

Gene regulation - II

Genetics 371B Lecture 28

17 Nov. 1999

Last time...

Negative control of transcription in the lac operon

BUT... That was in cells grown in glycerol

What if cells are grown in glucose?

Carbon source	β -gal activity/cell
glycerol	
glycerol + lactose	
glucose	
glucose + lactose	

Glucose overrides the lacI system:

	- glucose + lactose	+ glucose + lactose
lacI ⁻		
lacO ^c		

Why?

Mutational analysis of **catabolite repression**:

- ◇ cya^-
- ◇ cap^-

Complementation

- ◇ $cya^- cap^+ / cya^+ cap^-$:

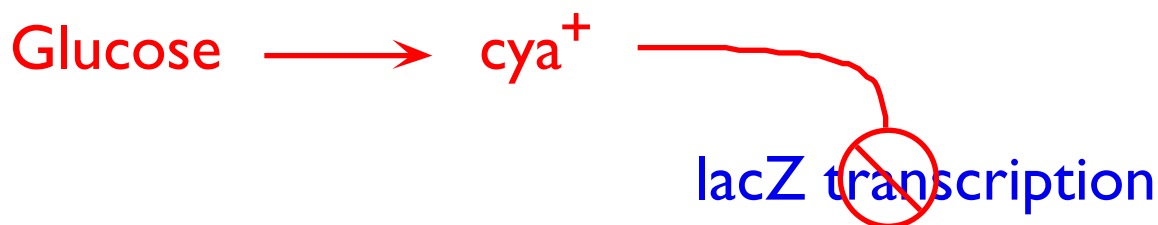
Models

◆ Positive control (activation)



cya^- cells:

◆ Negative control (repression)I



cya^- cells:

Test of the models:

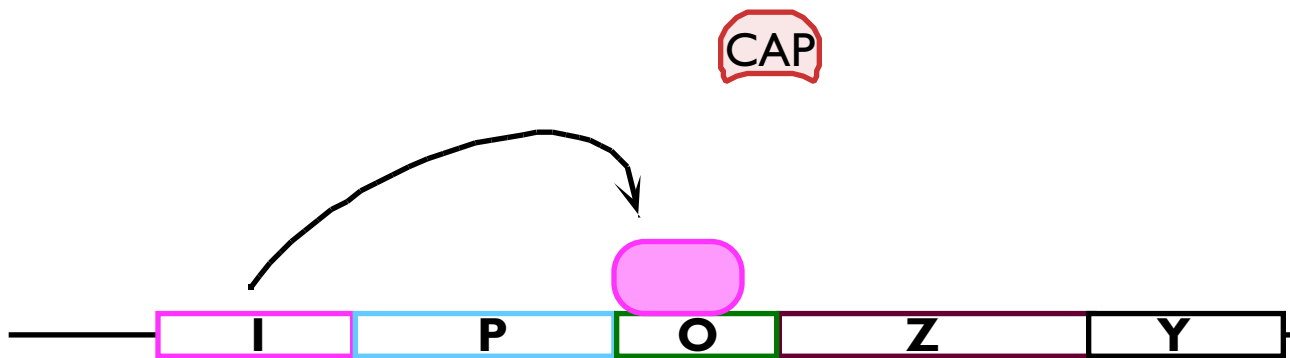
cya^- / cya^+ :

What do cya and cap do?

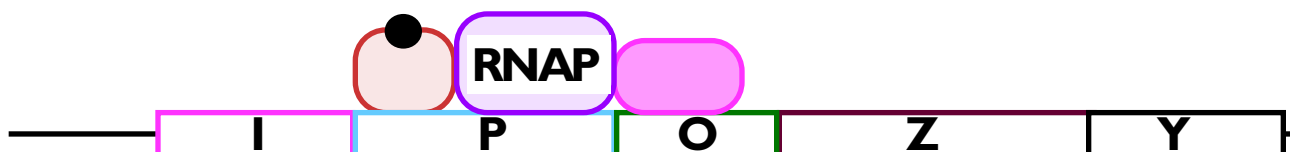
cya^+ : adenylate cyclase

cap^+ : catabolite activator protein (CAP)

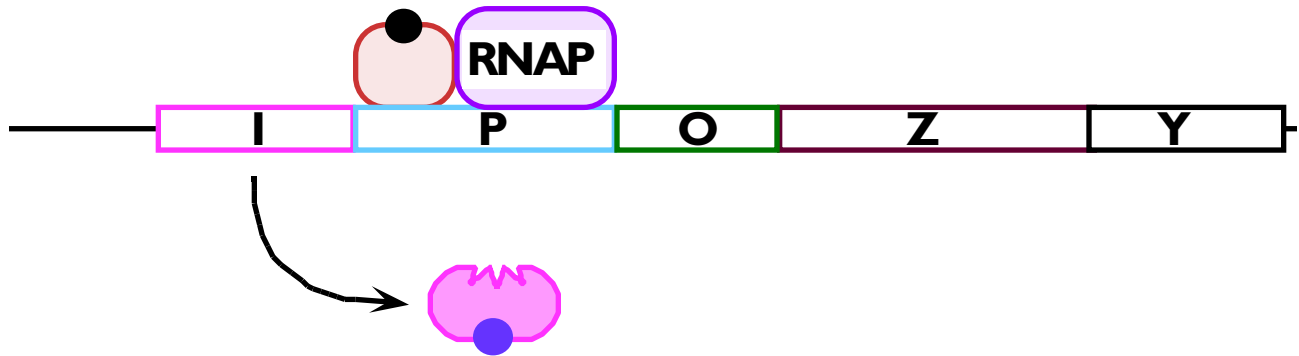
- ◆ Glucose present, lactose absent



- ◆ Glucose absent, lactose absent



- ◆ Glucose absent, lactose present



Exercise: Draw a pathway to represent regulation of the lac operon (including glucose and lactose).

Regulation of transcription in eukaryotes:

The **GAL** regulatory pathway in yeast

◆ GAL1, GAL10, GAL7 gene transcription –

◆ Regulatory mutations:

Strain	Phenotype
gal4 ⁻	non-inducible
GAL4/gal4 ⁻	inducible
GAL4 ^C	constitutive
GAL4/GAL4 ^C	constitutive
gal80 ^C	constitutive
GAL80/gal80 ^C	inducible
gal4 ⁻ gal80 ^C	non-inducible

Interpreting...

- ◆ Is GAL4 a positive activator or a negative regulator of GAL gene transcription?
- ◆ Is GAL80 a positive activator or a negative regulator of GAL gene transcription?
- ◆ What kind of interaction do GAL4 and GAL80 have?