

## **OUTLINE 3**

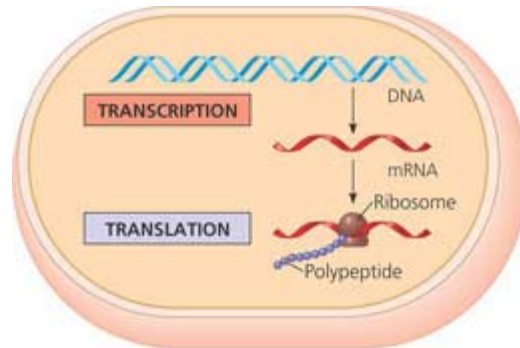
### **III. Control of Gene Expression in Prokaryotes**

#### **A. Regulatory proteins**

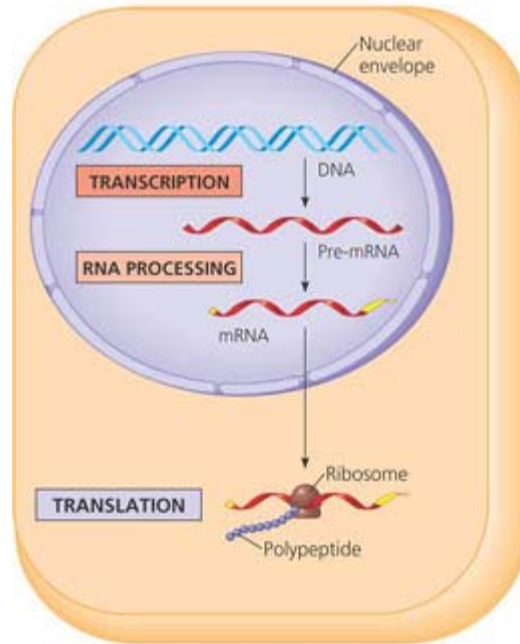
#### **B. The operon model**

#### **C. Examples**

- 1. the lac operon (substrate induction)**
- 2. the tryp operon (end product repression)**
- 3. the lac operon (positive control)**



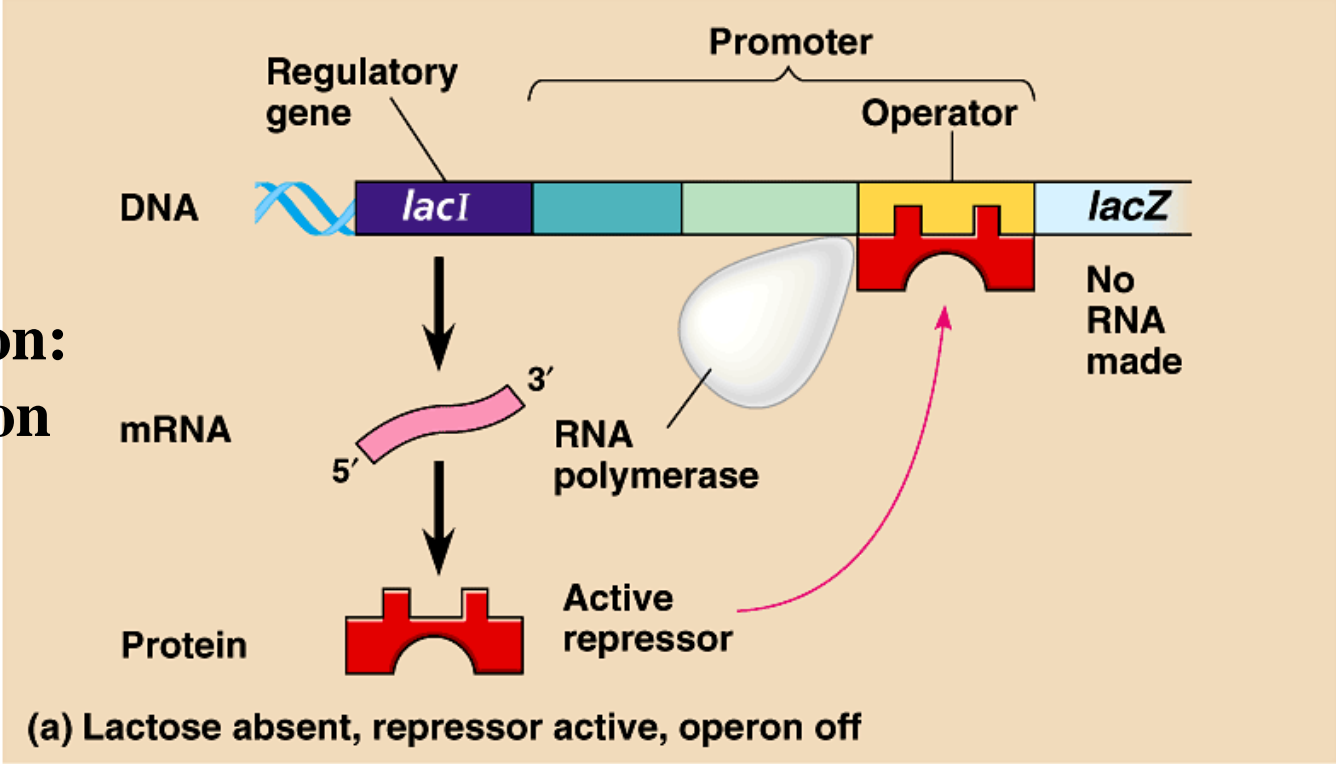
**(a) Prokaryotic cell.** In a cell lacking a nucleus, mRNA produced by transcription is immediately translated without additional processing.



**(b) Eukaryotic cell.** The nucleus provides a separate compartment for transcription. The original RNA transcript, called pre-mRNA, is processed in various ways before leaving the nucleus as mRNA.

Fig. 18.21

**Negative regulation:  
Substrate induction**



Copyright © Pearson Education, Inc., publishing as Benjamin Cummings.

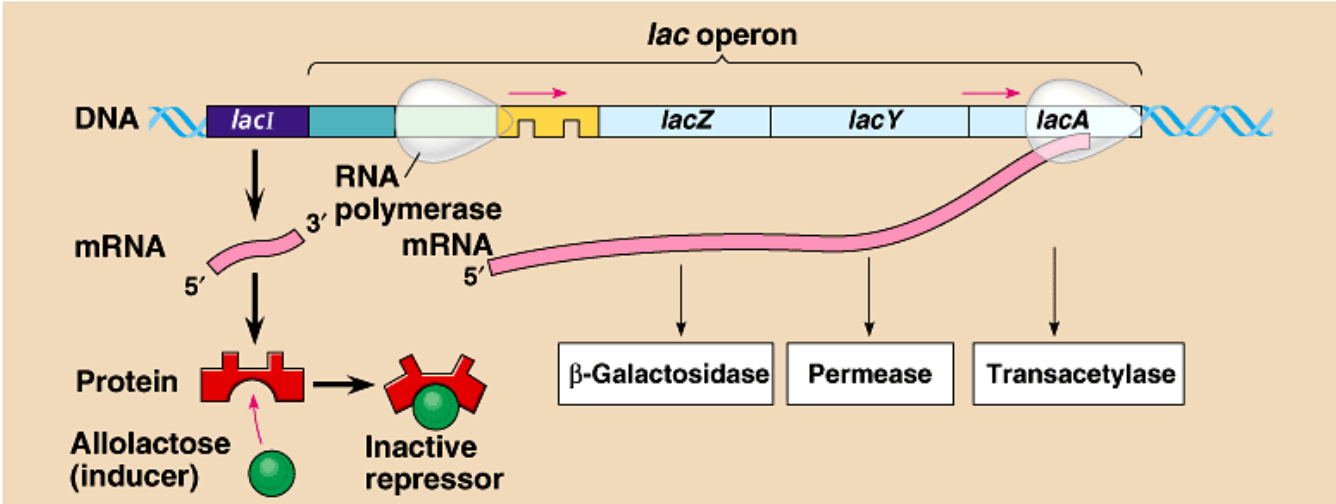


Fig. 18.22a **Positive regulation of the lac operon**

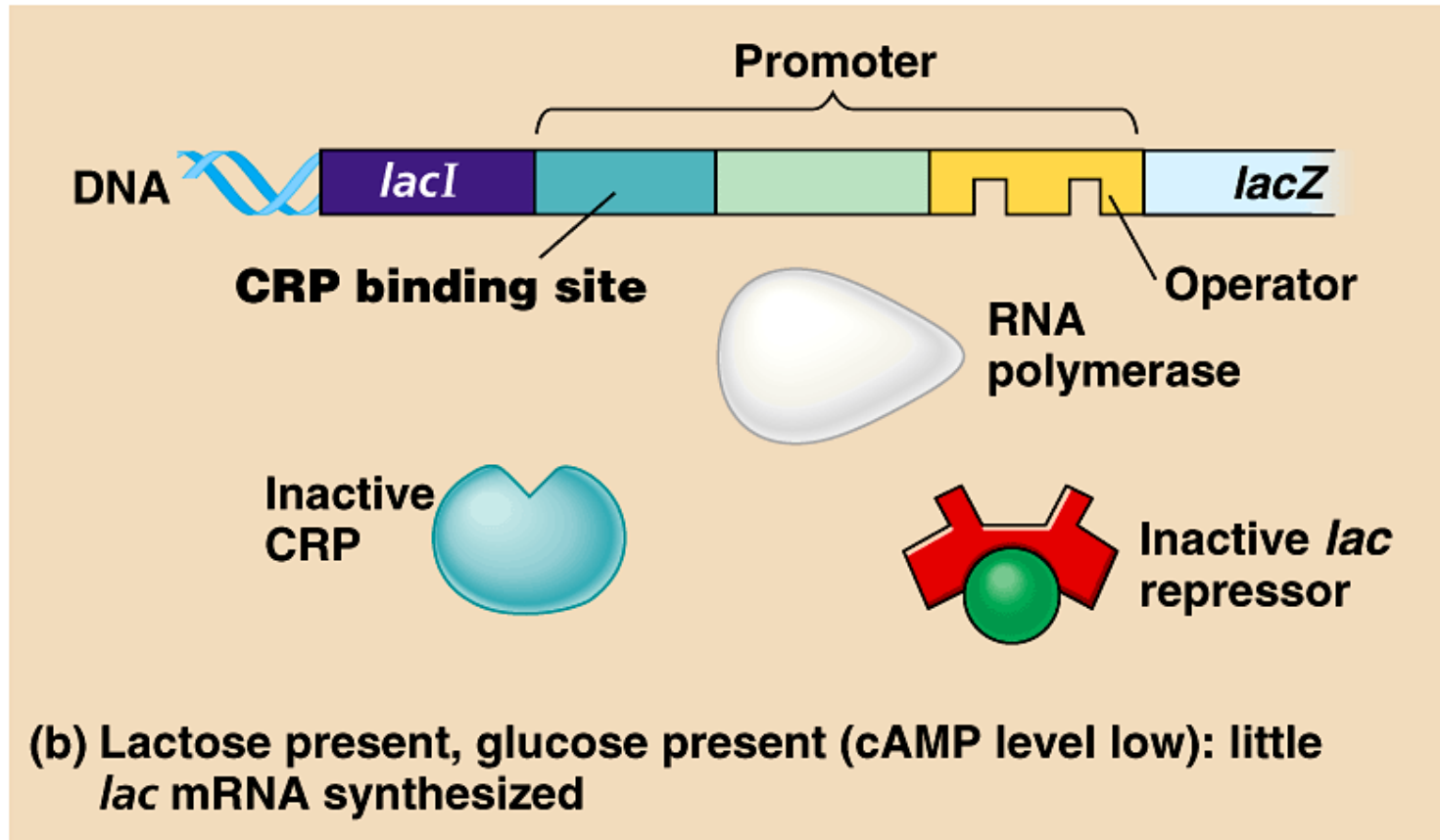
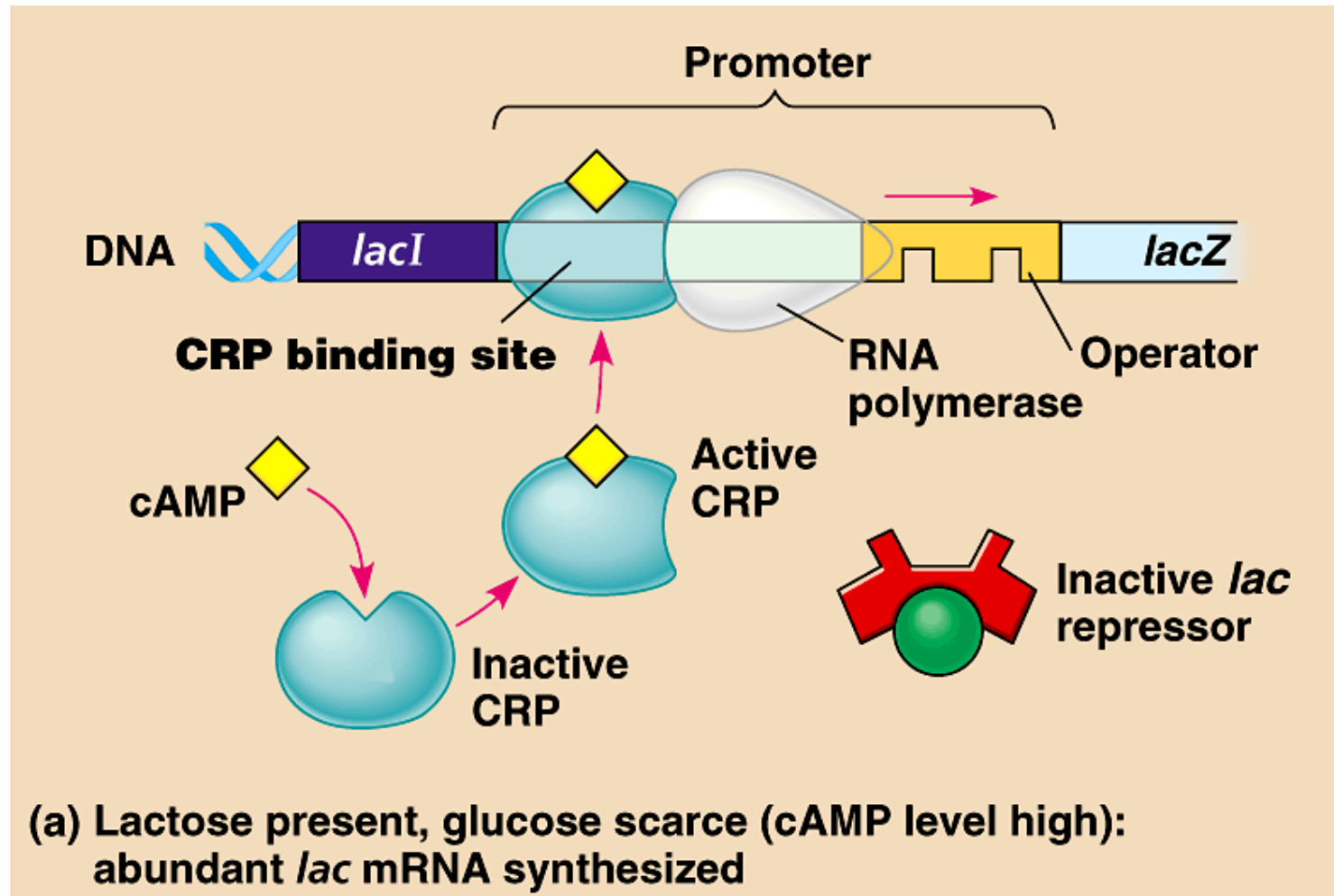


Fig. 18.22b

## Positive regulation of the lac operon



# Lac Operon

## No food

- Glucose?
  - Low: cAMP high, CRP attaches
- Lactose?
  - Low: Repressor attached

Operon is ready to be enhanced but is shut off

# Lac Operon

## Milk

- Glucose?
  - Low: cAMP high, CRP attaches
- Lactose?
  - High: Repressor removed

Operon is on and enhanced

# Lac Operon

## Milkshake

- Glucose?
- Lactose?
- High: cAMP low, CRP off
- Low: Repressor removed

Operon is on but un-enhanced

# Lac Operon

## Powerade

- Glucose?
  - High: cAMP low, CRP off
- Lactose?
  - Low: Repressor attached

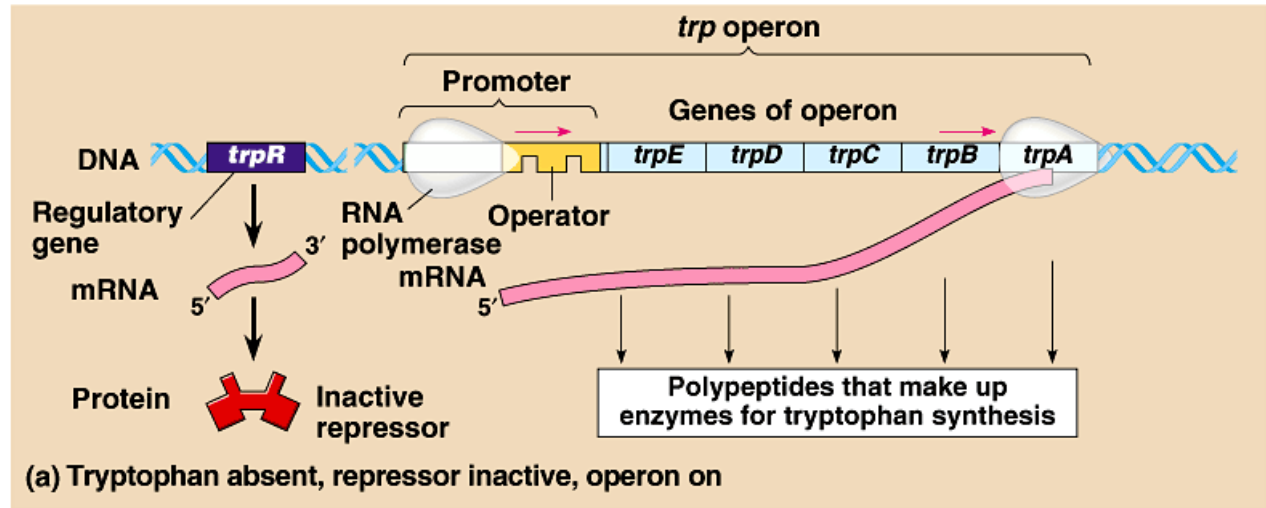
Operon is off and un-enhanced

# Lac Operon

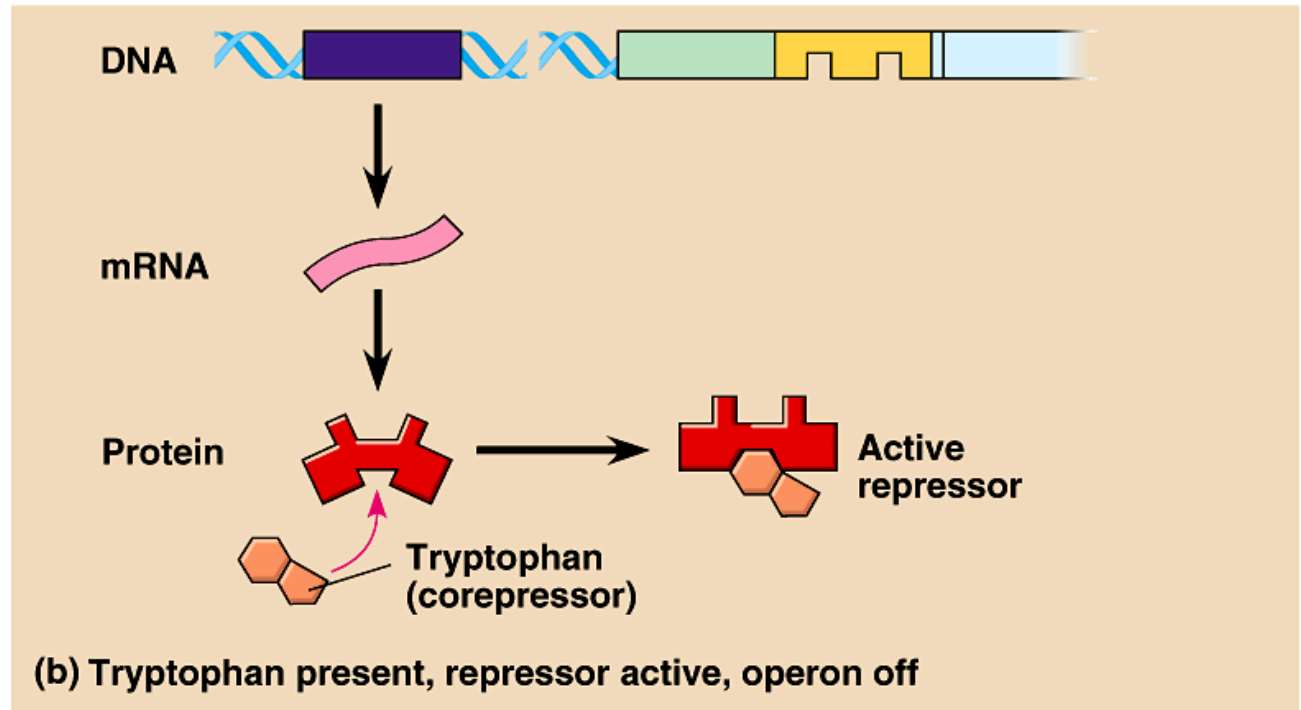
- No food: ready to be enhanced but off
- Milk: enhanced transcription
- Milkshake: un-enhanced transcription
- Powerade: off and un-enhanced

# Negative regulation: end-product repression

Fig 18.20



Copyright © Pearson Education, Inc., publishing as Benjamin Cummings.



Copyright © Pearson Education, Inc., publishing as Benjamin Cummings.