
## RNA polimerase

5 subunidades Mr 390.000

$\sigma$  Subunidade (Mr 70.000)

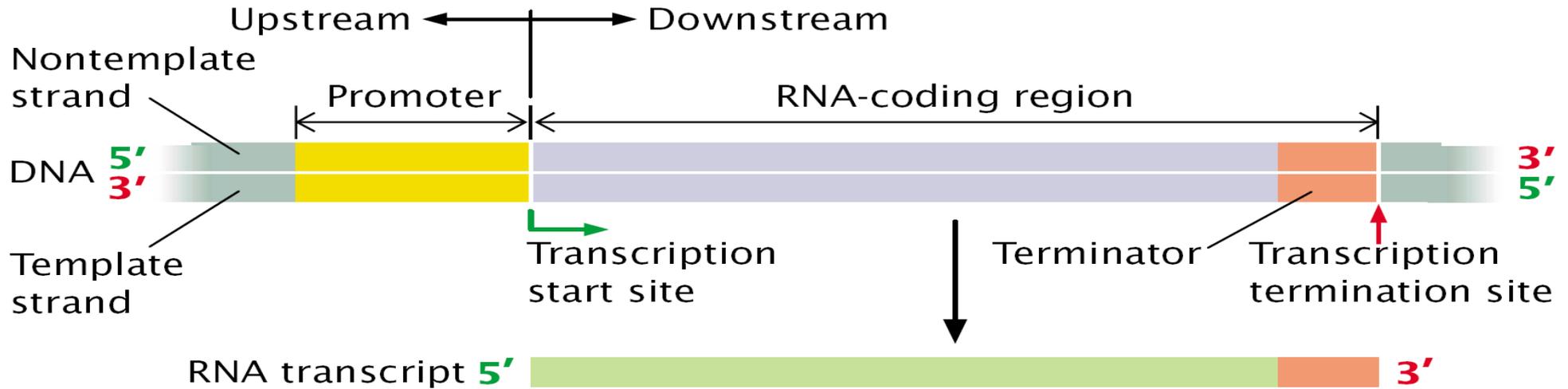
# Transcrição

As duas fitas podem atuar como fitas moldes em genes distintos



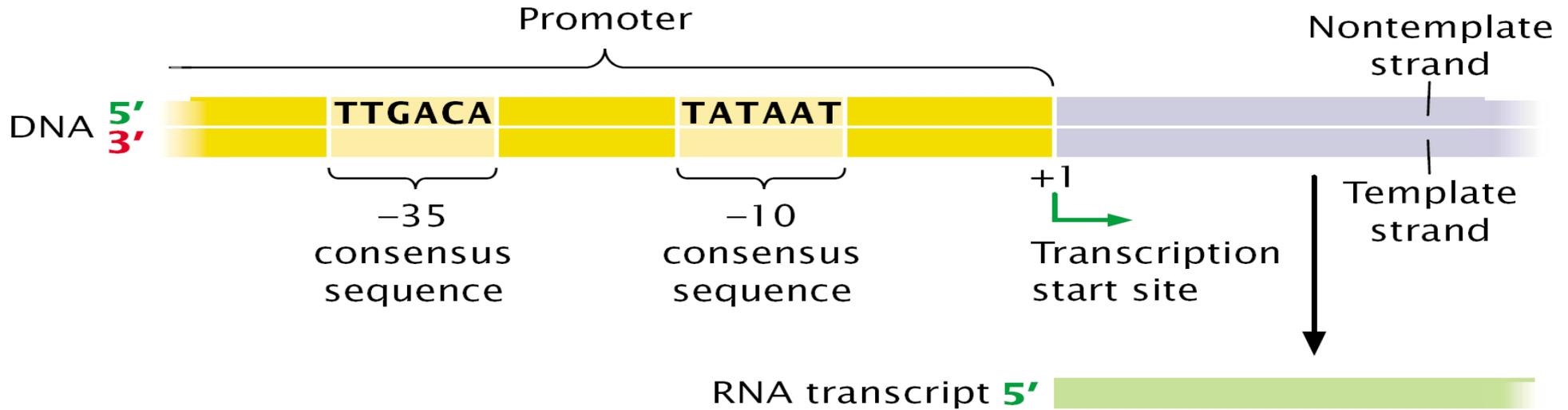
# Transcrição

## Unidade de Transcrição

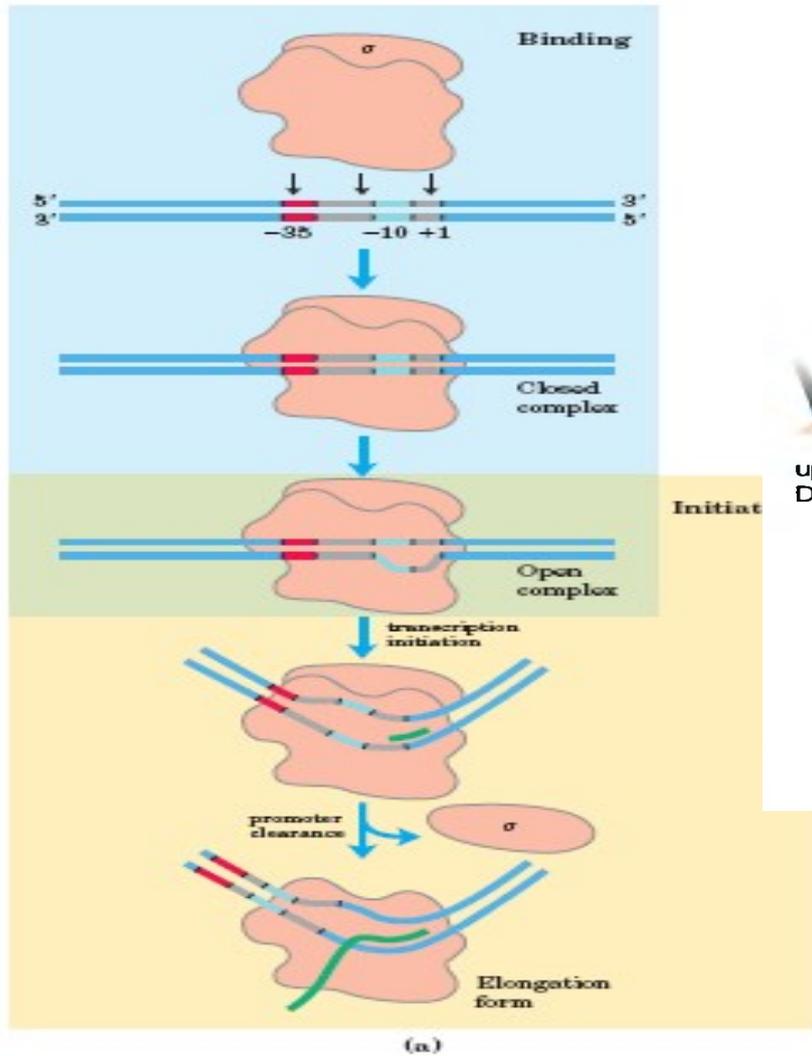


# Transcrição

## Promotor de *E. coli*

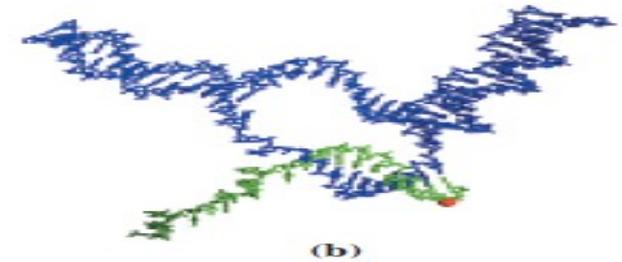
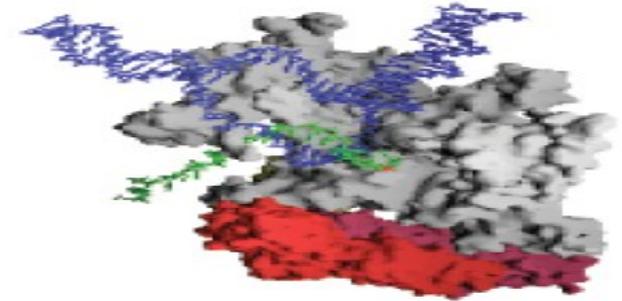
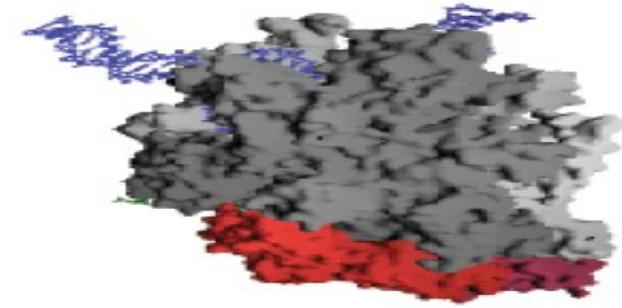


# Transcrição *E. coli*



RNA  
chai

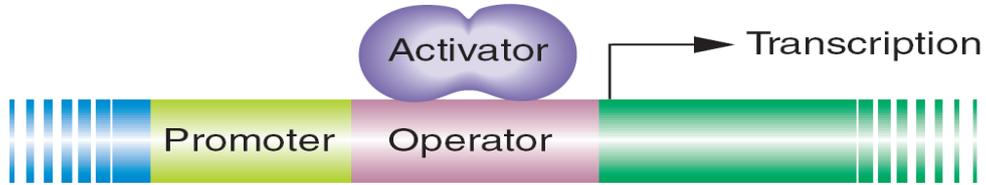
upstream  
DNA



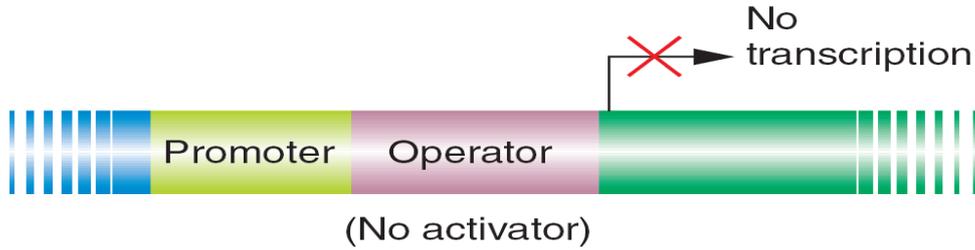
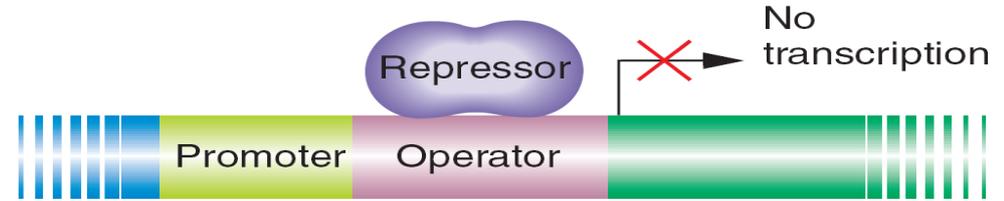
(b)

# Regulação da Transcrição Procariotos

## Positive regulation

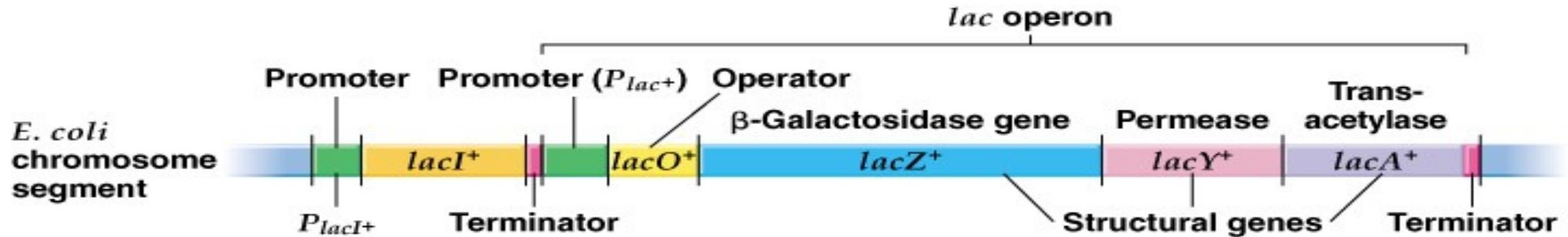


## Negative regulation



# Regulação da Transcrição Procariotos

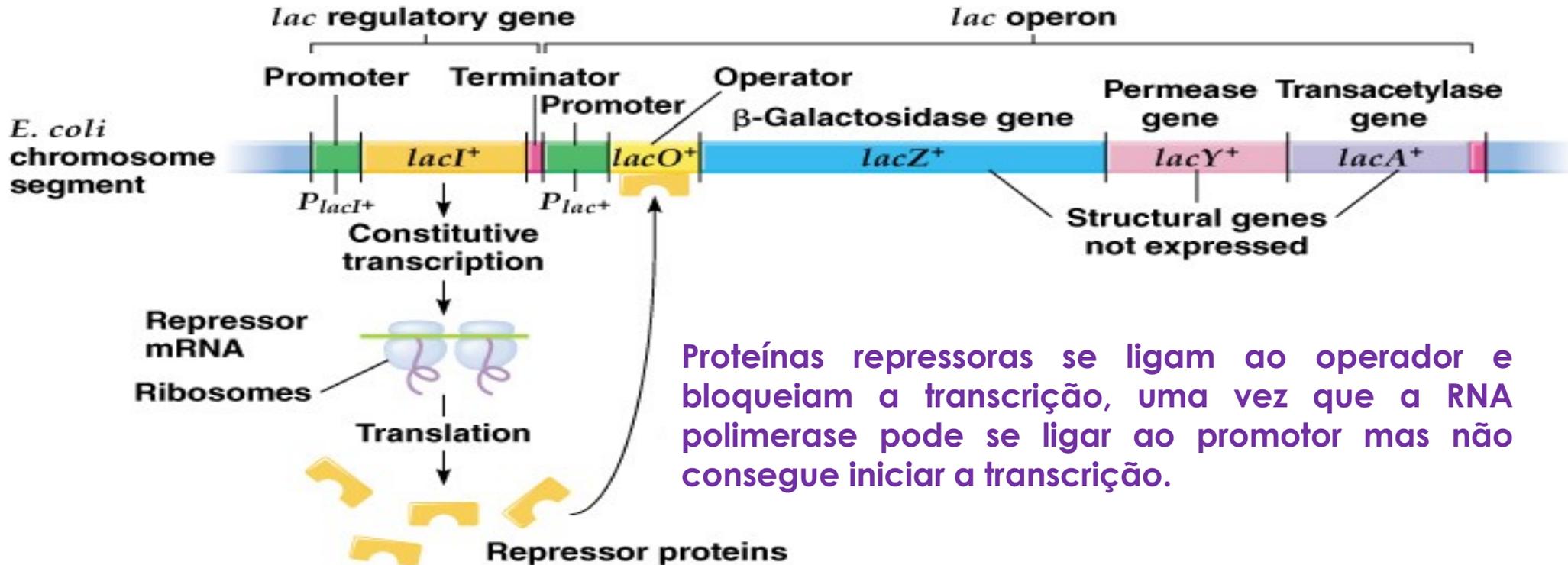
## Operon *lac*



- $\beta$ -galactosidase (*lacZ*)
  - Converte lactose ( $\beta$ -galactosídeo) em glucose e galactose
- $\beta$ -galactosídeo permease (*lacY*)
  - Transporta lactose através da membrana plasmática
- $\beta$ -galactosídeo transacetilase (*lacA*)
  - Transfere um grupo acetyl (da AcCoA) para  $\beta$ -galactosídeos
- *lacI* → Codifica Proteína Repressora do operon *lac* (*lacO<sup>+</sup>*)

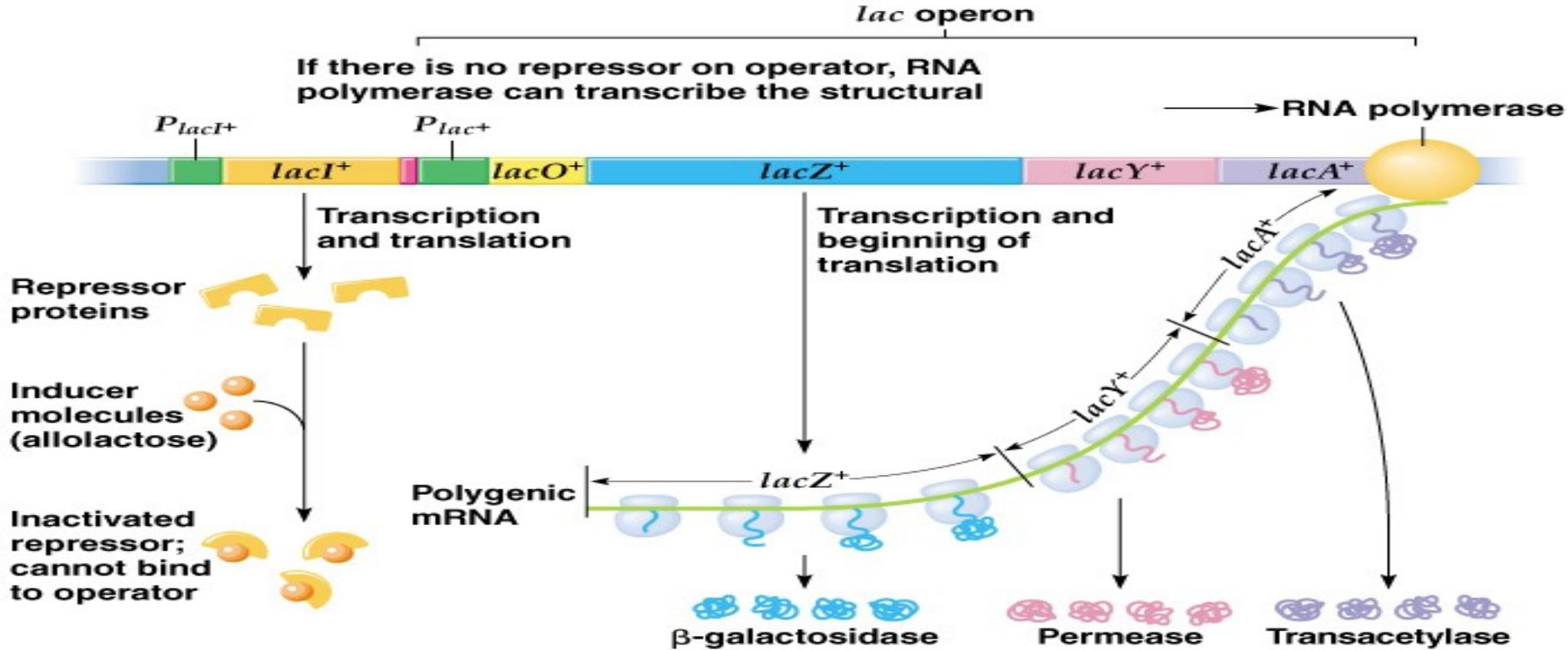
# Regulação da Transcrição Procariotos

## Operon *lac* na ausência de lactose



# Regulação da Transcrição Procariotos

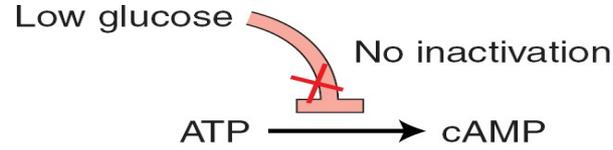
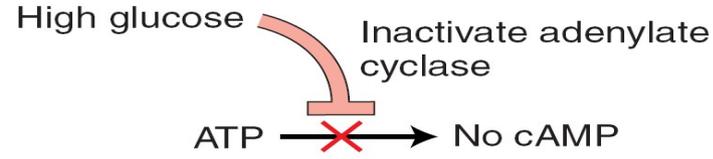
## *Operon lac na presença de lactose*



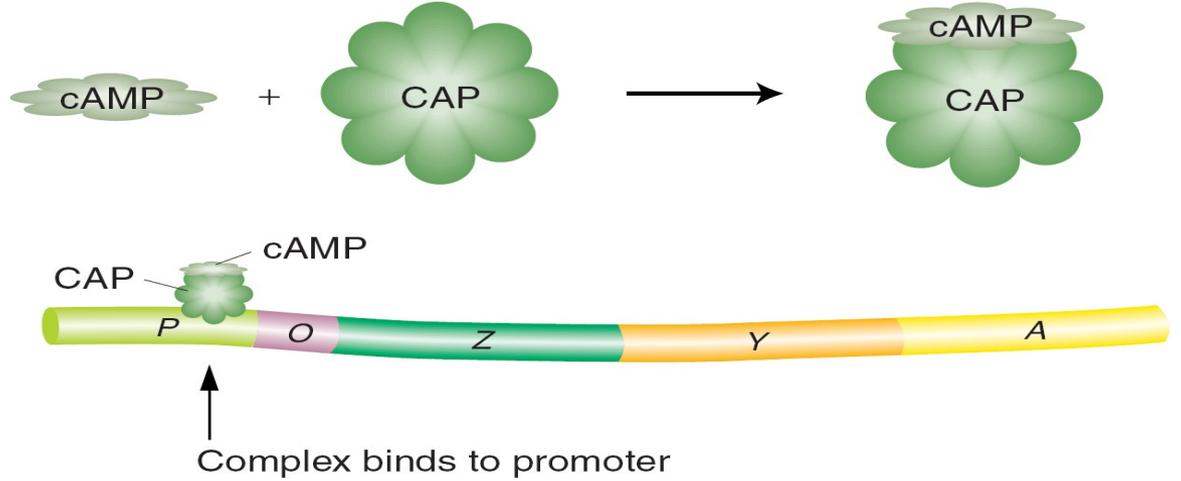
# Regulação da Transcrição Procaríotos

## Regulação Catabólica com CAP+cAMP

### (a) Glucose levels regulate cAMP levels



### (b) cAMP–CAP complex activates transcription



---

# Transcrição em Eucariotos

## **Type**

RNA polymerase I

RNA polymerase II

RNA polymerase III

## **Transcribes**

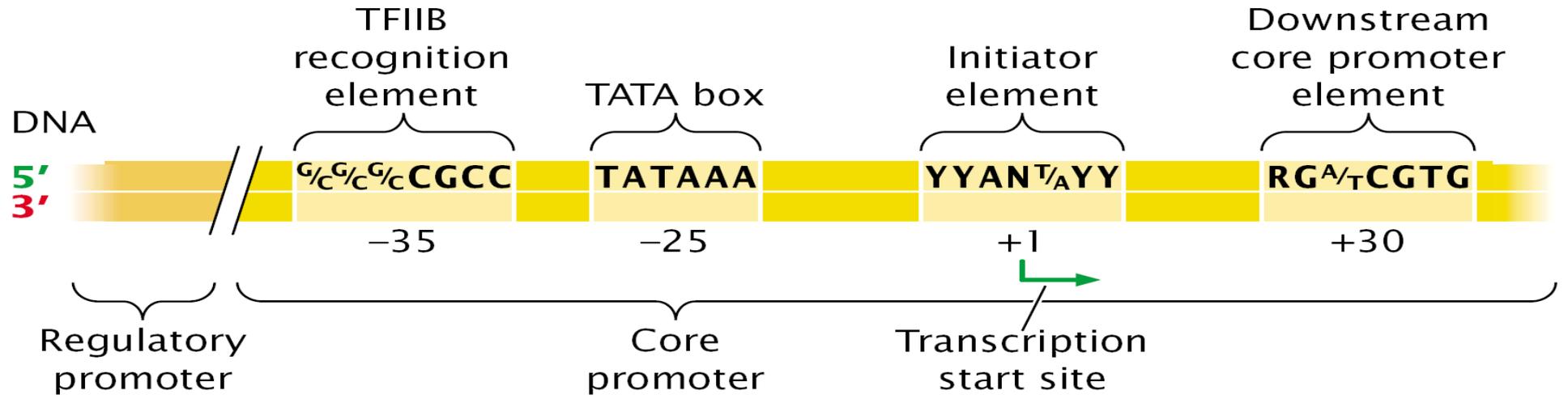
Large rRNAs

Pre-mRNA, some snRNAs, snoRNAs

tRNAs, small rRNA, snRNAs

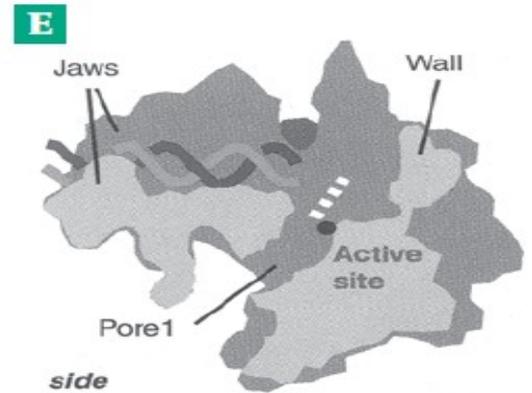
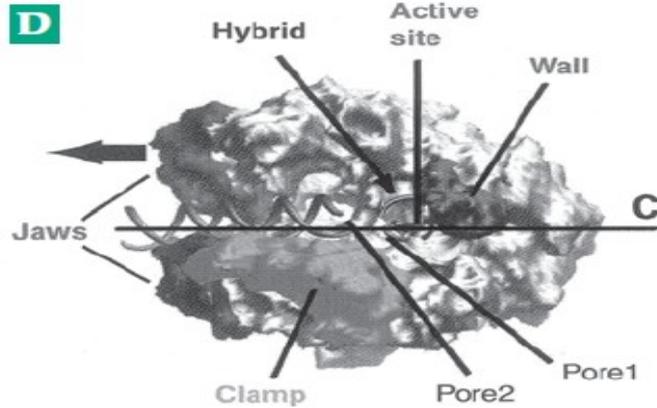
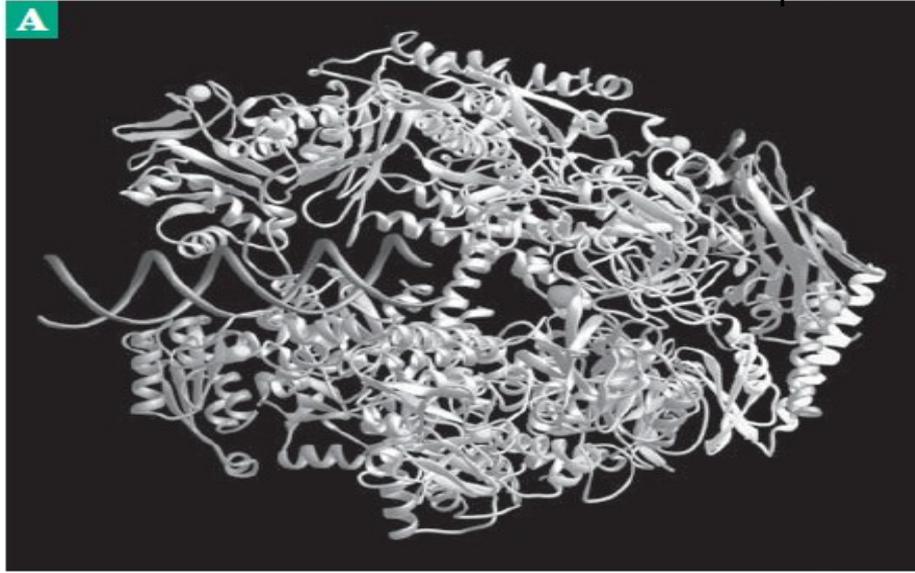
# Transcrição em Eucariotos

## Promotor Eucariótico

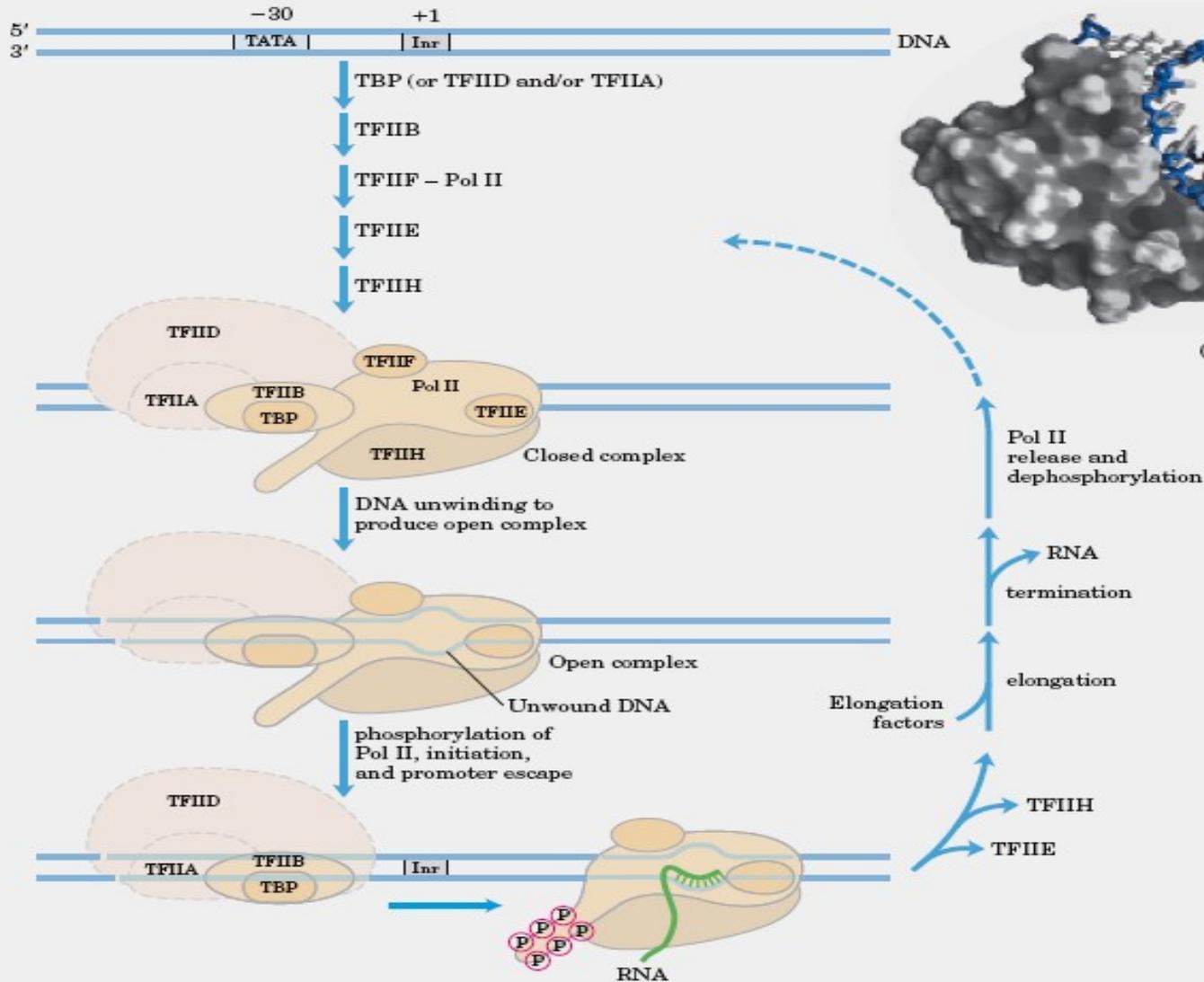


# Transcrição em Eucariotos

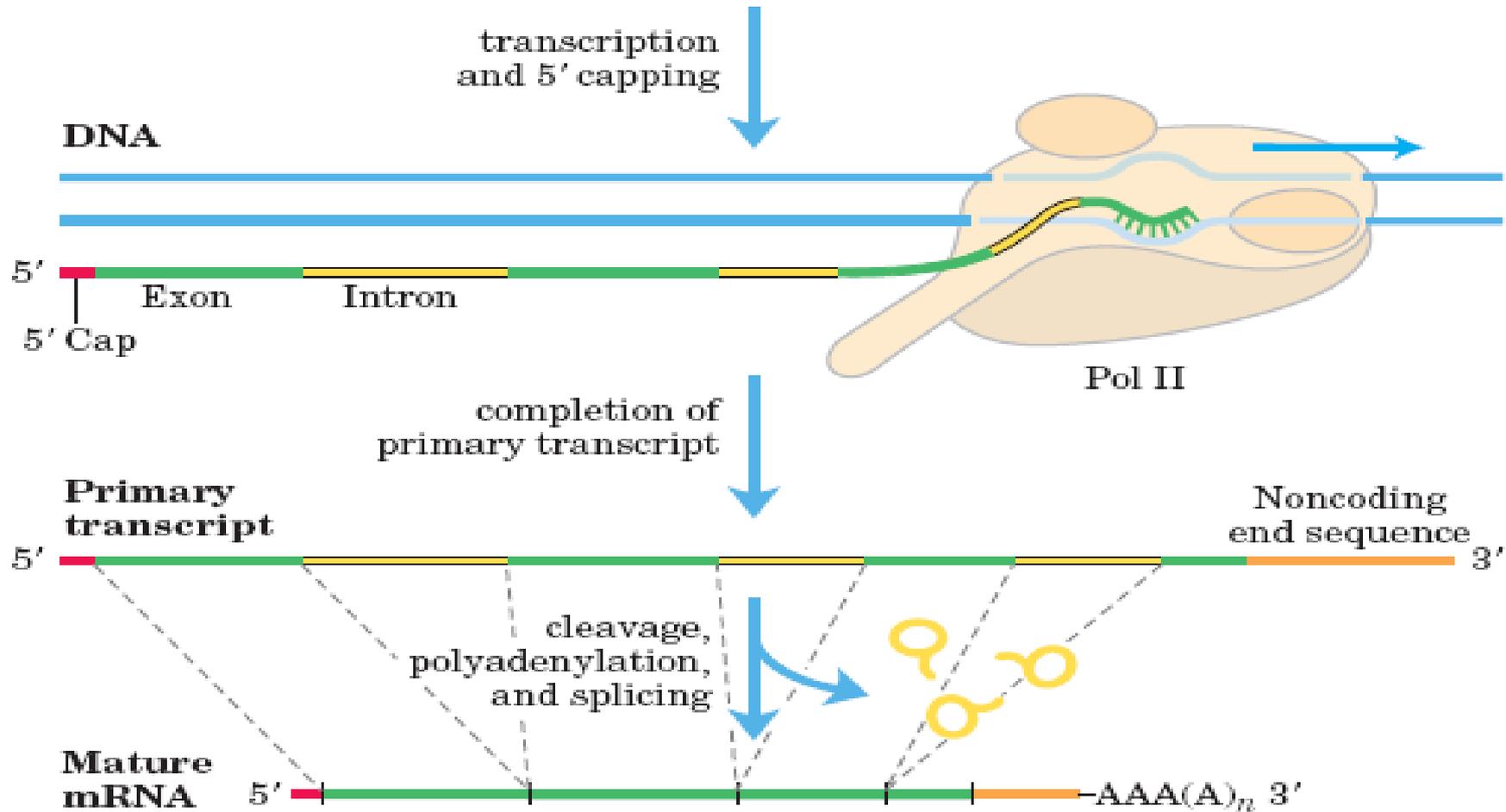
## RNA polimerase II



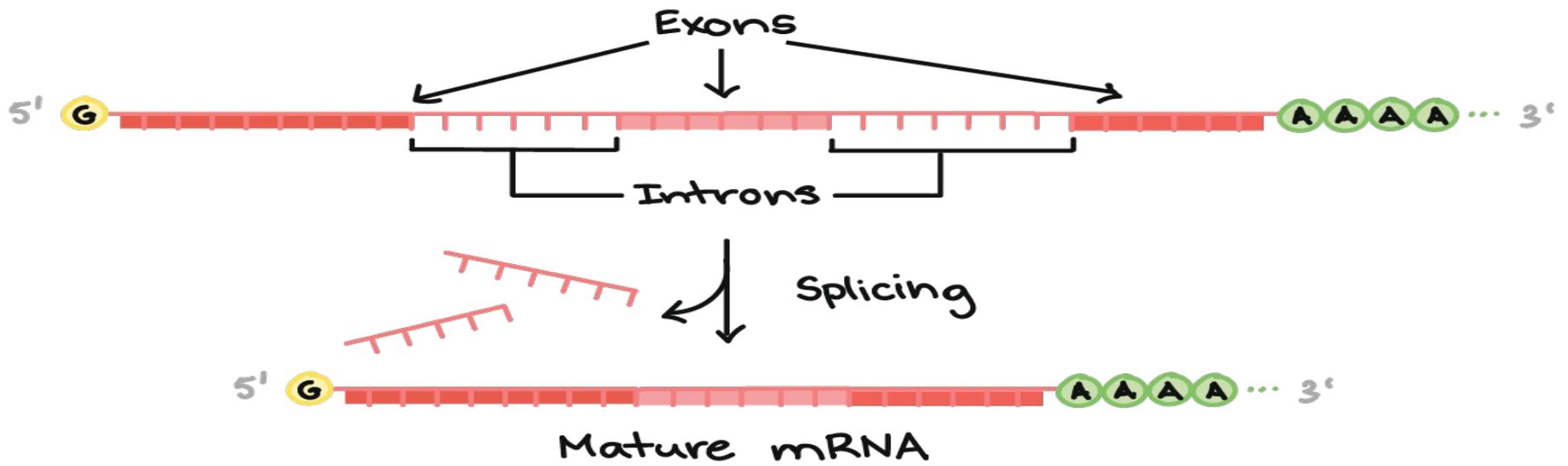
# Transcrição em Eucariotos



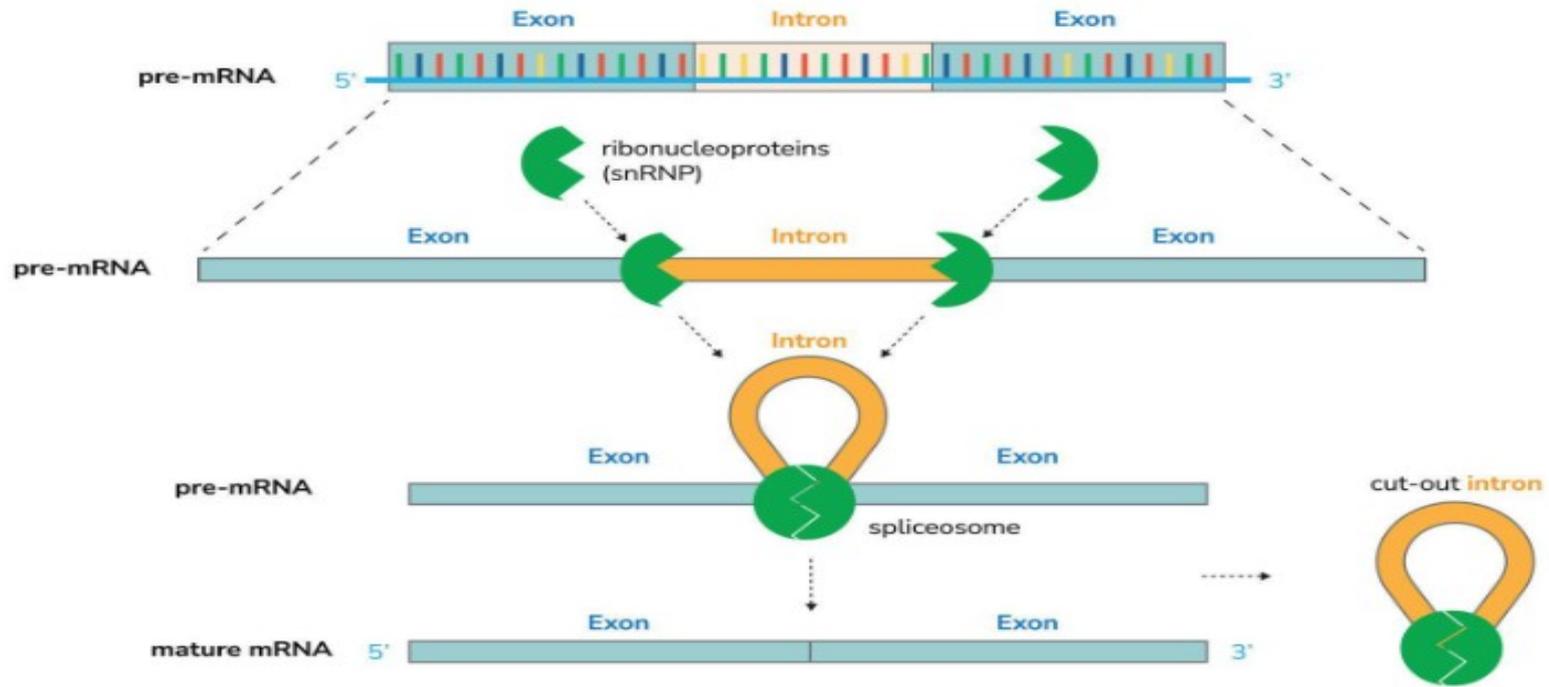
# Transcrição em Eucariotos



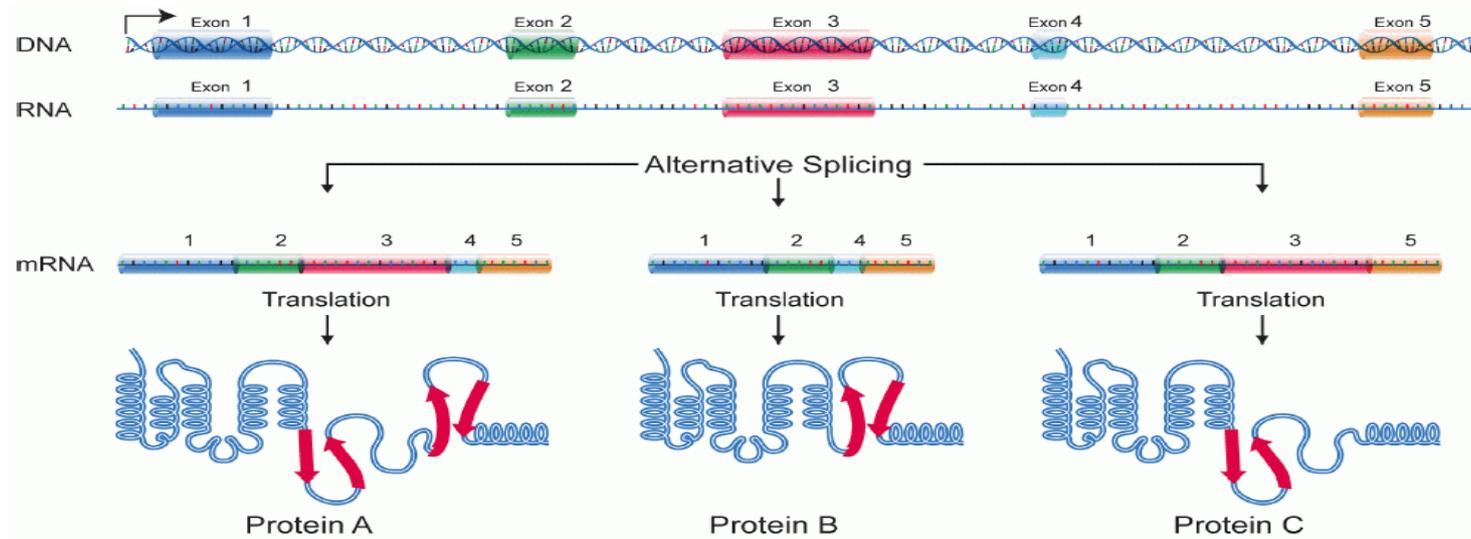
# Transcrição em Eucariotos



# Transcrição em Eucariotos

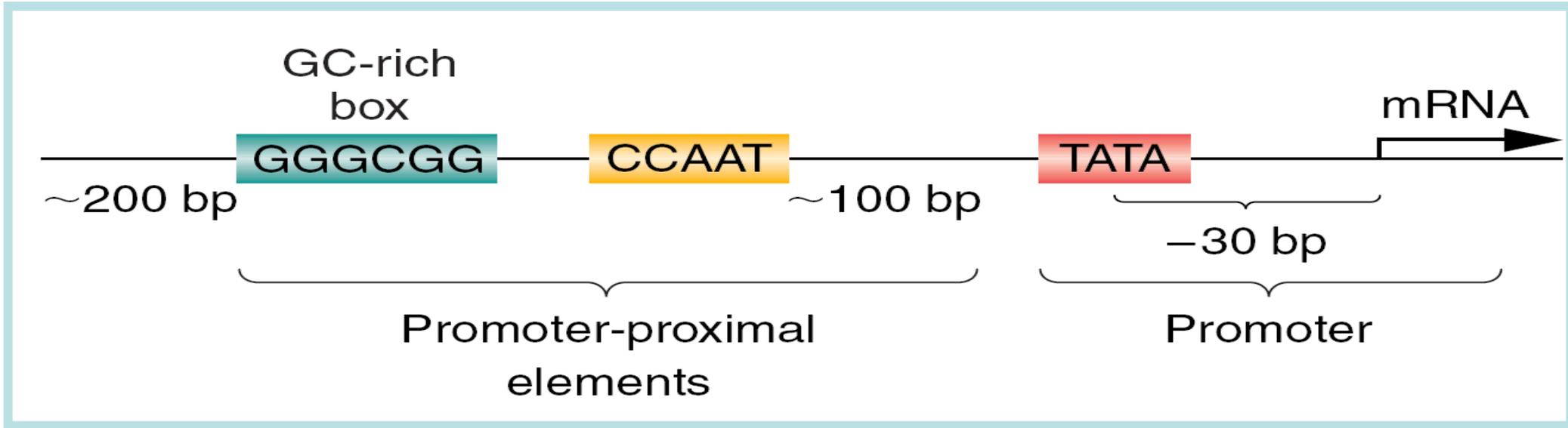


# Transcrição em Eucariotos



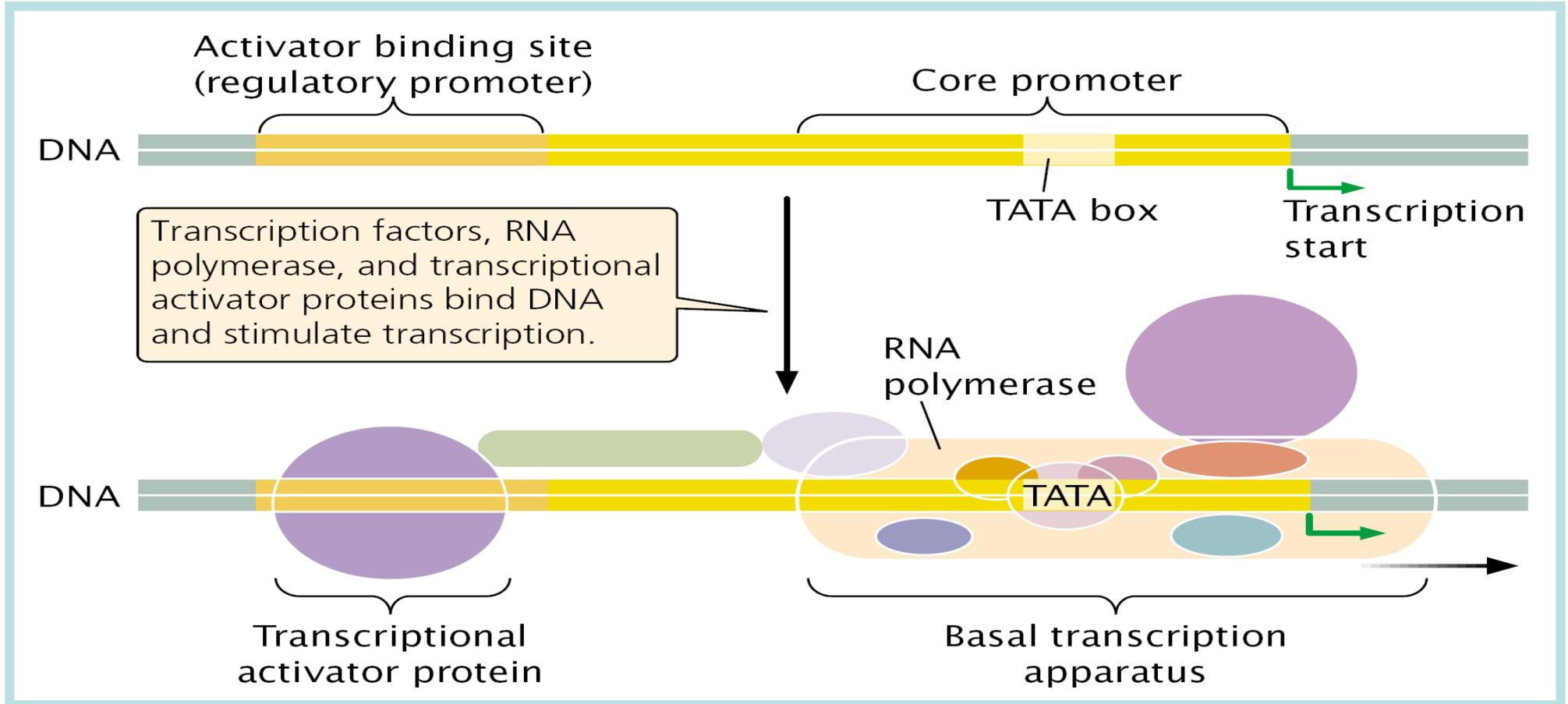
# Transcrição em Eucariotos

## Região Reguladora



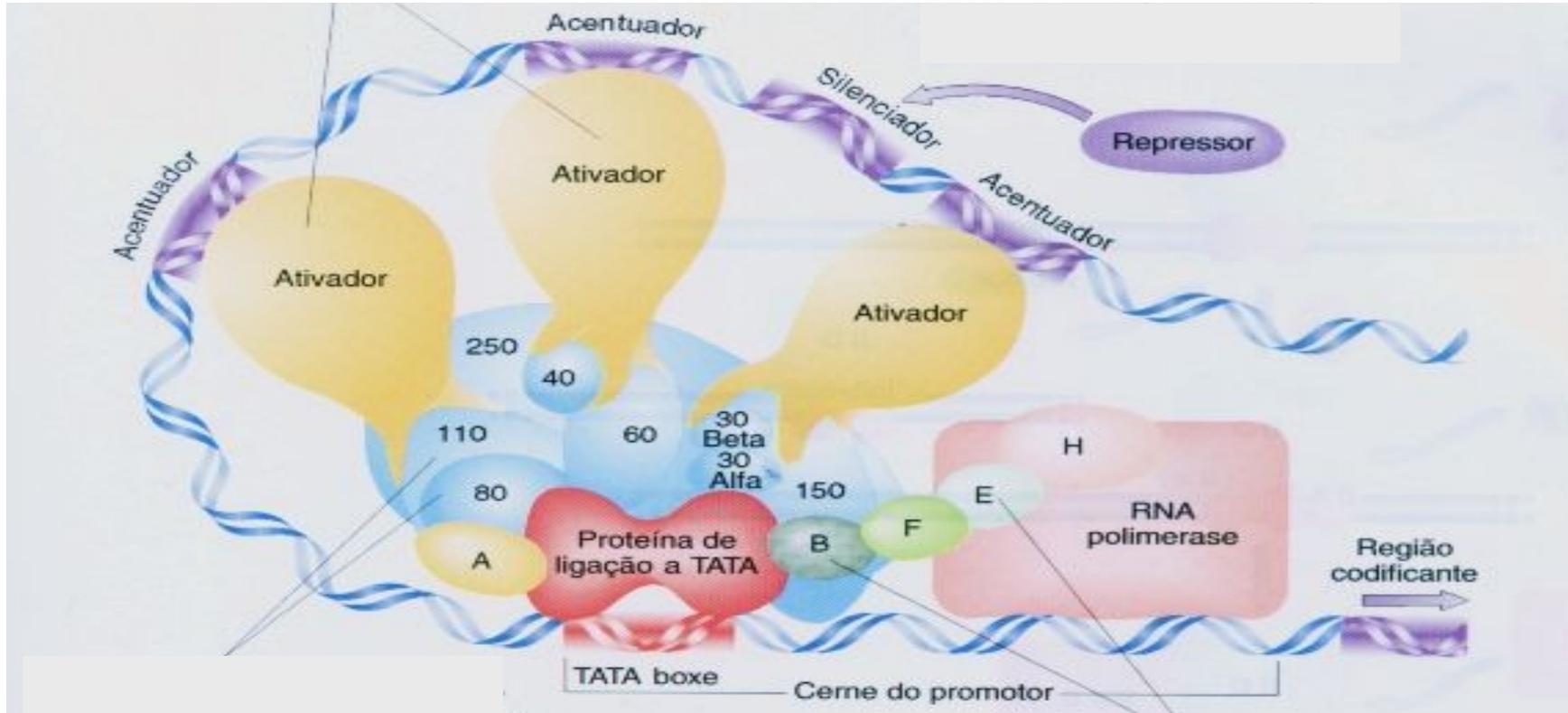
# Transcrição em Eucariotos

## Ativadores



# Transcrição em Eucariotos

## Acentuadores (Enhancers)



# Transcrição em Eucariotos

---

## Toxinas mortais – Inibição de RNA polimerases



Image modified from "[Amanita phalloides](#)," by Archenzo ([CC BY-SA 3.0](#)). The modified image is licensed under a [CC BY-SA 3.0](#) license.\_

## Papel da Estrutura da Cromatina na Regulação

- Reações reversíveis:
  - Acetilação de histonas
    - Reduz a afinidade histonas/DNA
    - Ativa a transcrição
  - Metilação do DNA
    - Pode atrair desacetilases (desacetila histonas)
    - Inativa a transcrição
  - Metilação de histonas
  - Fosforilação de histonas
    - Pode ativar ou inativar a transcrição
- Ativação da transcrição é precedida por:
  - Acetilação de histonas
  - Desmetilação do DNA

# Transcrição em Eucariotos

---

- Micro RNAs (miRNA)
  - Barreira física para repressão da tradução
  
- RNA (de) interferência (RNAi)
  - Clivagem de mRNA
  
- Degradação comum de mRNA
  
- Afetam a estabilidade do mRNA, bem como a tradução em proteína